A growth theory of professional services.

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Abstract

Most of the current economic literature on growth has focused on products and manufacturing. But professional services differ from manufactured products because their value stems from an interaction with the customer, while products value stems from technology. Therefore, growing a professional service is not about investing in technology but rather about increasing the amount of interactions that can be performed with the same level of quality. This article thus proposes a quality based theory of growth.

The proposed theory is shown to explain professional services observed empirical growth patterns with respect to age and size. It also shows that in professional services, growth can either be competition-driven or opportunity-driven depending in the importance of the client interaction in the service delivery. Finally, it is able to capture most of the known growth heterogeneity sources in terms of market and services characteristics.

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1 Introduction.

Professional services are defined as per the ISIC classification as the sum of legal, accounting, management consulting, advertising, engineering and architectural, scientific research and veterinary services [code 69 to 75]. As per the OECD, professional services have grown by about 8.2% on a year on year in revenue across OECD countries, outperforming the overall manufacturing landscape [as defined by ISIC code 5 to 39], which year on year revenue growth has been of on average 5.2% over the same period. On the other hand, employment in professional services across OECD countries has grown by 5.1% on a year on year basis, while the manufacturing landscape has shown a reduction of about 3.7%.

Although aggregated, those numbers reflect the differences in the value paradigm between manufactured products and professional services. As summarized in [1], professional services value stems from a bespoke client interaction, while manufactured products value is linked to a technological standard. As technology evolves, productivity improves and the resources needs become lower, which is consistent with the observed revenue and employment evolution patterns in manufacturing. However this doesn't hold for professional services, for which less than 15% of the service can delivered by technology as per recent benchmarks [2]. If the classical resource-based growth theory of [3] is compatible with the evolution of professional services, the fact that professional services do not compete on the premise of technology but of the quality of their service delivery model calls for a theory revision when it comes their long run dynamics. Technology shocks based theories similar to [4] only marginally explain growth variations and financial capital effects such as the ones described in [5] do not apply as most of the professional services firms are structured as privately held partnerships. Additionally, the learning theory initially developed by [6] and recently harmonized in [7] have been designed in terms of productivity improvement that relate to manufactured products but not to professional services. This therefore calls for a theory revision and a shift from productivity based growth paradigm to quality based one.

Even if it is scarce, the literature around professional services has indeed strongly stressed the importance of service quality [8] and the empirical literature has shown that it is strongly relevant to growth as it is the key driver of revenue through prices ([9], [10]) and client acquisition ([11],[12]). The quality of a professional service appears to be mainly set in the literature ([13], [14]), which means that long run dynamics could be similar to the human capital dynamic theory of [15] or to some of the matching principles of [16]. The only caveat is that in professional services, quality is stochastic as the deliverable results from a co creation with the client [17]. This gave birth to the central theme of reputation in professional services, which was considered as the best proxy for quality. However, the need for a reputation to avoid potential moral hazard issues is debatable as the rise of information technologies has drastically increased the ability of clients to understand the supplier nature [18].

This paper therefore aims at advancing the economic and management literature knowledge by proposing a growth theory for professional services based on their quality. This will done in three steps. In a section (2), revenue and employment growth for services which quality can be considered deterministic wile be reviewed. The consequences of quality stochasticity on the associated growth path will then investigated in section (3). Finally section (4) will discuss how the proposed theory scales to encompass the main known sources of growth heterogeneity.

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2 Growth of professional services under a quality standard.

Growth is about increasing revenue and/or employment [19]. To understand this phenomenon in the context of professional services, one must first understand the way client value is linked to the quality of professional interactions between a client and its provider and what this means from a services revenue standpoint. This will be modeled in section (2.1). Growing a professional service will then be shown to be endogenously constrained (2.2), as service quality is ensured by a supplier delivery model, which has a set evolution pace. This will finally inform a discussion around the impact of competition on revenue and prices in section (2.3).

2.1 Value and interactions in professional services: a model.

The delivery of professional services results from an interaction between the client and the service provider [1]. This interaction comes with a given quality level and the higher the quality, the higher the return for the client. Let us assume for starters that the quality of the interaction only depends in the provider and is known ex-ante. In this case, professional services firms [PSFs] compete on the premise of a quality standard. Note that the assumption that the professional services market is mainly driven by quality considerations appears relevant in light of recent studies ([20]). [21] has indeed shown that services and product sales are driven at 50 to 75% by quality and then by an equivalent mix of characteristics and price.

In this set up, assume that the market is composed of N clients of size $\{s_1 \geq ... \geq s_N\}$ and profit $\{\pi_1 \geq ... \geq \pi_N\}$. Clients are ranked in a descending order, so that out of two clients n and n', $n < n'$ implies that $s_n > s_{n'}$ and that $\pi_n > \pi_{n'}$. For a given service, the competition is made of M PSFs that have a service volume capacity $\{v_1; ...; v_M\}$ and a quality of service $\{q_1 > .... > q_M\}$. For the sake of simplicity, assume that service providers quality can be strictly differentiated.

A client n purchases a service to a supplier k with a price $P(q_k)$. Assume that a higher quality drives higher prices (i.e. $q_k > q_{k'} \leftrightarrow P(q_k) > P(q_{k'})$)) and that delivering the service to a client requires a fixed volume of work $\hat{V}$. For the sake of simplicity and in a fashion similar to [15], the clients is assumed to get a profit out of his contract with the supplier that is linear in quality:

$$\Pi_n(q_k) = (\pi_n.q_k - P(q_k)).\hat{V}$$

At equilibrium, the clients and the suppliers are matched to maximizes the overall economic well-fare $W = \sum_n \Pi_n(q)$. This implies that there is a positive assortative matching [PAM] between suppliers and clients (i.e. the most productive clients get the best services providers) based on professional services labor supply. When the market clears, for a given service, a professional services firm k indeed supplies multiple clients and the firm's service portfolio expands from client n_k^l to n_k^u, such that $n_{k+1}^u + 1 = n_{k+1}^l$, $n_k^u = inf\{n|\hat{V}.(n - n_k^l) < v_k\}$ and $n_1^u = 1$.

