PrivatE Company Classification Standard (PECCS™)

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EDHEC Infrastructure & Private Assets Research Institute

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1. PECCS™ Overview

The market for private assets, i.e., the buying and selling of private companies, makes up a large portion of global financial markets, both in terms of asset values and the amount of new capital raised. However, there is a clear absence of a private company-specific classification scheme to clarify the contents of private portfolios and precisely define a private investment. Currently, investors rely on existing industry classification schemes that only consider the company's activity, and hence are inadequate at capturing other important risk factors for private companies. To value private companies more frequently and with scarce pricing data, categories beyond industrial activity are needed that can capture additional risk factors with available information.

The PrivatE Company Classification Standard (PECCS™) has been created by the EDHEC Infra and Private Assets Research Institute to provide investors with a multi-dimensional classification scheme for private companies. PECCS™ comprises five pillars, namely, the industrial activity of the private company, its lifecycle phase, revenue model, customer model, and value chain type. These pillars help create peer groups of companies exposed to similar systematic factors, thus maximising the insights one can draw about private companies while dealing with limited data availability in private markets. With such informative groupings based on PECCS™, investors can improve allocation, performance monitoring, risk management, and benchmarking for private companies.

Why a new classification is needed?

Precise classification of private companies is important as it underpins the whole investment process in private markets. For example, investment screening by industrial activity needs a clear activity classification scheme. Also, a company's stage of growth, like being a startup or mature company, is a key consideration for the investment strategy, thereby requiring a classification that can differentiate companies on their lifecycle stages.

Although the capital structure of a private company is similar to that of a publicly listed company, and includes equity, equity-like, and debt securities, the key difference between them is that private companies are not traded in continuous markets. This lack of frequent trading can prevent market participants from clearly understanding the risk-factors of inv-esting in a private company in an objective manner. For example, common factors such as value and size factors, which are taken for granted in public markets, are difficult to measure in private markets due to lack of high frequency price information.

Thus, investors need additional proxies of the risks that private companies are exposed to, including but not limited to their industrial activity. To understand key private market dynamics, for example, it is necessary that the classification scheme should also group companies by their lifecycle stages, as startups face different systematic risks when compared to mature or established companies. Similarly, the classification should consider whether the companies sell their output to individual consumers (i.e., B2C) or to other companies (i.e.,

B2B), as B2B companies may have sales that are less volatile, less price sensitive and repetitive than their B2C peers.

What is PECCS™?

The objective of the *PrivatE Company Classification Standard* taxonomy, or PECCS™, is to organise private companies in the universe of private capital investments, and create homogeneous groups of companies that are subject to similar systematic risks and have closely related risk and return profiles.

PECCS™ achieves this goal using objective criteria and principles that are relevant to private market investors, and by grouping companies along their industrial activity, phase of growth, type of revenue model, position in the value chain, and output characteristics. These dimensions, or pillars, are based on prior academic work, which is detailed in subsequent chapters, and also on a survey of Private Equity investors conducted by the **EDHEC Infra and Private Assets Research Institute** in 2023. Survey respondents indicated that a private company classification can be impactful by focusing on private market-specific characteristics such as lifecycle phases, types of revenue models, and product market characteristics.

PECCS™ offers multiple benefits to investors which include but are not limited to aiding the valuation, monitoring, and benchmarking, of equity and debt investments in private companies.

How is PECCS™ Different

The PECCS™ taxonomy targets the private company rather than a security or a specific investment. Since the starting point for the valuation of any security is the company (or more specifically its cash flows), PECCS™ is built from the perspective of the private company rather than assessing it as an asset, security, or investment. This gives the taxonomy the flexibility to accommodate any kind of asset, security, or investment, which lays a claim to the company's cash flows. How PECCS™ differs from other classification schemes currently available to market participants, and why PECCS™ is the most capable at classifying private companies, is described below.

First, *Burgiss*, an *MSCI* subsidiary, employs a Private Capital Classification System or *PCCS* (Burgiss, 2023), which is unclear and incomplete. *PCCS* lays out a decision tree framework to classify an investment (or holding) in a private company. Although *PCCS* is used by *Burgiss* for benchmarking fund performance, the reliance on investment as the fundamental unit for classification can cause confusion.

For example, an investment under *PCCS* can qualify as a buyout if the investment is made in the form of equity securities for a controlling stake in underlying companies that are considered mature. When such conditions are not met, the investment could qualify as expansion, real assets, venture capital, or private debt, subject to satisfying other criteria under *PCCS*. Thus, it is possible for investments in the same private company, by two investors with different holdings, to qualify as both a buyout and an expansion at the same time, although the value generation is from the same underlying private company. Such ambiguity confounds the interpretation of performance of buyout and expansion capital.

Moreover, the different dimensions considered in *Burgiss's PCCS* include asset type (i.e., debt or equity) and lifecycle phases (mature or not) explicitly. *PCCS* also borrows industrial sectors based on *MSCI's GICS* (Global Industry Classification Standard), and implicitly considers geographic segments in breaking down the performance of subgroups of investments. Importantly, however, these dimensions ignore revenue models, customer models,

and value-chain, all of which are key risk factors for investments in private companies. For example, a private company with a more recurring revenue model or with high exposure to businesses may be more valuable given that its sales are more resilient to business cycle fluctuations, and such risk factors are currently not accounted for in *PCCS*.

Second, *MSCI's GICS*, although covering all industrial sectors of companies, considers only the activity of the company, and ignores other potential risk factors such as the proposed pillars.

Industry classification schemes developed by government agencies or statistical organisations such as SIC (Standard Industrial Classification Codes), NAICS (North American Industry Classification Scheme) or the more updated NACE (Nomenclature of Economic Activities), when used for private companies still do not capture the other potential risk factors proposed. In addition, the assignment of these codes, when performed by the company are static in nature, i.e., companies choose a SIC or NAICS code when they incorporate, and the code assignments and industry definitions are usually not updated as businesses and industries evolve, respectively.

Thus, compared with other taxonomies, PECCS™ covers several additional risk factors relating to private companies, and offers the flexibility to be adapted to different security types. The analyses of valuation of different securities can be stacked over PECCS™ by combining it with information on a company's capital structure, security characteristics, etc. Moreover, even if not explicitly included as a pillar, geography remains an implicit component of PECCS™ as private companies can be grouped by geography to examine their performance by regions.

PECCS™ Pillars

PECCS™ taxonomy is organised into multiple pillars, each of which captures an independent facet of the private company. Within each pillar the classes (or categories) and subclasses (or subcategories) are exhaustive, i.e., they cover all private companies. Also, in creating the taxonomy, it has been ensured that a company, with the exception of multi-segment private companies, can only belong to one class and one subclass in each pillar, i.e., the classes are mutually exclusive.

However, it is possible for private companies to have different segments, each of which, operate as independent units (e.g., subsidiaries), in which case they can belong to different classes or subclasses under each pillar of PECCS™. An example would be a diversified conglomerate whose industry spans more than one PECCS™ activity class. Similarly, some private companies might engage in complex activities that cannot be assigned to a single subclass and might need a "sum of the parts" approach, whereby an analyst breaks down the business into different segments. In such cases, it is recommended to assign each of the identifiable distinct units of the private company and their subdivisions to the appropriate class or subclass and rely on weighting these different units based on assets or sales, as appropriate. This enables the classification to remain clean and fit for purpose while enabling subjective application based on each asset's characteristics.

Moreover, the PECCS™ framework remains flexible when applied to publicly listed companies for purposes such as finding suitable public comparables for private companies. Private companies share a high degree of commonality with public companies, clearly observable during initial public offerings (IPOs), de-listings, and private investment in public entities (PIPEs), thus

Figure 1: The Five Dimensions of PECCS™ framework

making PECCS™ relevant to public companies. However, note that the objective of PECCS™ is not to group or analyse the performance of publicly listed companies.