The equilibrium hypothesis implies that the client - supplier matching and the prices are stable. This means that the profit generated with the smallest client of supplier k and the profit generated with the largest clients of supplier $k-1$ must be equal. Otherwise arbitrage opportunities could occur on one front or the other. This leads to the condition (1).

$$\forall k > 1 \qquad (\pi_{n_k^u}.q_k - P(q_k)) = (\pi_{n_{k+1}^l}.q_{k+1} - P(q_{k+1})) \tag{1}$$

This condition can be used to derive the equilibrium price of the market:

$$P(q_k) = \sum_{h=0}^{k-2} (\pi_{n_{k-h}^l}.q_{k-h} - \pi_{n_{k-h}^u}.q_{k-h-1}) + P(q_1) \tag{2}$$

Therefore the revenue at equilibrium R_k of service supplier k is fully determined by its quality level and its service supply capacity: $R_k = P(q_k).v_k$. However, because of the way professional services are delivered, the main path to growth is to increase the service supply.

2.2 Growth and the professional services delivery model.

To generate revenue, service providers first engage with potential clients and offer them a credible promise with respect to the value the interaction could bring ([1]). Once the sale is concluded, the interaction occurs and the service is delivered. This means that professional services can be conceptually articulated around two roles ([17]): sellers and producers. Sellers engage with potential clients, offer them a credible promise as they understand the firm specific service delivery mechanism and ensure the service quality. On the other hand, producers interact with the client under the supervision of the seller to generate a deliverable.
At each point in time t, let us assume that a provider k has $s_k(t)$ (resp. $a_k(t)$) sellers (resp. producers). Assume that to each of seller is associated a constant amount of service V, such that, according to the conventions used in section (2.1), each seller serves $\frac{V}{\hat{V}}$ clients. It therefore comes that the firm's k volume of service $v_k(t)$ obeys $v_k(t) = V.s_k(t)$. Because sellers articulate a promise to the client and ensure the quality of the delivery with the firm resources, sellers are mainly sourced organically (i.e. from within the firm) out of the firm's production body. Let us call $\theta_k(t)$ the proportion of producers that becomes sellers between two periods of time. This means that : $s_k(t+1) = s_k(t) + \theta_k(t).a_k(t)$.
Because producers are supervised by sellers, the service delivery model is stable from the quality standpoint over time. Assuming that market clears at each point in time t, this implies that the service provider k revenue evolution results from its increase in capacity and from its price shift due to the changes within the competition:

$$R_k(t+1) = P_{t+1}(q_k).v_k(t+1) = \frac{P_{t+1}(q_k)}{P_t(q_k)}.(1 + [\theta(v_k(t)).\frac{a_k(t)}{s_k(t)}]).R_k(t) \tag{3}$$

From a revenue standpoint, the rate of growth is therefore endogenously driven by the firm service delivery model in terms of promotion rules $theta_k$ and leverage ratio $\gamma_k(t) = \frac{a_k(t)}{s_k(t)}$ defined as number of producers per seller. Those quantities have two interesting properties.

Proposition 2.1 *A professional service firm k leverage ratio is a function of its volume of service $\gamma_k(t) = \gamma(v_k(t))$. As the firm deliver more services, its leverage ratio increases $\partial_v\gamma(v) \geq 0$ up to a limit Γ.*

Proof. Discussion around a service delivery model are usually approached through a task base view [2]. Delivering a service consists in a series of L tasks $T_1, ..., T_L$ that are sorted by order of complexity $\Psi_1 < ... < \Psi_L$. Those tasks can be tackled by different types of workers, depending in their complexity. Assume that there are also L types of workers and that a worker of type l can only tackle tasks of a complexity up to Ψ_l. Each task l tackled by a worker k requires an amount of work $w_{k,l}$. As workers are not equivalent, a task l requires more work for an worker k that is less skilled that a worker of type $k+1$ (i.e $w_{k,l} > w_{k+1,l}$). However the cost of completion of a given tasks for a worker of type k is lower than the one of a worker of type $k+1$.
To deliver a volume v of service efficiently, a firm would therefore need to a number of certain number of workers of type $k \in [1; L]$ and have an optimal leverage ratio of Γ. However the total volume of work for each task may not be sufficient to dedicate a full time worker so that tasks are pulled together

and allocated to a worker with a higher skill type. The total volume of work is therefore lower, but the cost of delivery is suboptimal. As the volume of service grows, the amount of work in each tasks increase and work gets pushed down to lower skill workers. Leverage then increases toward Γ.

Proposition 2.2 *Within a firm k, the proportion of producers that can become sellers between two consecutive periods of time is a function of the firm volume of service $\theta_k(t) = \theta(v_k(t))$. As the firm deliver more services, the proportion of producers that can become sellers decreases $\partial_v\theta \leq 0$ down to a limit Θ. Additionally, the proportion of producers per seller that can become sellers becomes lower (i.e. $\partial_v(\theta.\gamma) \leq 0$)*

Proof. A producer can only become a seller if his/her skill level is sufficient to master all the task necessary to deliver the service and ensure its quality (i.e. the worker is of type L, according to the convention of (2.1)). However as the supplier increase its volume, it also lowers the proportion of worker of type L to improve its cost of delivery, which leads to the proposed result. From a leverage perspective, each seller enable the delivery of a volume V of service. Alone a seller comes with a service delivery model of worker of type $1...L$ that is not optimal. Notably the proportion of workers of type L is inflated. As the firm grows the number of producers of type L grows as a slower pace than the number of sellers as work gets pushed down to less skilled workers. The probability of a worker L becoming a seller being constant, the above proposition holds.

Proposition (2.2) implies that at constant prices, the revenue growth rate of a professional service decreases with time (see equation (3)) and converges down to $\Theta\Gamma$. This is consistent with the empirical literature on firm growth that noticed that PSFs growth rates decrease with age and size ([22]). Interestingly, the model also shows that at equal size and constant prices, revenue growth is not impacted by the firm age. Note that, from an employment standpoint, the same conclusion can be drawn as the workforce growth rate μ_k for a provider k obeys:

$$\mu_k = \frac{s_k(t+1) + a_k(t+1)}{s_k(t) + a_k(t)} - 1 = (1 + \theta.\gamma(v_k(t))).\frac{1 + \gamma(v_k(t).(1 + \theta.\gamma(v_k(t))))}{1 + \gamma(v_k(t))} - 1 \tag{4}$$

Finally, at a granular level, as leverage and promotion probability can be understood as constant (see figure (1)) over certain phases of a the service growth and then change when the firm service has reached a critical volume of labor that calls for a reorganization, the growth rates can be considered constant outside of changes to the service delivery model and spike when the firm evolves to fuel the need for new lower skill workers. Ultimately, as the service delivery model matures, both workforce and endogenous revenue growth rates align down to $\Theta.\Gamma$.

2.3 Growth and competition in professional services.

The endogenous growth patterns described in section (2.2) are yet to be nuanced depending in the evolution of the competitive landscape. First revenue growth needs to be framed with the overall price evolution. Second employment growth needs to be reviewed from a profitability standpoint.
From a price standpoint, two main forces compete to influence revenue growth over time for the provider k. On one hand, the exogenous increase in service supply that has a better quality than the one offered the considered provider will drive prices down if it is not mitigated by client profitability increases. On the other, the endogenous service supply increase of the provider will drive prices down it changes from client segment. To further understand the impact of those two forces, let us assume

for the sake of simplicity that there is enough clients $N(t)$ to neglect profitability differences at the competition interfaces. In this case, the price equilibrium condition (1) can be simplified to:

$$\forall k \geq 1 \qquad P_t(q_k) = \underbrace{\sum_{1 \leq j < k} (q_j . \Delta_j \pi)}_{exogenous} + \underbrace{\pi_{n_k(t)} . q_k}_{endogenous} = P_k^{exo}(t) + P_k^{endo}(t) \tag{5}$$

This leads to the following two propositions.

Proposition 2.3 *Assuming that the competitive landscape remain unchanged for provider k (i.e. $P_k^{exo}(t)$ constant over time), revenue will increase if and only if customer segment does not expand beyond the following profitability threshold given by the provider service delivery model:*

$$\pi_{n_k(t+1)} \geq \pi_{n_k(t)} . \frac{1}{(1 + (\theta.\gamma)_k(t))} + \frac{P_k^{exo}}{q_k} . \frac{(\theta.\gamma)_k(t)}{(1 + (\theta.\gamma)_k(t))}$$

Proposition 2.4 *Assuming that the customer segment of the service provider k remains unchanged (i.e.$P_k^{endo}(t)$ constant over time), revenue will increase if and only if the competition coverage doesn't increase above a certain threshold given by the following condition:*

$$P_k^{endo} . \frac{(\theta.\gamma)_k(t)}{1 + (\theta.\gamma)_k(t)} \geq \sum_{1 \leq j < k} (q_j . (\frac{\Delta_j \pi(t)}{1 + (\theta.\gamma)_k(t)} - \Delta_j \pi(t+1))$$

If revenue growth for professional services is subject to constraints due to potential client segment shifts either due to an excess in the own service supply of the provider or due to the increase in the competition supply, an additional constraint appears on the overall growth of PSFs with respect to employment.
To keep growing its workforce, a service provider indeed needs to be profitable. Calling $C_k(v_k)$ the cost per unit of service supply of provider k, it comes that employment growth will only occur if $(P_t(q_k) > C_k(v_k))$. The arguments used in to establish proposition (2.1) stress that the unit cost of service is decreasing with the volume the provider k is able to supply (i.e. $\partial_v(C_k(v)) < 0$) as tasks get pushed to lower skills/wage workers. This in turn can lead to a growth cap from an employment standpoint if the customer segment of provider k is shifting because of its competition or because of its own evolution (see equation (5)).
Section (2) has shown that the combination of a PSF quality standards and service delivery model [SDM] determine both its revenue and employment growth as the market clears in PAM fahsion. The associated growth rates have been shown to be endogenously decreasing with time as the firm SDM matures. This rule has been shown to be subject to nuance depending in the competitive landscape evolution as both revenue, and employment (through profitability) as subject to caps both endogenous and exogenous. The above PAM equilibrium yet needs to be challenged as in a host of cases, the quality of the deliverable is stochastic as it not only depends in the provider, but in the client as well.

3 The impact of co-creation in professional services growth.

The assumption that professional services output is standardized from a quality standpoint needs to be challenged. As stressed in ([17]), professional services are very diverse and if some of them revolve around the application of a standard procedure which output can be predicted (e.g. accounting), a

host of services outputs are stochastic because the associated client-provider interaction requires a knowledge transfer in both directions (e.g. legal services). When a knowledge transfer occurs, the quality of the output evolves as the client-provider interactions become more frequent and in those cases a relationship emerges. The underlying motivations behind the establishment of those business relationships will be first modeled in section (3.1). The associated consequences with respect to firm growth will then be discussed in section (3.2). Finally, section (3.3) will show the impact of relationships on prices and competitive behavior.

3.1 Co creation in professional services leads to relationships.

According to [17]), a host of professional services revolve around co creating a deliverable with a client based on a service provider specific canvas. Additionally, for a given professional service, each provider k has its own canvas, which quality q_k is known to everyone and constitute their reputation in the market place [8]. The canvas adaptation is however a difficult exercise that can fail with a probability $\phi_k \in [0; 1[$ if the knowledge necessary to properly tailor it is insufficient. If the responsibility of the knowledge transfer is shared between the client and the provider, the best service providers are the most versatile [23]. This means that the adaptation failure probability (ϕ_k) decreases with the provider quality $\forall k > k'$ $\phi_k < \phi_{k'}$. Additionally, the provider's understanding of the client naturally improves with time (see [24]), so that the adaptation failures likelihood (ϕ_k) drops with a rate β. For the sake of simplicity, let us assume that this failure rate is independent of both the client and the provider.
The knowledge transfer and learning components of professional services lead to the emergence of relationships [25] either at a service or provider level. Should the client repeatedly needs a service or require a new one, he will indeed tend to rely on his historical provider. If the literature has stressed that those connections usually last between seven to eleven years, they can also break if the canvas adaptation fails. From a model standpoint, let us assume that this break up occurs with a probability ψ assumed independent of the client. Note that as learning happens both ways in the relationship, the longer the provider and the client have worked together, the more forgiving the client is ([26]), so that the break up probability decreases at a rate ρ. Additionally when satisfied with the relationship, the client is assumed to be loyal ([23]), which means that he does not seek another provider. This mechanism is summarized in figure (4).
The previous assumptions means that a new relationship between a client n of profits π_n that grow at a rate α_n between two consecutive periods of time and a provider k of quality q_k and price $P(q_k)$ yields an expected benefit of U_0 for the client that can be defined by the following program:

$$U_0 = (1 - \phi_k.\beta^0).(\pi_n.\alpha_n^0.q_k + \delta.U_1) - P(q_k) + \phi_k.\beta^0.(1 - \psi.\rho^0).\delta.U_1$$

Which translates into:

$$U_0 = \sum_{t\geq 0}(\delta^t.(\Pi_{j\leq t}(1 - \phi_k.\psi.(\beta.\rho)^j))(\pi_n.\alpha_n^t.q_k.(1 - \phi_k.\beta^t) - P(q_k))) \tag{6}$$