A Rationale for Identifying PECCS™ Pillars

When performing the valuation of a company, an analyst may use information relating to the company such as its regulatory environment, the type of technology used in production, the barriers to new entrants, strategic complementarities, availability or threat of substitutes, capital intensities of businesses, and various other criteria. In the PECCS™ framework, the question then arises as to whether all these dimensions of information on the private company should be considered as separate pillars in PECCS™. However, as described below, inclusion of additional pillars require satisfying the below criteria.

1. *Does the proposed pillar add new information that is not captured by current pillars?* Some of the potential pillars may not capture enough additional information over the current five pillars. For example, the activity pillar may already capture differences in companies in their capital intensities and degree of competition. To illustrate, private companies operating in the "*Information and communication*" sector can be reasonably expected to face higher competition and be less capital intensive. Thus, these proposed dimensions may not

add substantial new information to the risk factors of these private companies that is not already captured by its activity.

2. *Applicability*: Any new pillar should also apply to the entire spectrum of private companies, rather than only subsegments. For example, infrastructure companies can be classified into regulated (prices determined by authority), merchant (market determined prices), or contracted (prices are contracted at the beginning) based on their business risk. But such a classification might be less meaningful for a non-infra company.
3. *Objectivity and Measurements*: Also, the potential new pillars should not be based on subjective criteria, which allow users to arrive at different assignments for the same private company, thereby reducing the objectivity and the utility of PECCS™. Moreover, any new pillar proposed needs to be able to support quantitative measurements which can lead to the objective groupings of classes.

Given these considerations in addition to a preference for simplicity, PECCS™ pillars are restricted to activity, lifecycle phases, revenue model, customer model, and value chain types, the choice of which is also supported by the survey.

PECCS™, A Standard for the Industry

PECCS™ categorisation enables the comparative evaluation of any private company in an objective manner, thus setting a standard for private companies. It is relevant to asset allocators, asset managers, regulators, banks, consultants, researchers, service providers, and other participants in the following ways:

- **Framework:** Provides a systematic framework to classify and organise private companies;
- **Benchmarking:** Enables identification of rivals and peer groupings for private companies;
- **Allocation:** Documents the investable segments and sub-segments in private capital markets;
- **Returns:** Measure and track the performance of private companies, thus providing inputs for benchmarking fund strategies and fund managers;
- **Risk:** Compare baseline systematic risk exposures of investor portfolios with market benchmarks, enabling investors to build on them through customisation and integration of other risk factors; and
- **Performance attribution:** Enable performance attribution in examining fund manager performance in terms of company, security, sector, and market selection, a vast improvement over quartiling approaches

PECCS™ Structure and Methodology

PECCS™ has multiple pillars to classify private companies, including:

- 12 classes and 67 subclasses of activity;
- 3 classes and 7 subclasses of lifecycle phase;
- 4 classes and 14 subclasses of revenue model;
- 2 classes and 8 subclasses of customer model;
- 3 classes and 6 subclasses of value chain.

Each private company can be mapped to a single class and a single subclass in each of these pillars based on qualitative and quantitative criteria, including their business activity, founding histories, characteristics of their revenue, value chains, and output.

PECCS™ Comparative Advantage

PECCS™ is built in the context of the **EDHEC Infra and Private Assets Research Institute** database of private companies, which tracks the valuation and performance of a large, representative set of global unlisted private

companies. Overlaying PECCS™ on country groupings can contextualise the performance of various segments of unlisted private capital markets across the world, allowing standardised and comparable metrics, the kind investors are familiar in using for publicly listed securities but have previously been unavailable to private capital market participants.

PECCS™ is also reviewed regularly to accommodate changes and evolution in the markets and business models. Governance of PECCS™ is established through a PECCS™ Review Committee that comprises asset owners, regulators, and academics. The proposed governance structure, periodic reviews, and design considerations detailed in subsequent chapters, enable the taxonomy to be robust and evolve naturally. [1]

The rest of this document provides more details on each PECCS™ pillar, along with guidance for classifying a company within each pillar. Finally, in the Appendix, few examples for classifying private companies are illustrated. Figures 2 and 3 provide a preview of the classes and subclasses in the PECCS™ classification.

1 - The committee has oversight on the design, maintenance, and relevance of PECCS™. All the committee members must meet high standards for competencies, expertise, and experience, and EDHEC Infra and Private Assets Research Institute is grateful for their contribution in establishing and maintaining PECCS™.

Figure 2: All the Classes & Subclasses in Activity Pillar of PECCS™

Figure 3: All the Classes & Subclasses in Non-Activity Pillars of PECCS™

2. Activity Classification

The first PECCS™ pillar captures the industrial *activity* of private companies, organised into classes and subclasses. Private companies operating in the same industrial activity face similar investment opportunities, mixes of tangible and intangible assets, exposure to systematic factors, regulatory environments, competitive forces, and employ related technologies in production. These overlaps make this this a key pillar in the risk factors that affect a private company.

Prior academic work strongly supports the existence of a strong industry effect in valuations and consequently returns. For example, hot IPO (initial public offerings) and SEO (seasoned equity offerings) markets are characterised by large and numerous issuances, high valuation, and lower subsequent returns are usually concentrated in industries (e.g., Helwege and Liang, 2004). Waves of mergers and acquisitions (M&A) propagate through industry links (Ahern and Harford, 2014). In addition, investment opportunities and financing policies are closely correlated among industry firms, resulting in industry momentum in returns (e.g., Moskowitz and Grinblatt, 1999). Consequently, dividing private companies by activity helps to capture the key systematic risk factors of private investments.

NACE Taxonomy

Any new proposed activity scheme needs to be comprehensive and reflect all od the kinds of businesses performed by private companies. Moreover, it should be simple and easy to adopt for market partcipants who are already exposed to numerous classification schemes. To satisfy these requirements of ease of use, familiarity, and interoperability, we evaluated the common schemes already available to investors, such as the SIC, NAICS, or NACE codes, and selected NACE to form the basis of the activity pillar.

NACE (or Nomenclature of Economic Activities) is the taxonomy of economic activities proposed by Eurostat, the statistical office of the European Communities. NACE has characteristics that are especially beneficial when applied to classifying a global universe of private companies in a multipillar framework:

- **Objective**: NACE classification is not dependent on the type of ownership, legal, or organisational structures, the technology in production, or commercial viability of the activity. But rather NACE focuses on the economic activity, which takes place when resources such as capital goods, labour, manufacturing techniques or intermediary products are combined to produce specific goods or services (Carré, 2008).
- **Scope**: NACE is compatible and builds on top of the United Nation's International Standard Industrial Classification of All Economic Activities (or ISIC), thus making the scheme more relevant at classifying a global sample of companies.
- **Updates**: NACE is more frequently updated when compared to other schemes such as SIC or NAICS codes. The latest version of NACE, the NACE Rev 2.1 is distributed in February 2023, making it the most recent publicly available activity classification scheme. Also, the revisions are undertaken with significant feedback and participation from industry, ensuring that all evolving changes are reflected in the classification in a timely manner.
- **Granularity**: NACE is extremely granular, which can be exploited to identify very similar companies. NACE is currently structured as four nested levels consisting of

22 sections at level 1, 87 divisions in level 2, 277 groups in level 3, and 651 classes in level 4. Each category in the framework is mutually exclusive (i.e., one activity can belong to only one category without overlaps) and exhaustive (i.e., all activities can be classified) and characterises the majority of the products and services produced by a company.

Thus, NACE provides the most representative, up-to-date, and relevant classification when considering a global opportunity set of private companies.

Approach

The first two levels of activities as classified by NACE Rev 2.1 which includes 22 sections at level 1 and 87 divisions in level 2, are adopted to constitute the activity pillar of PECCS™. A dual-class system offers flexibility when applied to private companies as it allows both coarse and granular groupings.