Where $\delta \in [0; 1[$ represents the clients time preference.
From a provider point of view, assuming as in section (2) that service quality is constant over time, the relationship with the client n brings an average expected revenue of R_k^n over the course of its expected tenure L_k^n defined by:

$$R_k^n = P(q_k).L_k^n \qquad L_k^n = \sum_{t\geq 0}\Pi_{j<t}(1 - \phi_k.\psi.(\beta.\rho)^j).\phi_k.\psi.(\rho.\beta)^t.(t + 1) \tag{7}$$

The establishment of relationships has an impact on the long term service market structure and generates differences to the initial PAM structure described in section (2) that are summarized in the following proposition:

Proposition 3.1 *If* $(max(\phi_k).\psi + \rho.\beta) < 1$ *and assuming that the number of clients and providers doesn't change, the overall relationship landscape reaches an equilibrium over time. This equilibrium is yet sub optimal from a client well-fare standpoint as relationships potentially lock in clients with inferior service providers.*

Proof. First, under the right conditions, an equilibrium is indeed achieved because the number of breaks up in the market gets lower over time. Assume that there are N clients (resp. K providers), ordered by profitability (resp. service blue print quality) in a fashion similar to section (2.1). At period t, each client $n \in [1; N]$ has been in a relationship with a provider $k_n(t)$ for a time τ_n. Let be $B(t)$ the pool of client that break up with their providers.

$$\mathbb{E}(Card(B(t))) = \sum_{n\in[1;N]} \phi_{k_n}.\psi.(\rho.\beta)^{\tau_n}$$

The number of break ups is therefore bounded and the condition displayed in proposition (3.1) appears:

$$\mathbb{E}(Card(B)(t+1)|B(t)) = \sum_{n\in B(t)} \phi_{k_n(t+1)}.\psi + \sum_{n\notin B(t)} \phi_{k_n(t)}.\psi.(\rho.\beta)^{\tau_n+1} < (max(\phi_k).\psi+\rho.\beta).Card(B(t))$$

Second, the equilibrium is suboptimal because, if an average provider k gets paired, at a point in time, with the most valuable client, it is probable, because of the client loyalty, that the client and the average provider will stay in a relationship even if the client could potentially do better.

3.2 Relationships impact on professional services growth.

There are two mains differences to section (2.2) induced by co-creation on professional services growth. First, between two periods, the market no longer clears as the stochastic nature of the service adaption becomes prominent. Second, for any service provider k, both revenue and employment growth rates fluctuate as relationships come and go.
On average though, the relationships induced by the co creation mechanism yield more subtle patterns than a strictly decreasing revenue growth rate. Calling $\Xi_k(t)$ the client portfolio of provider k, revenue $R_k(t)$ is given by $R_k(t) = P_t(q_k).Card(\Xi_k(t))$. Defining $A_k(t)$ (resp. $B_k(t)$) the number of new (resp. lost) client at time t, the following relationship holds:

$$Card(\Xi_k(t+1)) = Card(\Xi_k(t)) + Card(A_k(t)) - Card(B_k(t))$$

Leveraging the standard client acquisition theory pioneered by [27], the overall market at time t has a potential of $N_k(t) = N(t) - \sum_{j\neq k} Card(\Xi_j(t))$ clients for the provider k. The acquisition of new clients thus obey the following law:

$$\frac{\mathbb{E}_t(Card(A_k(t)))}{N_k(t)} = \nu_k + (\zeta_k - \nu_k).\frac{Card(\Xi_k(t))}{N_k(t)} - \zeta_k.(\frac{Card(\Xi_k(t))}{N_k(t)})^2 = f_k(t).\frac{Card(\Xi_k(t))}{N_k(t)}$$

where ν_k accounts for innovators that directly build a relationship with the provider, while ζ_k accounts for imitators that are drawn to the provider by other clients. The models proposed in section (3.1)

lead to an average revenue growth rate for provider k of age $a_k(t)$ that is given by:

$$\mathbb{E}_t(\frac{P_t(q_k)}{P_{t+1}(q_k)}).\mathbb{E}_t(\frac{R_k(t+1)}{R_k(t)}) = (1 + f_k(t) - \sum_{n\in\Xi_k(t)} (\psi.\phi_k.(\beta.\rho)^{\tau_n(t)}) \tag{8}$$

If the service delivery model considerations of section (2) still hold, the co-creation of services has a direct impact on the capacity of the firm to promote "sellers". Blending equations (3) and (8) leads indeed to:

$$\mathbb{E}_t(\theta_k.\gamma_k)(V.Card(\Xi_k(t))) = f_k(t) - \sum_{n\in\Xi_k(t)} (\psi.\phi_k.(\beta.\rho)^{\tau_n(t)}$$

As the leverage model γ_k depends in the nature of the services and its quality and is therefore not time dependent, PSFs have therefore to adjust at every time period their promotion rules θ_k to sustain their growth in a fluctuating environment. As the market no longer clears, employment growth μ_k (see eq. 4) becomes reactive to a mix of endogenous and exogenous conditions:

$$\mu_k(t) = \underbrace{(1 + f_k(t) - \sum_{n\in\Xi_k(t)} (\psi.\phi_k.(\beta.\rho)^{\tau_n(t)}))}_{Exogenous} . \underbrace{\frac{1+\gamma(\hat{V}.Card(\Xi_k(t+1)))}{1+\gamma(\hat{V}.Card(\Xi_k(t))}}_{Endogenous} -1$$

Professional services employment growth therefore appears made of two phases. First employment is driven by both market and internal organizational constraint as the services ramps up and its service delivery model reaches an optimal leverage Γ. Then employment becomes purely reactive to the market and promotion rules θ_k are used as market driven adjustment variables such that once the SDM has reached maturity at time t^*:

$$\forall t >> t^* \qquad \mathbb{E}_t(\theta_k)(t).\Gamma \approx (1 + f_k(t) - \sum_{n\in\Xi_k(t)} (\psi.\phi_k.(\beta.\rho)^{\tau_n(t)}))$$

The Bass assumption comes with two interesting possible behaviors with respect to the promotion rates. First, if innovators in the professional services client space are rare (i.e. $\nu_k \approx 0$), then promotion rates strictly decrease over time once the SDM is mature. However if innovative clients exist, then promotion rates from producer to seller can exhibit a U-shape over time after the SDM maturation. Those growth characteristics are of interest to PSFs as their up or out culture is enabled by a financial incentive for producers to become sellers in the form an important wage differential (see the tournament theory of [28]). If the promotion probability varies when the SDM is mature, both sellers and producers wage levels can potentially be impacted. As PSFs are mainly structured as partnerships, sellers own the partnership and are compensated based on the profit of the firm. For the firm to still be attractive to producers when the promotion probability declines, producers wages must rise, which in turn lowers the firm profitability and the sellers compensation. This will be further discussed in a later strand of this research.