NACE, however, does not take into consideration the extent of how populated (or not) each group could be. Such a consideration is important for a taxonomy for investors, as each subsegment should be investable and present enough choices for investors. With those principles in mind, a few of the level 1 sections are grouped into fewer classes based on economic similarity (e.g., return correlation, performance correlation) and business similarity (e.g., whether the business descriptions of companies in the two groups are similar). Below, the consolidated groups with the name of PECCS™ activity in the left and the corresponding NACE sections in the right, are described.

1. **Natural resources**: Includes 1) Agriculture, forestry and fishing, and 2) Mining and quarrying
2. **Utilities**: Includes 1) Electricity, gas, steam and air conditioning supply, and 2) Water supply, sewerage, waste management and remediation activities
3. **Real estate and construction**: Includes 1) Construction and 2) Real estate
4. **Hospitality and entertainment**: Includes 1) Accommodation and food service activities, 2) Publishing and broadcasting, and 3) Arts, entertainment, and recreation
5. **Professional and admin services**: Includes 1) Professional, scientific, and technical, 2) Admin and support services, and 3) Other services
6. **Education and public**: Includes 1) Public admin, defence, and social security and 2) Education

Other than these groupings at level 1 NACE Rev 2.1 sections, households and extraterrestrial activities are excluded from PECCS™ activity pillars as these activities are less investable in private markets.

Furthermore, as NACE Rev 2.1 is a flexible and principle based framework, the dervied activity pillar of PECCS™, is also seamlessly mappable to other industry schemes, allowing users to integrate PECCS™ into their current workflows. For example, the classification of infrastructure companies, which forms a growing and increasingly important part of private companies, can be performed on the basis of TICCS®,[1] which is mappable to NACE, and hence with PECCS™.

PECCS™ Industrial Classification

Under PECCS™, each private company is assigned to its class and subclass based on the closest match of its key business activity with the definitions of these classes and subclasses. In total, PECCS™ divides key business activities into:

- 12 activity classes; and
- 67 activity subclasses.

1 - Developed by **EDHEC Infra and Private Assets**, TICCS® is the predominant industry classification standard for infrastructure companies, adopted by a majority of infrastructure asset owners and fund managers.

The detailed definitions of each class in PECCS™, their original names in NACE Rev 2.1., and their definitions are shown in Table 1. Table 2 lists the PECCS™ subclasses which assume the same name as the level 2 in NACE Rev 2.1, to avoid confusion.

Table 1: Activity Definitions

Code	Activity Class	NACE Rev 2.1 Section	Definition
AC01	Education and public	1) Education 2) Public Administration And Defence; Compulsory Social Security	Companies that are involved in activities relating to education, public administration, defense, and compulsory social security.
AC02	Financials	Financial And Insurance Activities	Companies that are involved in financial service activities, insurance and reinsurance activities, and similar auxiliary activities.
AC03	Health	Human Health And Social Work Activities	Companies that are involved in healthcare related activities, residential care activities, and social work activities without provision of accommodation.
AC04	Hospitality and entertainment	1) Accommodation And Food Service 2) Publishing, Broadcasting, And Content Production And Distribution Activities 3) Arts, Sports And Recreation	Companies that are involved in accommodation and food service activities, publishing, broadcasting, content production and distribution, and those in arts, sports, and recreation activities.
AC05	Information and communication	Telecommunication, Computer Programming, Consulting, Computing Infrastructure And Other Information Service Activities	Companies that are involved in telecommunication, computer programming, consulting, computing infrastructure, and other information service activities.
AC06	Manufacturing	Manufacturing	Companies that are involved in manufacturing activity, including repaid and maintenance activities.
AC07	Natural resources	1) Agriculture, Forestry And Fishing 2) Mining And Quarrying	Companies that are involved in agriculture, forestry, fishing, mining, and quarrying related activities.
AC08	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Companies that are involved in professional, scientific, technical activities, those involved in administrative and support services, and other services offered to consumers.
AC09	Real estate and construction	1) Construction 2) Real Estate Activities	Companies that are involved in real estate activities, and in construction activities.
AC10	Retail	Wholesale And Retail Trade	Companies that are involved in wholesale and retail trade.
AC11	Transportation	Transportation And Storage	Companies that are involved in transportation and storage related activities, including all modes of transportation and warehousing.
AC12	Utilities	1) Electricity, Gas, Steam And Air Conditioning Supply 2) Water Supply; Sewerage, Waste Management And Remediation Activities	Companies that are involved in electricity generation and supply, supply of steam, air conditioning, and water, and those that provide sewerage, waste management, and remediation services.

Table 2: Activity (or AC) Definitions

Code	AC Class	NACE Rev 2.1 Section	AC Subclass (NACE Rev 2.1 Division)
AC01001	Education and public	1) Education 2) Public Administration And Defence; Compulsory Social Security	Education
AC01002	Education and public	1) Education 2) Public Administration And Defence; Compulsory Social Security	Public administration and defence; compulsory social security
AC02001	Financials	Financial And Insurance Activities	Activities auxiliary to financial services and insurance activities
AC02002	Financials	Financial And Insurance Activities	Financial service activities, except insurance and pension funding
AC02003	Financials	Financial And Insurance Activities	Insurance, reinsurance and pension funding, except compulsory social security
AC03001	Health	Human Health And Social Work Activities	Human health activities
AC03002	Health	Human Health And Social Work Activities	Residential care activities
AC04001	Hospitality and entertainment	1) Accommodation And Food Service 2) Publishing, Broadcasting, And Content Production And Distribution Activities Activities 3) Arts, Sports And Recreation	Accommodation
AC04002	Hospitality and entertainment	1) Accommodation And Food Service 2) Publishing, Broadcasting, And Content Production And Distribution Activities Activities 3) Arts, Sports And Recreation	Food and beverage service activities
AC04003	Hospitality and entertainment	1) Accommodation And Food Service 2) Publishing, Broadcasting, And Content Production And Distribution Activities Activities 3) Arts, Sports And Recreation	Gambling and betting activities
AC04004	Hospitality and entertainment	1) Accommodation And Food Service 2) Publishing, Broadcasting, And Content Production And Distribution Activities Activities 3) Arts, Sports And Recreation	Motion picture, video and television programme production, sound recording and music publishing activities
AC04005	Hospitality and entertainment	1) Accommodation And Food Service 2) Publishing, Broadcasting, And Content Production And Distribution Activities Activities 3) Arts, Sports And Recreation	Programming, broadcasting, news agency and other content distribution activities
AC04006	Hospitality and entertainment	1) Accommodation And Food Service 2) Publishing, Broadcasting, And Content Production And Distribution Activities Activities 3) Arts, Sports And Recreation	Publishing activities
AC04007	Hospitality and entertainment	1) Accommodation And Food Service 2) Publishing, Broadcasting, And Content Production And Distribution Activities Activities 3) Arts, Sports And Recreation	Sports activities and amusement and recreation activities
AC05001	Information and communication	Telecommunication, Computer Programming, Consulting, Computing Infrastructure And Other Information Service Activities	Computer programming, consultancy and related activities
AC05002	Information and communication	Telecommunication, Computer Programming, Consulting, Computing Infrastructure And Other Information Service Activities	Computing infrastructure, data processing, hosting and other information service activities
AC05003	Information and communication	Telecommunication, Computer Programming, Consulting, Computing Infrastructure And Other Information Service Activities	Telecommunication