3.3 Co-creation impact on competitive behaviors.

Sections (3.1) and (3.2) have shown that the co creation in professional services led to the development of relationships and a non well-fare optimal market for clients. In turn, co-creation renders professional services growth volatile both from a revenue and employment standpoint. But co-creation has also an

effect on the overall competition mechanism and the way service prices are set.
When co-creation can be neglected and the market clears, competition is organized around providers quality which is known to all and prices reflect the provider's client portfolio. However when co-creation matters, if service quality q_k can be assessed, providers are unaware of the relationships that exists between their competitor and their potential clients. Additional they face a moral hazard problem when assessing the versatility of their competitor (reflected in the previous models by ϕ_k). PSFs growth is thus fueled by an opportunistic acquisition of new clients in a given segment ([29]) and prices no longer reflect the providers portfolio but its quality level ([30]).
To win over service providers that have a lower quality when competing to acquire a random new client, a supplier k must indeed ensure that its value proposition offers the highest benefits possible. Calling $\epsilon_k(\alpha) = \sum_{t\geq 0} \alpha^t.\delta^t.(\Pi_{j\leq t}(1-\phi_k.\psi.(\beta.\gamma)^j))$ the provider specific relationship benefit discount rate and leveraging equation (6), this translates into the following condition:

$$\forall k > k', \forall n \qquad P(q_{k'}).\epsilon_{k'}(0) - P(q_k)\epsilon_k(0) \leq \pi_n.(\epsilon_{k'}(\alpha_n).q_{k'} - \epsilon_k(\alpha_n).q_k)$$

Assuming that N is the client with the lowest value, it comes that for a provider k to be competitive for all clients while maximizing its revenue, its price must be such that:

$$\forall k \qquad P(q_k) = \frac{\epsilon_K(0)}{\epsilon_k(0)}.P(q_K) + \pi_N.(\frac{\epsilon_k(\alpha_N)}{\epsilon_k(0)}.q_k - \frac{\epsilon_K(\alpha_N)}{\epsilon_k(0)}.q_K) \tag{9}$$

Compared to equation (5), where prices were determined by a mix of endogenous and exogenous variables, the need for co-creation in professional services leads to prices that are purely defined by endogenous characteristics. Price stability is moreover granted provided that both the provider's quality and that its client segment choice (defined as its lowest profitability client N) do not change. Section (3) has shown that considering that co-creation in professional services yielded a deviation from the well-fare optimal market because of relationships. This was shown to impact both revenue and employment growth as relationship acquisition drives the sellers promotion rules. Finally when co creation occurs, competition is becoming more random due to network and interpersonal relationship effects. Professional service prices become then purely endogenously driven.

4 What are the main sources of growth heterogeneity in professional services?

Professional services growth was initially discussed in section (2) under the assumption that, within a given market, service quality can easily be assessed and that all providers can compete with each other. This was shown to result, at equilibrium, in a welfare optimal structure based on the match of high profitability clients with high quality service providers. In this environment services providers growth was demonstrated to be paced by the development of their nearest competitor, while the overall tone was set by the best service provider. The assumption that the competition is perfect was then challenged in section (3) by introducing the notion of co-creation in the delivery of professional services. Co-creation indeed limits the competition for a given client because of a relationship mechanism. Aside of stylized facts on equilibrium prices and market structure, co creation was shown to lead to a growth cadence that is stochastic and driven by relationships acquisition.
If the two proposed growth modes can be both used to describe real professional service providers evolution, the associated differences naturally raise the question of growth heterogeneity. This will be the core focus of this three parts section. First, a review of the characteristics of professional services

will be used to explain the differences behind previously modeled growth patterns. In a second time, the discussion will move up to encompass non modeled exogenous market considerations. Finally the section will wrap up on a discussion about the influence on PSFs environment on service growth.

4.1 Growth heterogeneity is linked to service characteristics.

Professional services span by definition across a number industrial sub sectors such as legal, accounting, management consulting and engineering services (see the NAICS classification system for instance). But if markets across industrial sub sectors differ, professional services characteristics can be standardized. The seminal work of [1] indeed provided a professional service typology that can be translated into service delivery model specificities, which then entails a set growth trajectory as seen in sections (2.1) and (3.3).
As seen on figure (5), professional services can be decomposed across the traditional demand vs supply paradigm as per 6 main variables. On one hand, the demand in service can be characterized by the client size, the complexity and the recurrence of his needs. On the other hand, the service supply can be defined by assessing to which extent the service can be standardized, whether it is sold through relations or through a competitive bidding process and whether the service is delivered for a fixed lump sum or through a variable pricing scheme.
If those multiples dimensions could potentially lead to 64 services types, most services actually belong to 1 of the 3 categories according to ([17]), namely: "brains" (type "B"), "gray hairs" (type "G") and "procedure" (type "P"). "Brains" are client relation-based services, which are offered to long-term clients. "Grey hairs" (type "G") are more creative problem solving services , which leverage an expertise in a given field and to solve the most unique and difficult problems there are. Finally "Procedure" (type "P") are ready solution services.
Firms usually aspire at growing a given service to improve the associated financial performance ([31]). To grow the revenue associated to a given service, a firm needs first more sellers that are able to articulate a credible offering to clients ([32]). However, the more complex the problem at the heart of the service, the more time an individual requires to develop the required selling skills ([1]). Therefore the probability of a producer to become a seller is lower in brain (resp. gray hair) firms than in gray hair (resp. procedure) professional services. Leveraging the superscript "B"/"G"/"P" to refer to the service type and the notations of the previous sections, this translates into the following service delivery model condition:

$$\forall R > 0 \qquad (\theta.\gamma)_B(z) \leq (\theta.\gamma)_G(R) \leq (\theta.\gamma)_P(R)$$

This first means that whether the service is sold through a competitive bidding process, which ends up mimicking the matching process described in section (2.1), or through relationships similar to what was described in section (3), the associated revenue growth will be different because of its service delivery model [see equations (**??**) and (**??**)]. But to achieve a profitability improvement for a given service, a PSF must also consider the coordination costs $C(R)$ (s.t. $\partial_R C > 0$ and $\partial_{RR} C < 0$) that are necessary to orchestrate its service growth ([33]). Note that those costs are assumed to be the same whatever the service type. This result in the following proposition.