Table 2: Activity (or AC) Definitions: Continued

Code	AC Class	NACE Rev 2.1 Section	AC Subclass (NACE Rev 2.1 Division)
AC06001	Manufacturing	Manufacturing	Manufacture of basic pharmaceutical products and pharmaceutical preparations
AC06002	Manufacturing	Manufacturing	Manufacture of beverages
AC06003	Manufacturing	Manufacturing	Manufacture of chemicals and chemical products
AC06004	Manufacturing	Manufacturing	Manufacture of coke and refined petroleum products
AC06005	Manufacturing	Manufacturing	Manufacture of computer, electronic and optical products
AC06006	Manufacturing	Manufacturing	Manufacture of electrical equipment
AC06007	Manufacturing	Manufacturing	Manufacture of fabricated metal products, except machinery and equipment
AC06008	Manufacturing	Manufacturing	Manufacture of food products
AC06009	Manufacturing	Manufacturing	Manufacture of furniture
AC06010	Manufacturing	Manufacturing	Manufacture of leather and related products of other materials
AC06011	Manufacturing	Manufacturing	Manufacture of machinery and equipment n.e.c.
AC06012	Manufacturing	Manufacturing	Manufacture of motor vehicles, trailers and semi-trailers
AC06013	Manufacturing	Manufacturing	Manufacture of other non-metallic mineral products
AC06014	Manufacturing	Manufacturing	Manufacture of paper and paper products
AC06015	Manufacturing	Manufacturing	Manufacture of rubber and plastic products
AC06016	Manufacturing	Manufacturing	Manufacture of textiles
AC06017	Manufacturing	Manufacturing	Manufacture of wearing apparel
AC06018	Manufacturing	Manufacturing	Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials
AC06019	Manufacturing	Manufacturing	Other manufacturing
AC06020	Manufacturing	Manufacturing	Repair, maintenance and installation of machinery and equipment
AC07001	Natural resources	1) Agriculture, Forestry And Fishing 2) Mining And Quarrying	Crop and animal production, hunting and related service activities
AC07002	Natural resources	1) Agriculture, Forestry And Fishing 2) Mining And Quarrying	Extraction of crude petroleum and natural gas
AC07003	Natural resources	1) Agriculture, Forestry And Fishing 2) Mining And Quarrying	Fishing and aquaculture
AC07004	Natural resources	1) Agriculture, Forestry And Fishing 2) Mining And Quarrying	Forestry and logging
AC07005	Natural resources	1) Agriculture, Forestry And Fishing 2) Mining And Quarrying	Mining of coal and lignite
AC07006	Natural resources	1) Agriculture, Forestry And Fishing 2) Mining And Quarrying	Mining of metal ores
AC07007	Natural resources	1) Agriculture, Forestry And Fishing 2) Mining And Quarrying	Mining support service activities
AC07008	Natural resources	1) Agriculture, Forestry And Fishing 2) Mining And Quarrying	Other mining and quarrying

Table 2: Activity (or AC) Definitions: Continued

Code	AC Class	NACE Rev 2.1 Section	AC Subclass (NACE Rev 2.1 Division)
AC08001	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Activities of head offices and management consultancy
AC08002	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Activities of membership organisations
AC08003	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Employment activities
AC08004	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Investigation and security activities
AC08005	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Legal and accounting activities
AC08006	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Office administrative, office support and other business support activities
AC08007	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Other professional, scientific and technical activities
AC08008	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Personal service activities
AC08009	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Rental and leasing activities
AC08010	Professional and other services	1) Professional, Scientific And Technical Activities 2) Administrative And Support Service Activities 3) Other Service Activities	Repair and maintenance of computers, personal and household goods, and motor vehicles and motorcycles
AC09001	Real estate and construction	1) Construction 2) Real Estate Activities	Construction of residential and non-residential buildings
AC09002	Real estate and construction	1) Construction 2) Real Estate Activities	Real estate activities
AC10001	Retail	Wholesale And Retail Trade	Retail trade
AC10002	Retail	Wholesale And Retail Trade	Wholesale trade

Table 2: Activity (or AC) Definitions: Continued

Code	AC Class	NACE Rev 2.1 Section	AC Subclass (NACE Rev 2.1 Division)
AC11001	Transportation	Transportation And Storage	Air transport
AC11002	Transportation	Transportation And Storage	Land transport and transport via pipelines
AC11003	Transportation	Transportation And Storage	Postal and courier activities
AC11004	Transportation	Transportation And Storage	Warehousing, storage and support activities for transportation
AC11005	Transportation	Transportation And Storage	Water transport
AC12001	Utilities	1) Electricity, Gas, Steam And Air Conditioning Supply 2) Water Supply; Sewerage, Waste Management And Remediation Activities	Electricity, gas, steam and air conditioning supply
AC12002	Utilities	1) Electricity, Gas, Steam And Air Conditioning Supply 2) Water Supply; Sewerage, Waste Management And Remediation Activities	Waste collection, recovery and disposal activities
AC12003	Utilities	1) Electricity, Gas, Steam And Air Conditioning Supply 2) Water Supply; Sewerage, Waste Management And Remediation Activities	Water collection, treatment and supply

3. Lifecycle Phases

This chapter discusses the second pillar of PECCS™, the *lifecycle phase* of a private company. We explain why lifecycle phases are important for private companies and the implications of their phase on the characteristics of a private company. We then explain our approach to categorising private companies into each of the proposed classes, based on objective guidelines.[1]

Motivation For Considering Lifecycle as a Pillar

A key dimension of the valuation of private companies is their lifecycle phase. Compared with public companies, the lifecycle phases of private companies if often more heterogeneous (e.g., younger companies are usually investable in private markets much before they are ready to publicly list), thus making it a key systematic risk factor. For example, the systematic risks faced by portfolio companies within a venture capital fund are different from those faced by holdings of buyout funds.

Typically, the lifecycle phase of a company has implications for strategy, growth, operations, and investments (Demsey, 2018). Different lifecycle phases of business development are themselves the outcome of the changes in the strategy, structure, decision-making methods, and organisational situation of firms (Miller and Friesen, 1984; Su et al., 2017). Prior academic work typically propose five phases a typical company experiences, namely birth, growth, maturity, revival, and decline.

The birth phase is characterised by small, young firms, which are dominated by owner-managers and unlikely to seek external capital, especially from institutions. The companies are also homogeneous and born out of creativity (Greiner, 1998). Moreover, governments also spur innovation and entrepreneurship in the economy, by specifically targeting young and small firms for tax, R&D, and productivity related programs that offer various incentives, subsidies, or tax reliefs. The growth phase follows when the firms are older, investable, have multiple shareholders, operate in a competitive environment, are likely EBITDA-positive, and witness rapid growth (e.g., Lyden, 1975).

The maturity phase is an extension of the growth phase where firms are even older, more dispersedly owned, and operate in more competitive environments. In this stage, firms are also more formal and bureaucratic, and offer differentiated products or services.

This phase is followed by the revival phase at which the firms reach their maximum size and operate in dynamic and extremely competitive environments. Firms strive to diversify into different industries or products/services at this stage. The final phase is decline where firms stop innovating, lose market share, and do not use very sophisticated decision-making processes (e.g., Scott, 1975).

Although these theoretical phases characterise most companies at different stages with implications for investors, the challenge is in the blurred demarcation between each of these phases, and the difficulty in assigning companies to a phase in the cross-section. To achieve a meaningful segmentation, the principles of these phases are combined with quite commonly available information about

1 - Despite the recommended guidelines to classify private companies, data paucity issues may hinder assigning companies to classes, and in such cases, qualitative information about the company, can help in finding its relevant class.

private companies such as their most recent financing or reorganising decision to come up with the below classes. These classes are relevant and familiar to industry practitioners. The categories include:

1. **Startup**: Further subdivided into Early Stage, Late Stage, and R&D Ventures subclasses.
2. **Growth**
3. **Maturity**: Futher subdivided into Conventional Mature, Reorganisation, and Restructuring subclasses.

Implication of Lifecycle on Valuation

These three distinct classes have different implications for the valuations and return expectations of investors. For example, when looking at startup companies, investors are less likely to rely on historical financial information but rather evaluate companies on the creativity of their business and the problem that the company solves in the marketplace.

However, in a growth asset, investors expect higher top-line growth but without an accompanying expansion in net profits, although they may be EBITDA positive. Investors are tolerant of lower net profitability as a trade-off for higher growth.

In a mature company, however, preferences invert for investors and they prioritise profitability. At this stage, more focus is on operating efficiency and capital structure decisions which can provide a large fraction of the returns to investors.

Lifecycle Classification

Having established the categories, the next step is to formulate rules to assign private companies (or specifically private-company-years) to each of these different stages. A simple assignment based on the age of the company can be misleading as not all companies are born equal. For example, companies created through divestitures, carve-outs, or spin-offs already operate in a mature phase but are young. Thus, additional information is required to classify the companies.

An approach that looks at both qualitative and quantitative information to assign company-years to lifecycle phase is favoured. Such an approach can take into account the recent financing rounds, reason for company formation (e.g., divestitures), capital structure information, disclosure levels[2], age, and the rate of sales growth.

Table 3 lays out the principles behind the classification of a private company according to its lifecycle phase pillar of PECCS™. These principles apply for most firms with the exception of highly innovative companies that may operate permanently in startup modes, e.g., a R&D organisation that is developing new pharma formulations.

2 - Bakarich et al. (2019) show that the tone of disclosures by companies change along with their lifecycle phases. Specifically, they find that as companies progress through the lifecycle phases, the optimism and the ambiguity of disclosure characteristics change predictably. Companies exude more optimism (e.g., tone and sentiment), and are less ambiguous (e.g., complexity and readability), as they traverse the different phases from start-up to maturity.

Table 3: Lifecycle Phase (or LP) Definitions

Code	LP Class	LP Subclass	Definition
LP01001	Startup	Early Stage	i) Any company that is three years or younger, and whose formation is not the result of divestiture, spin-off, split-off, or a carve out. ii) Includes companies that have obtained seed-round or early-stage financing (e.g., Series A) in current or previous year. Seed round funding is the first round of offering ownership to outside investors other than the founding team, and the product or service is only an idea. Early-stage financing follows seed stage, and this is when the company has a working prototype of the product or service.
LP01002	Startup	Late Stage	i) Any company that is between three and seven years old and whose formation is not the result of a divestiture, spin-off, split-off, or a carve-out is to be considered as a late stage company. ii) Includes companies generating revenue and have obtained multiple rounds of financing (e.g., Series B, C, or later) in current or previous years. iii) Companies that are less than 15 years in age, are generating revenue, but still are unprofitable are also included here, provided they do not qualify under any Growth class criteria. iv) Companies that are less than 15 years in age, and have recently (i.e., in the previous three years) raised capital from a venture-capital fund.
LP01003	Startup	R&D Ventures	i) Companies that solely engage in clinical trials or product development, irrespective of their age, are included here. ii) Companies that do not qualify for any other Startup class, but are eligible for targeted tax, R&D, or productivity related programs that offer incentives, subsidies, co-investments, or tax reliefs. Exclude considering programs that are available to all companies.
LP02001	Growth	Conventional Growth	i) Any company that is between seven and 15 years old, and whose formation is not the result of a divestiture, spin-off, or a carve out is included as a growth company. ii) Any company that is over seven years old and has recently (i.e., up to three years in the past) obtained financing that can be characterised as *Growth* or *Expansion* financing, is included here.
LP03001	Mature	Conventional Mature	i) Any company that cannot be classified as *Growth* or *Startup* and is older than 20 years old is considered mature. ii) Any company that is between 16 and 20 years old, and has been owned by a Private Equity firm or has been part of a general partner-led secondary buyout transaction is included in this class. iii) Any company that is between 16 and 20 years old, and has been part of at least one recapitalisation can be considered as mature. iv) Includes companies in mass adoption stage or in saturated markets. Mass adoption stage is where their products and services are offered in a growing market, while they are mature. Saturated markets are when the demand for their products or services has plateaued.
LP03002	Mature	Reorganisation	Any company that is formed through divestitures (or spin-offs, split-offs, carve-outs) from old and established corporations, irrespective of their age, are included here.
LP03003	Mature	Restructuring	i) Companies that are in bankruptcy or some form of reorganisation are included here. ii) Includes companies that are pre-bankruptcy. Pre-bankruptcy includes companies that have made a filing for reorganisation or have missed one or more debt payments. iIi) Includes companies that are post-bankruptcy. Post-bankruptcy includes companies that have already emerged from bankruptcy and have restructured creditor claims.

4. Revenue Model

Revenue Model, the third pillar of PECCS™ is also an important determinant of the valuation of a private company, as a company's sales volatility can be explained through the type of revenue model. In this chapter, the different types of revenue models are discussed and guidance is provided on how private companies can be classified into the proposed classes.

Types of Revenue Models

Revenue models refer to the key principles that underlie a company's sales. Or, in other words, how does a company earn its revenue? For example, a software company that sells an operating system can sell its product in multiple ways:

1. The company can choose to sell the software as a subscription service requiring a periodic payment from its customers - a *subscription model*.
2. The company can sell its software as a one-time sale, either offering support services or not - a *licensing model*.
3. The company can also distribute its software for free, but then earn revenue through the sale of bundled advertising in its software - an *advertising model*.

The choice of revenue model has implications for the sustainability, scalability, and predictability of the revenue. Even accounting policies such as revenue recognition, cash and inventory management, capital structure choices, etc., that rely on the type of revenue model, can be a significant component of a company's valuation.

Although the exhaustive list of revenue models is numerous and some of these models are constantly evolving, the below approach is adopted to categorise private companies, where revenue models that are similar in terms of their value potential, sustainability, and customer loyalty, are combined into one group. Such an approach leads to the below classes:

1. **Advertising model**: A model in which businesses generate the majority of their revenue (i.e., greater than 50%) from advertising, such as selling ad spaces in both digital and non-digital media.
   Also, includes digital businesses such as marketplaces, where the revenue arises from advertisements, and affiliate models, wherein a company earns revenue by referring to a third-party's product or service and earns a commission on the sale of such product/service.
   Some examples include those that operate in media, publishing, broadcasting, search engines, social media, billboards, yellow pages, and affiliate marketing. Private companies are further identified as belonging to one of these three advertising subclasses of affiliate models, marketplaces with ads, and conventional advertisements.
2. **Production model**: In this model, a company produces or manufactures a new product or service, thereby generating revenue from a customer who purchases it. Compared to the reselling model, the cost of goods will form a smaller proportion of revenues in the production model, and the product or service is significantly value-added when compared to the supplier inputs.
   The direct sales model, wherein a company directly sells its products or service through the deployment of its sales force or marketing channels including digital channels (e.g., web sales), is part of the production model.

Also includes companies that sell complementary products or services where one of these is sold at cost or at a discount while the company relies on generating profits by also selling a complementary product or service (e.g., razors and blades, consoles and video games, etc)

Few examples include companies involved in activities that include manufacturing, energy producers, hospitals, restaurants, pharmaceutical companies, telecommunication services, and producers of durable and nondurable products, computer hardware, and mobile phones. This class includes subclasses of complementary models, direct sales, and conventional production.

3. **Reselling model**: The majority of the revenue of companies in this class is generated through surcharges to the cost of goods or services sold from a supplier or wholesaler, without any significant value addition to the product or service. The goods or services are generally purchased at a wholesale price, and then a markup is added to the wholesale price before being sold to their customers (e.g., Gerrard, 2022).

   Commission-based revenue models are also part of markup models, wherein the company sells or promotes a product or service and earns a commission on closing a sale (e.g., real estate agencies).

   Thus, examples include companies that operate in retail, distribution, wholesalers, trading companies, real estate brokers, and similar companies. Interestingly, by this criteria, we can also include commercial banks and lending institutions as operating on a reselling model - they too borrow at a lower rate and make loans at a higher rate. In the same vein, stock and financial brokers can also be considered as adhering to the reselling model.

   So here subclasses of commission-based, financials, and retail are included.