Proposition 4.1 *Services based on relationships have an endogenous growth cap in revenue $\hat{R}$ that is imposed by their type ("brains"/"gray hair"/"procedure"), such that: $\hat{R}_B < \hat{R}_G < \hat{R}_P$ Additionally the more complex the service offer is, the slower is its revenue growth (μ is such that $\mu_B < \mu_G < \mu_P$). Services sold in a competitive matching process (e.g. bidding) (see section (2.1)) see similar growth*

patterns to relationship based services if the associated client targets and their associated price level do not change.

If the growth of a service is capped by the ability of the firm to generate "sellers" internally, it is possible to increase the firm potential by sourcing "sellers" externally. To further this article, it would be interesting to understand when a service growth can effectively be boosted. The overall PSFs landscape "sellers" population indeed evolves a fixed pace and for a firm to integrate sellers from another firm, it must bear an incremental cost. The efficiency of such technique along the firm growth path would potentially needs to be discussed and as per a recent literature review ([34]), if the topic has already received a little bit of attention ([35]), it represents an underdeveloped area of research.
If services characteristics can be standardized and used to explain some of the observed growth heterogeneity, markets, defined in terms of clients and competitors pools can be extremely different from one place to the next, which intuitively calls for a extension of the discussion on growth diversity.

4.2 Why do markets matters for professional services growth?

From a market standpoint, the growth of a professional service occurs in 4 steps ([36]) and is driven by a mix of a customer segment and geography related activities. The first step in growth consists in competing to attract more and more clients in a given customer segment after a local introduction. The second step is about developing an offering by complementing the existing service in a peripheral fashion through sub-services if the service quality can easily be assessed [37]. This indeed increases the perceived service quality in a given customer segment, therefore distinguishing the provider from its competition. The third step relies on the service introduction in a new geography. The last step is about expanding the service to a new customer segment, which often leads to its redefinition.
The choice of a given market as defined by its geography (for example choosing the market of the technology firms with more than 200 employees in London - United Kingdom versus the one in Berlin - Germany) has been empirically shown to drive growth differences. PSFs that introduce their services in large and fast growing metropolitan areas see indeed a quicker growth than their counterparts ([38], [39]). Looking back at the models developed in sections (2) and (3), the growth of a service is indeed capped by the overall market evolution as:

$$\forall t \qquad \sum_{m\in[1;M(t)]} s_k(t).V \leq \hat{V}.N(t) \qquad \text{OR} \qquad \sum_{m\in[1;M(t)]} s_k(t).J \leq N(t) \tag{10}$$

Therefore the location choice of a PSF can reduce its growth opportunities if the market is or becomes saturated (i.e. the constraint (10) becomes binding). Note that the choice of the service extension to another customer segment has the equivalent effect as it relaxes the condition (10) for the firm. Therefore PSFs generally both expand geographically and across customer segment at the same time in order to maximize their growth potential ([40]). If the client demand matters, the condition (10) shows that the market supply in terms of number of competitors as well as their time of entry has also an impact on the service growth for the firms. Upon market saturation, there is indeed no need for additional sellers and firms no longer promote producers to sellers' positions (i.e $\theta_k \to 0$).

Example. To illustrate those differences, let's assume that a given management consulting service is introduced by a firm in 2016. This service is offered to legal and accounting firms in France that have between 50 and 250 employees. This represents a client pool $N(t)$ of 340 firms according the OECD Structural Business Statistics (ISIC Rev. 4) database. For the sake of simplicity, all the firms

that supply this service are assumed to have the same leverage ratio $\gamma_k = 5$ (which is on par with the benchmarks observed in the literature [41]) as well as the same promotion probability $\theta_k = 10\%$ (which is also on par with the literature benchmarks [42]). Let us also assume that this customer segment is relatively stable over time (i.e. $N(t) = N = 340$) Assume that 4 firms successively enter this market at 2 periods of interval with one seller. Assuming that for every client, 1 seller is required (i.e. $\frac{\hat{V}}{V} = 1$ or $J = 1$), and that an equilibrium is achieved for each period, the market has room for 4 competitors and saturation is achieved 14 periods after the first firm entry. Finally the compounded aggregated employment growth rates of each firm for the proposed service between their introduction and period 14 are respectively of 45.7% (for the first entrant), 56.9%, 60.4% and 70.7% (for the last entrant).

As shown in the previous two subsections, services and market characteristics can trigger heterogeneous growth paths. But the internal environment of PSFs can also influence those trajectories.

4.3 How can PSF characteristics influence some of their services growth?

Growth is a multi faceted and not easily achieved phenomenon. As discussed in [43], most firms start small, do not grow and die. Outside of the previously described sources of growth heterogeneity with respect to the market and service characteristics, it has to be noted that the firm in which the service is grown has an impact [19]. This can be summarized along three main lines.

First the demographic characteristics of the firm in which the service is developed drive the service growth speed and regularity over time. Besides stochastic fluctuations (see the seminal work of [4] for a firm level discussion), services growth has indeed been shown to be persistent as well as dependent in PSFs size and age ([22]). If there is little quality transferability from one service to the next within a firm [33], the size-age effect has been explained in the service diversification literature by the fact that PSFs can leverage their own experienced workers (e.g. industrial sector knowledge etc...) to speed up the service development, a stylized fact that echoes the resource based theory of firm growth developed by [3].

Next to the firm characteristics, an important factor for service growth revolves around the firm overall strategy in terms of its mix of organic versus acquisition driven growth [3]. This notably has consequences on services growth rates [44]. Employment for services that are developed in an organically growing firm increases, whereas employment is generally shrinking in existing services when growth is brought by acquisitions [45]. Additionally, when looking at revenue, the overall deleterious effect of acquisitions on profitability [46] seems to suggest that services revenue growth would also be negatively impacted by the firm acquisition growth mode.

Finally, amongst the internal sources of growth heterogeneity, the management and economic literature has also recognized the influence leaders styles and ambitions [44]. Empirical work has indeed shown that many leaders are not interested in growth ([47],[48]) as they focus on non financial questions such the well-being of employees, independence ([35]) and control. Note that even for leaders that focus on financial objectives, preferences for short term over long term profitability can lead to different decisions. For instance, if geographical expansion can be used generate more revenue (see [49]), it can also solely be used for cost management purposes as some of the tasks within the service can be potentially be centralized [50] in cost efficient locations that have a suitable labor pool and a high quality ICT infrastructure. Note that besides leaders ambitions, a recent review of the literature [51] reported that personal parameters such as the leadership team prior experience and education, access to capital as well as cohesiveness had also been found to influence growth either in terms of employment or revenue as they relate to the leaders ability to operationalize their ambitions.