4. **Subscription model**: A model in which a customer pays a single time or recurringly in regular intervals of time for access to a product or service (e.g., Schüritz et al., 2017). Moreover, the marginal cost of producing one more unit is negligible. There are multiple types of subscription models including the below:
   - **Franchise model**: The company earns its revenue by allowing another entity to use its brand, business model, suppliers, products, and services to earn revenue. The source of revenue for the original company can be either fixed or variable or a combination of both based on the sales of the franchising entity.
   - **Freemium model**: In a freemium model, a product or service is sold in multiple tiers with minimum features/characteristics offered as free, but enhanced features or characteristics are charged as subscriptions (e.g., Altexsoft, 2020).
   - Licensing model: A payment is made a single time and access to the product and service is availed for a longer period of time or indefinitely. Such licensing models are included as a subclass of the subscription class.
   - **Pay-per-user/usage model**: A customer pays a price for using a product or service to the extent they need to. This is also a type of subscription model where the product or service is used a single time. For example, road tolls fall under this type.
   - **Conventional subscription model**: This represents the classic model in which a customer signs up for using the product or service for a longer period of time with renewal of the amount they are charged over each period. Such models are more sustainable for the private company and hence are usually regarded as valuable by investors. Emerging models are included here such as kickstarters where a customer pays a price for a

product or service[1] under development and secures first/priority access when it is ready (e.g., Ng, 2010).

Thus, in the subscription class, examples of companies include those that derive revenues from operating SaaS (software as a service), selling software solutions, cloud-based solutions, and media companies deriving revenue from subscribing users, rental, and leasing companies.

Table 4 provides a summary of these revenue models.

1 - For example, Patreon is a company that offers a kickstarter model for services in 2023.

Table 4: Revenue Model (or RM) Definitions

Code	RM Class	RM Subclass	Definition
RM01001	Advertising Model	Affiliate Model	Majority revenue is earned through referral of a third-party's products or services.
RM01002	Advertising Model	Conventional Advertising	Majority revenue is generated by selling ad spaces in digital and analogue media.
RM01003	Advertising Model	Marketplaces with Ads	Majority revenue is earned as a marketplace through advertisements.
RM02001	Production Model	Complementary Model	Majority revenue is generated by selling complementary products, the pricing of one of which is subsidised while the other is not (e.g., razors and blades, printers and ink, consoles and games, etc).
RM02002	Production Model	Conventional Production	i) Majority revenue is generated through a new product or service produced, which cannot be classified in any other subclass of production models. ii) Cost of goods and value addition are smaller and larger, respectively, in comparison to the reselling model.
RM02003	Production Model	Direct Sales	Majority revenue is generated by selling a product or service through its network of salespeople to customers, without using any brick-and-mortar locations or retailers, showing some level of vertical integration as compared to Conventional Production.
RM03001	Reselling Model	Commission-based	Majority revenues are earned as commissions on transactions of non-financial assets.
RM03002	Reselling Model	Financial Products & Services	i) Majority of revenue is earned as a spread or margin on making loans or by offering financial assets. ii) Includes banks, lending institutions, and financial brokers whose revenues are based on markups of financial asset prices or loans.
RM03003	Reselling Model	Retail	i) Majority revenue generated through surcharges to the cost of goods or services sold from a supplier or wholesaler, that is in the form of markups. ii) No significant value-addition by the company selling the product or services.
RM04001	Subscription Model	Conventional Subscription	Majority revenue from the sale of product or service is recurring, and cannot be classified elsewhere in subscription model.
RM04002	Subscription Model	Franchising	Majority revenue is generated from independent business owners who make use of the brand, business model, and other intellectual property of the company, either on a fixed fee or fixed fee plus variable or entirely variable function of the business owner's revenue.
RM04003	Subscription Model	Freemium	Basic product or service is offered free, with enhanced features being charged to generate the majority of the revenue.
RM04004	Subscription Model	Licensing	Majority revenue is generated through the sale of licenses that allow the use of a product or service for a limited or indefinite period of time.
RM04005	Subscription Model	Pay-per-user/usage	Majority revenue is generated through per user or per usage fees (e.g., road tolls, airport levies).

5. Customer Model

In this chapter, we discuss the two types of *Customer Model* pillar of PECCS™ and give guidance on how to differentiate between private companies that fall into these two classes.

Motivation

Companies may distribute and sell their goods and services to end users and/or other businesses. At certain times, the characteristics of a product or service might underpin such distribution preferences, while at other times it may arise from a specific business strategy. Irrespective of such differences, a company's type of customer affects its business strategy (Liu et al., 2018), marketing activity (Iankova et al., 2019), customer engagement (Zolkiewski et al., 2017), and loyalty (Wirtz and Lihotzky, 2003).

Consequently, a private company's customer typehas strong implications for its valuation, profits, and performance (Dotzel and Shankar, 2019). Thus, the customer model pillar of PECCS™aims to capture the different characteristics of the customer base.

Customer Model Classification

Broadly private companies can be divided into serving two types of customers: Business Focused (i.e., B2B or business to business) and Consumer Focused (i.e., B2C or business to consumer). To be more precise, the below guidelines are laid out to make sure every private company can be captured in only one of the classes unambiguously.

1. **Business Focused**: There is no consensus on how to define a B2B company clearly in the literature (Gummesson and Polese, 2009). We have chosen a very straightforward definition: any company with sales of more than 50% percent to other businesses is considered as following a Business Focused customer model. Further, the below specific subclasses of customer models are included within the Business Focused class:
   - **Bundled Business to Business to Consumer (B2B2C)**: While B2B2C models share similarities with both B2B and B2C models, the below approach is adopted in classifying B2B2C models as B2B. Assume there is a focal business that produces the goods or services for the consumer and there is an intermediary business. The intermediary business (the middle B in B2B2C) that bundles the products/services of the focal business along with other products and services, is classified as a subclass of Business Focused.
   - **Business to Business to Consumer (B2B2C) without Owning Relationship**: A focal business, the first B in B2B2C is classified as Business Focused, when the focal business does not own the relationship with a consumer. However, if the focal business owns the relationship, such a business is included under Consumer focused (specifically Direct to Consumer).
   - **Business to Government**: Government orders for goods and services share more similarities with businesses than individual consumers, who can be capricious and make sentimental purchase decisions. Thus, the B2G model is included as a subclass of Business Focused.
   - **Conventional Business to Business**: Typical B2B models where a business sells the majority of its products or services to another business entity.

2. **Consumer Focused**: Following a similar logic, any company with sales of more than 50% to consumers, is classified as following a Consumer Focused customer model. Specifically, the below subclasses are included under this class:
   - **Crowdsourced and Consumer to Business (C2B)**: In business models such as kickstarters, a customer pays a price for a product or service, well in advance before delivery. Here a consumer is showing greater loyalty and also taking some risk in supporting the production of the goods or service in exchange for early or privileged access to it.
   - **Direct to Consumer (D2C)**: Evolving customer models in which companies sell directly to customers without making use of any intermediary. Sales are usually achieved through outlet stores, online stores, and even third-party retail shops. Manufacturing, promoting, selling, and even shipping is performed by one business in such models.
   - **Intermediary Marketplace in Business to Business to Consumer (B2B2C)**: When companies make use of another intermediary business that provides marketplace services, then such models have more in common with the B2C class of customer models. This includes digital marketplaces such as App stores, companies that sell through unrelated brick-and-mortar outlets, and similar models.
   - **Conventional Business to Consumer (B2C)**: All remaining business to consumer models in which a private company sells its products or services to an individual consumer. In such a classification, if a company sells through intermediaries such as retailers, online marketplaces, wholesalers, etc., who help in aiding the distribution of the goods and services to the consumer, the sales are still accounted as being done to the individual consumer. That is, the intermediaries are not denoted as businesses, thus shifting many of the classifications toward the B2B customer model.

A summary of the two classes of customer model is provided in Table 5.

Table 5: Customer Model (or CM) Definitions

Code	CM Class	CM Subclass	Definition
CM01001	Business Focused	Bundled B2B2C	Business to Business to Consumer (B2B2C) models where the intermediary business offers equally or more attractive offerings in a bundle.
CM01002	Business Focused	B2B2C without Owning Relationship	Business to Business to Consumer (B2B2C) models where the focal business does not own the relationship with the customer.
CM01003	Business Focused	B2G	Business to Government, i.e., majority revenue is generated by selling to national, state, regional, or local government entities.
CM01004	Business Focused	Conventional B2B	Business to Business, i.e., majority revenue is generated by selling to other businesses.
CM02001	Consumer Focused	Conventional B2C	i) Conventional Business to Consumer where majority revenue is generated by selling to individuals (i.e., retail clients) ii) Sales through intermediaries such as retailers, online marketplaces, wholesalers, etc., who help in aiding the distribution of the goods and services, are still ascribed as sales to consumers.
CM02002	Consumer Focused	Crowdsourced and C2B	Majority revenue is earned through crowdsourcing campaigns or in Consumer to Business (C2B) model. Crowd sourcing campaigns involve consumers signing up early for access to a product or service even before production starts. In the C2B model, businesses profit from consumers' willingness to name their own price or contribute data or marketing to the company, while consumers profit from the flexibility, direct payment, or free or reduced-price products and services.
CM02003	Consumer Focused	D2C	Majority revenue is earned by directly marketing the product to the consumer, i.e., Direct to Consumer (D2C) through a self-owned network of salesforce, digital assets, and physical stores.
CM02004	Consumer Focused	Intermediary Marketplace in B2B2C	Majority revenue is earned as a marketplace or retailer in Business to Business to Consumer, where different sellers market their wares to consumers.

6. Value Chain Types

In this chapter, we discuss the three classes of the *Value Chain*, the final pillar of PECCS™ and ofer guidance on how to divide private companies into these classes.

Motivation

Value chain refers to the processes or activities by which a company adds value to its products and services, including aspects of its production and after-sales services. Key characteristics of the value chain is how a company manages its supply chain, after-sales support, and logistics arrangements. Such characteristics can be an important source of operational value gains for investors (Alvarez and Jenkins, 2007).

Generating operational value in a private company investment is a large source of value creation, especially when interest rates are low and there is a high degree of competition among Private Equity funds. Moreover, supply-chain induced inflation (e.g., increased costs of raw materials and/or support services) and contemporaneous increases in interest rates, as witnessed in 2022 and subsequently, have increased both the opportunities and threats to private company investors, related to the value chains of their products and services.

Why and how would value chains be associated with private company valuation? A key shift in modern business management is the reduction in competition among businesses (i.e., horizontal competition) and an increase in cooperation or coordination as supply chains (Lambert and Cooper, 2000) (i.e., vertical sectors). Production of cutting-edge equipment involves extremely sophisticated value chains with considerable investments, which when properly designed are effective to the extent of being considered as organisational intangible capital (e.g., Stulz, 2020).

Effective value chain management generally involves reducing costs, improving the flow of goods downstream and flow of information in both directions. Private Equity funds rely on seasoned industry experts or professional advisors for improving value chain processes to address profitability at the SKU (or stock-keeping unit) level, improve order fill rates, minimise lost sales, lowering cost of goods sold through labour alignment, lowering shipping rates, and improving customer satisfaction (Alvarez and Jenkins, 2007), and thus subsequently create value.

To understand the value chain proposition, we examine the characteristics of a private company's output. Most outputs can be dichotomously characterised as being either products or services, and these two categories require very different approaches to value chain such as supply chain management, and after-sales support requirements.

For example, products require sourcing of high-quality raw materials, logistics to bring everything to the point of production, extensive sales channels, and reverse logistics to deal with returns or repairs post-sales. The key value chain considerations for products include their life cycle, demand predictability, product variety, and market lead times (e.g., Fisher et al., 1997). Differences in these considerations can help tailor management decisions on working capital, supplier orders, and inventory levels. Consistent and sustainable revenue can be generated (in the case of businesses) or utility can be obtained (in the case of individuals) from an installed base of products with a

long life cycle (Knecht et al., 1993), suggesting products as a category, may have implications for valuation.

On the other hand, services are usually delivered in the presence of the customer, and require fewer logistics, while needing more training and support for the customer. Value chain management for services is principally different. A key distinguishing feature of services is that they take place at an interface with the customer (e.g., Sampson, 2012), thus making the customer crucial in the design, creation, and delivery of the service (Bitner et al., 1997). Specifically, value chain management in the context of services refers to the management of information, processes, capacity, service performance, and funds from the earliest supplier to the ultimate customer (e.g., Ellram et al., 2004).

Services, in general, can support higher margins than products and also can provide a more recurring source of revenue as they are arguably more resistant to the economic cycles that influence investment and equipment purchase decisions (Anderson et al., 1997; Quinn, 1992), thus implying there could be systematic differences in valuation of a private company that delivers services as compared to one that produces products. Although theoretically, the differences are stark, in practice, many private companies offer a combination of products and services, thereby motivating the third class, the hybrid, which combines both products and services in its offering. The classification is described in the next subsection.

Value Chain Classification

The above arguments lead us to select the following groups to make up the value chain pillar of PECCS™:

1. **Products**: Private companies whose majority revenue is derived from the sale of products that are tangible in nature are included here. Some defining characteristics of a product include a lower level of customisability, needing material inputs to be produced, requiring the company or its distributors to have an inventory, and the need to be transported or delivered to the customer or allow to be picked up after a sale. If a company offers products and services, and more than 80% of its revenue comes from these products, it is classified as belonging to this class. These thresholds are borrowed from the accounting literature, where a source of revenue, when constituting over 20% is considered significant for consolidation.
2. **Services**: Private companies whose majority revenue is derived from the sale of services that are intangible in nature. Some defining characteristics of a service include being non-physical, allowing a higher level of customisability, delivered with the customer in attendance, and often is recurring. If a company offers products and services, and more than 80% of its revenue comes from services, it is classified as belonging to this category.
3. **Hybrid**: Apart from this binary classification, some product-based companies are also integrating services with their products to enhance the utility of their products, giving rise to a distinct integrated product-services kind of firm output (Beuren et al., 2013). These outputs represent a marketable set of products and services capable of jointly fulfilling a customer's needs (e.g., White et al., 1999).
   Such outputs can include the below three types of product-services, following Tukker and Tischner (2006)
   - *Product-orientated services* such as advice and consultancy that enhance the product (e.g., dedicated customer care services to aid the use of a technologically complex product),
   - *Use-orientated services* such as allowing leasing of the product to the customer

(e.g., an auto retailer providing the customer a lease to an automobile), and

- *Result-orientated services* (e.g., Rolls Royce charges its customers a fixed price for each hour the engine is in the air while taking care of all the maintenance, support, and parts supply for it (Yang and Evans, 2019)).

Another independent dimension of value chains that has the potential to significantly affect an asset's characteristics relates to the geographical proximity of organisations involved with the product or the service (i.e., suppliers). For example, a car manufacturing company can obtain its parts from halfway across the world or from the same geographic region as it is located. These choices have significant economic effects on its operations, inventory policies, profitability, quality management, and consequently valuations. Also, the threat of chronic geopolitical risks can affect the valuation of companies with value chains that are exposed to sensitive geographies.

Moreover, such choices can have differential implications for services. For example, even in services, providers can be geographically far away and render services virtually or remotely. Like call centres may provide after-sales support services to a technology company and could be located in a country far away. However, it is to be noted, that the implications of a geographic subclass in services are likely very different from that of a similar geographic subclass in products, especially in terms of customer perception of the product or service. To illustrate, availing of a call centre service operating out of an emerging country may be perceived differently from buying a product whose raw materials are sourced from an emerging market country. Thus, it is conceivable to nest geographic proximity of value chains within the classes of PECCS™ value chain as these subsegments have different implications in the context of whether the output is a product or service or both.