5 Conclusion.

In summary, the growth of a professional service is different depending in the share of co-creation associated to its delivery. When co-creation is restricted, quality can be considered deterministic and professional services can be allocated to clients in a welfare optimal fashion through a matching mechanism. In this case, the growth of a service is competition-driven as it is about gaining and losing clients from its closest competitors depending in the evolution of each firm's labor supply. However when co-creation is important, quality is subject to random fluctuations and professional services tend to be sold through relationships, which will spur market inefficiencies as clients and services providers gets locked with another. In this case growth is more opportunistic and driven by the ability of the service firm to source "sellers" that are able to articulate a credible promise to clients while ensuring the quality of the service delivery. If the models developed in sections (2) and (3) can be used to discuss growth at a service level, they can also reflect most of known source of growth heterogeneity across professional services as discussed in section (4). They can indeed account for service types as well as market structure differences. They could yet benefit from an extension to account for firm level specificities in terms of objectives, organic versus acquisition driven growth model and human capital.
To further this stream of research, it would be interesting to conduct more empirical investigations. This would first provide professional services sector specific benchmarks in terms of the main growth measures namely: revenue and employment growth (as discussed in [19] for instance). Second those numbers would help illustrate the acknowledged growth differences that exist between the service and the manufacturing industry. The latter has indeed been the focus of most of the growth related literature. Finally, the professional services sector would benefit from additional research on how to operationalize growth. This could come in several forms: a standardization and optimization of the "producer" to "seller" career path, a characterization of firms objectives in a vein similar to [52] or a drill down on how to build sustainable relationships, via for instance a more efficient "sellers" - client matching [53].

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6 Appendix.

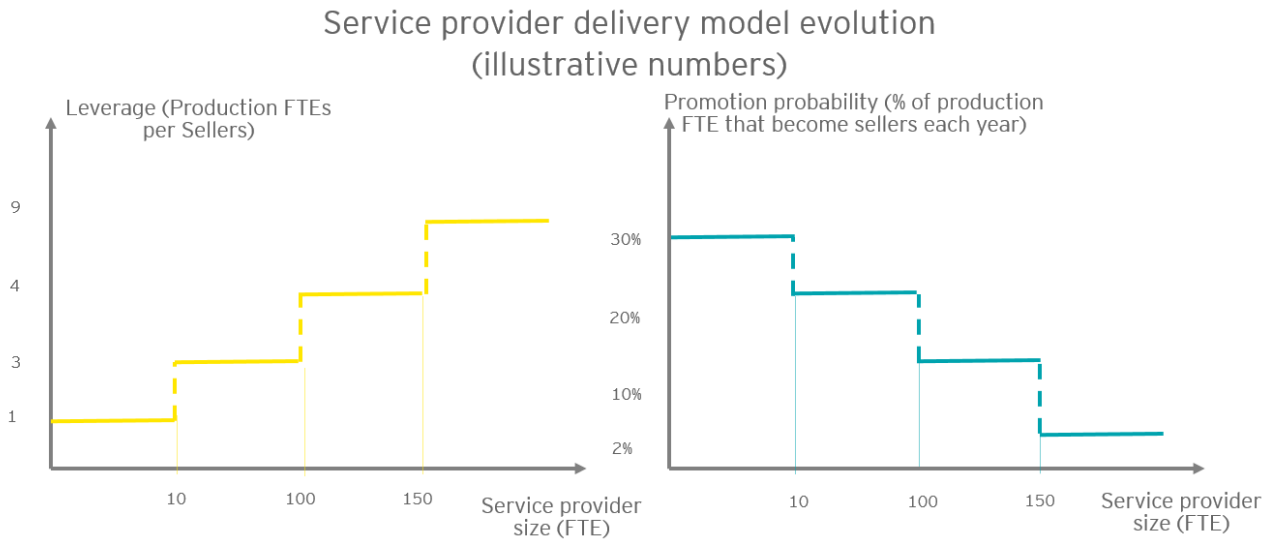

Figure 1: Implication of the PSFs delivery model evolution.

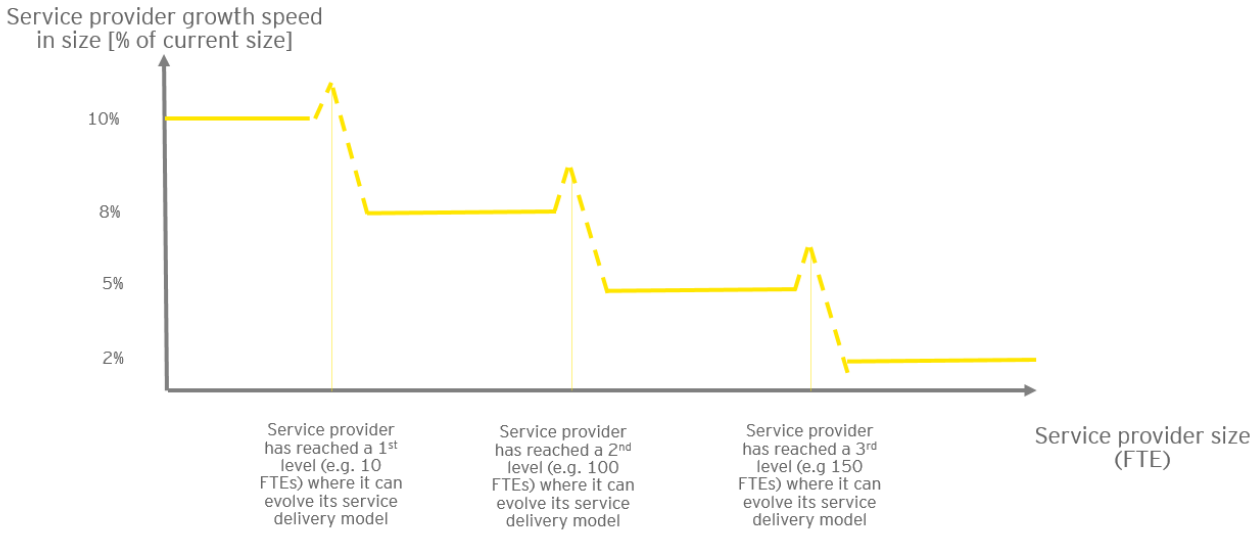

Figure 2: PSFs Growth Rates evolution.