To define categories of geographic proximity, a conservative approach is adopted and value chains are bifurcated into 1) global and 2) national. Although theoretically, it is possible to consider a regional subclass as well, data limitations on sourcing and suppliers are likely to severely restrict what could be gleaned about private companies on the nature of their suppliers. Therefore, from an application perspective, the subclasses are made to span the global and national value chain within each of the three value chain classes.

A summary of the three classes and the nested subclasses of the value chain are provided in Table 6.

Table 6: Value Chain (or VC) Definitions

Code	SC Class	SC Subclass	Definition
VC01001	Hybrid	Global	i) Key suppliers are geographically diverse, i.e., at least one key supplier is in a different country than the private company's operating country. ii) Outputs that include a marketable set of products and services capable of jointly fulfilling a customer's needs iii) includes product-orientated services such as advice and consultancy that enhance the product, use-orientated services such as allowing leasing of the product to the customer, and result-orientated services. iv) Less than 80% of revenue is attributable to products (or services).
VC01002	Hybrid	Regional	i) Key suppliers are within the same country as the private company's operating country including inter-regional (e.g., in different states in a country), regional (e.g., within a state) or local (e.g., within a city). ii) Outputs that include a marketable set of products and services capable of jointly fulfilling a customer's needs iii) includes product-orientated services such as advice and consultancy that enhance the product, use-orientated services such as allowing leasing of the product to the customer, and result-orientated services. iv) Less than 80% of revenue is attributable to products (or services).
VC02001	Products	Global	i) Key suppliers are geographically diverse, i.e., at least one key supplier is in a different country than the private company's operating country. ii) More than 80% of revenues come from products that are tangible in nature iii) Tangibility includes an output that has a lower level of customisability, needs material inputs to be produced, requires the firm or its distributors to have an inventory, and needs to be transported or delivered to the customer or allow to be picked up after a sale.
VC02002	Products	Regional	i) Key suppliers are within the same country as the private company's operating country including inter-regional (e.g., in different states in a country), regional (e.g., within a state) or local (e.g., within a city). ii) More than 80% of revenues come from products that are tangible in nature iii) Tangibility includes an output that has a lower level of customisability, needs material inputs to be produced, requires the firm or its distributors to have an inventory, and needs to be transported or delivered to the customer or allow to be picked up after a sale.
VC03001	Services	Global	i) Key suppliers are geographically diverse, i.e., at least one key supplier is in a different country than the private company's operating country. ii) More than 80% of revenues come from services that are intangible in nature iii) Intangibility includes an output that has a higher level of customisability, is non-physical, delivered with the customer in attendance, and is often recurring.
VC03002	Services	Regional	i) Key suppliers are within the same country as the private company's operating country including inter-regional (e.g., in different states in a country), regional (e.g., within a state) or local (e.g., within a city). ii) More than 80% of revenues come from services that are intangible in nature iii) Intangibility includes an output that has a higher level of customisability, is non-physical, delivered with the customer in attendance, and is often recurring.

A. Appendix

In this appendix, a few examples of how the PECCS™ classification can be applied in practice is presented. Note that the PECCS™ classification is applicable at one point of time and can evolve as businesses of companeis change, as they acquire different entities, thus changing the mix of their revenues and core offerings. With that principle in mind, the below examples provide a year of reference for assessment of each company. Moreover, availability of more information about a private company improves the accuracy of dividing the company into classes and subclasses. However, even when limited information is available, qualitative criteria can help to classify a company. For the below examples, a short bio of each company from publicly available sources such as company websites and other profile websites is provided. Following the bio, tables of each example's PECCS™ segmentation is presented.

1. EMC, United States, 2015

EMC, founded in 1986, is a provider of IT infrastructure services that help workplaces achieve their digital business goals. It offers a combination of infrastructure management, data storage solutions, servers, networking solutions, data protection systems, and enterprise security solutions. Its operations span Big Data, SaaS, cybersecurity, and TMT areas. 2014 revenue can be broken down into 1) EMC had USD16.5bn from EMC II (Infrastructure Management), 2) USD1bn from RSA Security (security token device), 3) USD6bn from VMware (Virtualization Solution. VMWare was 80% owned by EMC), and 4) USD230m from Pivotal Software (cloud platform hosting and consulting services).

2. Wm Morrison, United Kingdom, 2021

Wm Morrison Supermarkets is the fifth largest supermarket chain in the United Kingdom in 2021, with 497 supermarkets across England, Wales, and Scotland. It was founded in 1899, beginning as egg and butter stall. As of February 2021, Morrisons employed 110,000 employees and served around 11 million customers each week. Store formats include superstores, convenience stores, and even online retail. They offer their own brand of food products in addition to stocking other brands.

3. Clarios, United States, 2018

Clarios is a manufacturer of batteries intended for automakers, aftermarket distributors, marine, golf, and retail sectors. The company offers advanced, low-voltage battery technologies for global mobility and industrial applications to power cars, commercial vehicles, motorcycles, marine vehicles, power sports vehicles, and industrial products. The company was founded in 2006 as a spin out of Johnson Controls International.

Table 7: Example 1: PECCS™ Assignment

PECCS™Class & Subclass	Company: EMC	Reason (if required)
Activity Class	Information and communication	
Activity Subclass	Computing infrastructure, data processing, hosting and other information service activities	Provides IT Infra services.
Lifecycle Phase Class	Mature	
Lifecycle Phase Subclass	Conventional Mature	29 years old with mature and profitable business.
Revenue Model Class	Subscription	
Revenue Model Subclass	Conventional Subscription	Offers infrastructure management products and services primarily, which are recurring in nature.
Customer Model Class	Business Focused	
Customer Model Subclass	Conventional Business to Business	Offers services primarily to organisations.
Value Chain Class	Hybrid	Information Storage (hardware such as storage arrays and software such as database software) and VMWare (a virtualisation solution) constitute the largest fraction of revenue. Both segments rely on a combination of hardware and software solutions.
Value Chain Subclass	Global	Employees, offices, and customers are globally dispersed

Table 8: Example 2: PECCS™Assignment

PECCS™Class & Subclass	Company: Wm Morrison Supermarkets	Reason (if required)
Activity Class	Retail	
Activity Subclass	Retail trade	Operates superstores that sell variety of products including produce, package meat, delicatessen, and rotisserie.
Lifecycle Phase Class	Mature	
Lifecycle Phase Subclass	Conventional Mature	More than 100 years old.
Revenue Model Class	Reselling	
Revenue Model Subclass	Retail	Majority revenue from operation of retail stores and fuel sales.
Customer Model Class	Consumer Focused	
Customer Model Subclass	Intermediary Marketplace in Business to Business to Consumer	Majority revenue from operation of retail stores and fuel sales.
Value Chain Class	Products	Although not broken segment wise, the key divisions include retail outlets, fuel sales, manufacturing its own brands, online operations, and wholesale supply, all of which are products majorly.
Value Chain Subclass	Global	Although fresh meat, egg, and milk are preferably sourced nationally, much of the frozen food and other products are sourced globally.

Table 9: Example 3: PECCS™ Assignment

PECCS™Class & Subclass	Company: Clarios	Reason (if required)
Activity Class	Manufacturing	
Activity Subclass	Manufacturer of electrical equipment	Battery manufacturing.
Lifecycle Phase Class	Mature	
Lifecycle Phase Subclass	Reorganisation	Formed as spin out of Johnson Controls International.
Revenue Model Class	Production	
Revenue Model Subclass	Conventional Production	Majority revenue from sale of batteries.
Customer Model Class	Business Focused	
Customer Model Subclass	Conventional Business to Business	Key customers include Automobile manufacturers and other industrial manufacturers.
Value Chain Class	Products	Produce over 100 million batteries annually.
Value Chain Subclass	Global	Customers are present in over 100 countries and the company operates multiple manufacturing, recycling, and distribution centres globally.

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