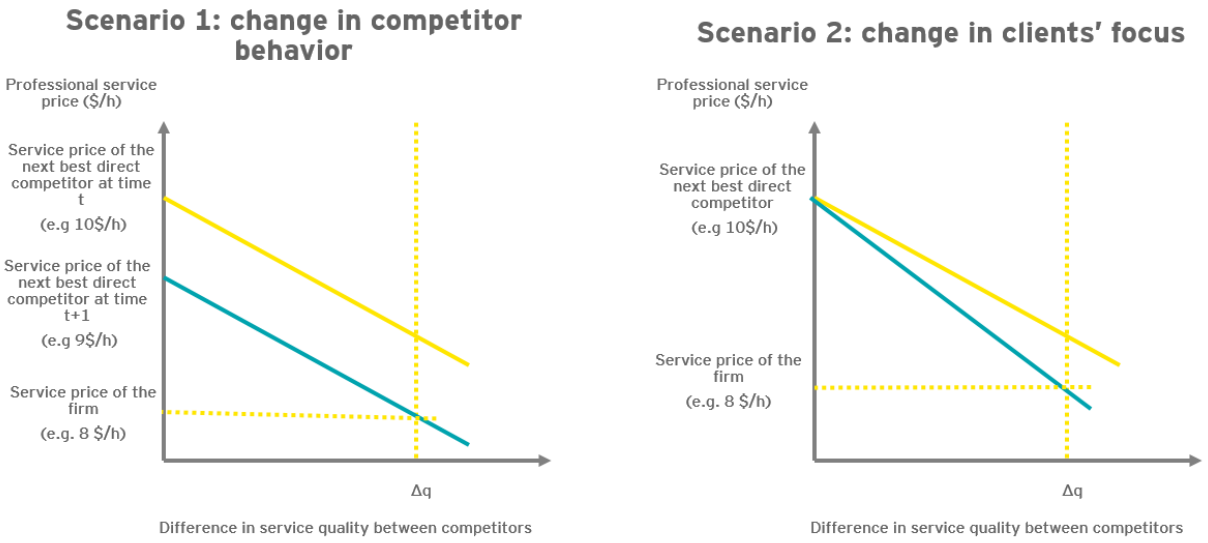

Figure 3: PSFs price changes possibilities.

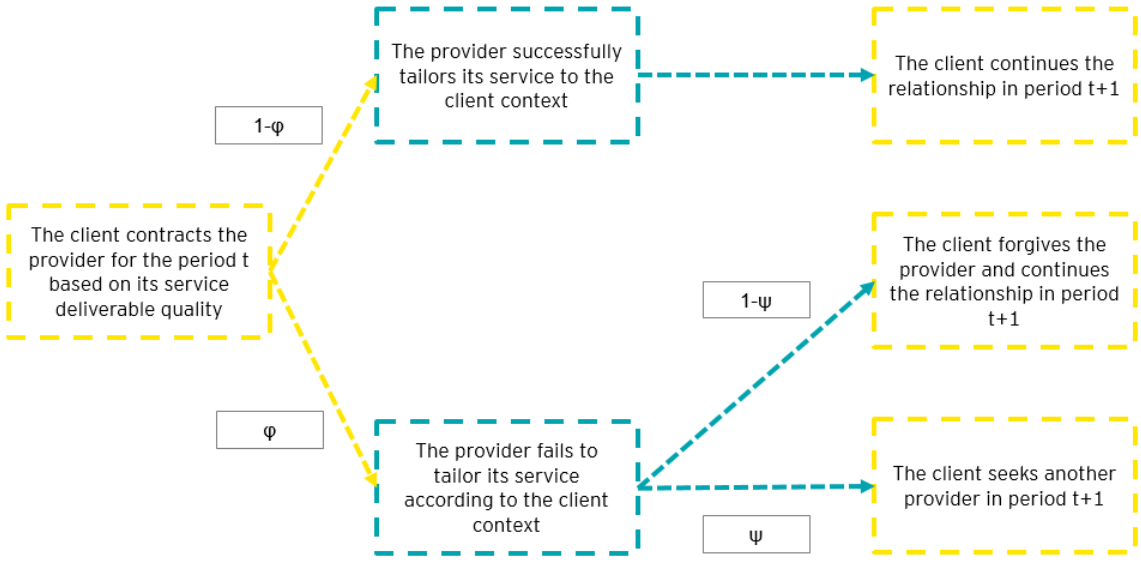

Figure 4: Client - Service provider relationship mechanism.

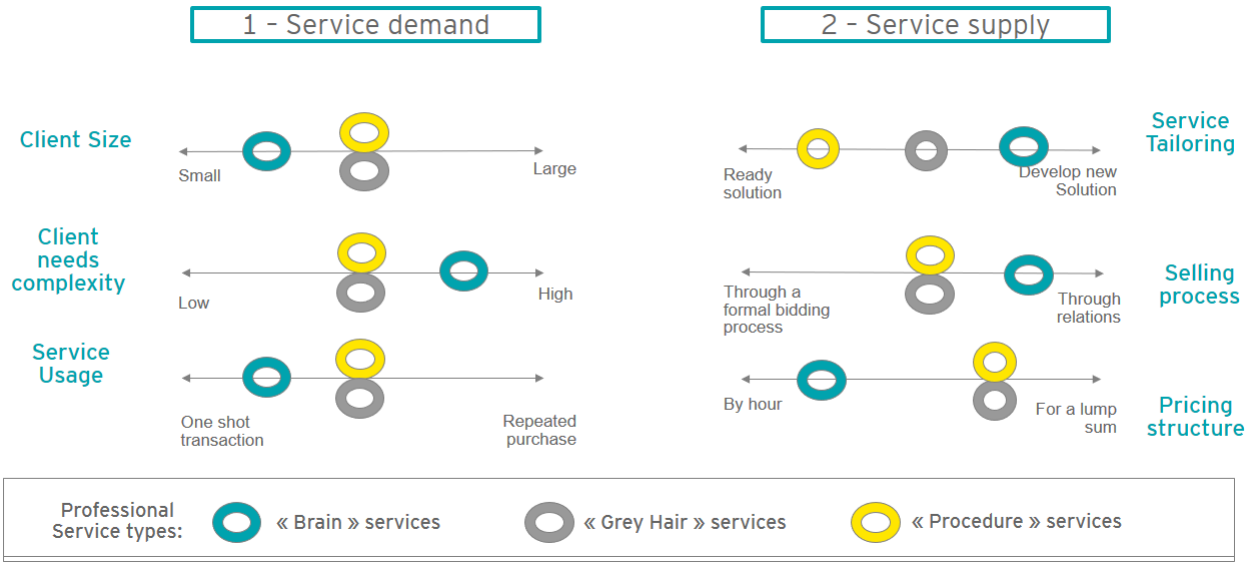

Figure 5: Main professional services types.