



HAL
open science

Transforming the professional services firm

Edouard Ribes

► **To cite this version:**

Edouard Ribes. Transforming the professional services firm. Economics and Finance. Mines ParisTech - Ecole des mines de Paris, 2022. English. NNT: . tel-03672108v1

HAL Id: tel-03672108

<https://hal.science/tel-03672108v1>

Submitted on 19 May 2022 (v1), last revised 12 Jan 2023 (v2)

HAL is a multi-disciplinary open access archive for the deposit and dissemination of scientific research documents, whether they are published or not. The documents may come from teaching and research institutions in France or abroad, or from public or private research centers.

L'archive ouverte pluridisciplinaire **HAL**, est destinée au dépôt et à la diffusion de documents scientifiques de niveau recherche, publiés ou non, émanant des établissements d'enseignement et de recherche français ou étrangers, des laboratoires publics ou privés.

THÈSE DE DOCTORAT
DE L'UNIVERSITÉ PSL

Préparée à MINES ParisTech

**Transformation des entreprises de services professionnels
; Transforming the professional services firm.**

Soutenue par

Edouard A. RIBES

Le 24 02 2022

École doctorale n°N°543

**SDOSE: Sciences de la
Décision, des Organisa-
tions, de la Société et de
l'Échange**

Spécialité

Economie; Economics

Composition du jury :

| | |
|--|---------------------------|
| Françoise CHEVALIER Associate Professor, H.E.C | <i>Présidente</i> |
| Heski BAR-ISAAC Professor, Rotman School of Manage- ment | <i>Rapporteur</i> |
| Angelo SECCHI Professor, Paris School of Economics | <i>Rapporteur</i> |
| Raphaël LEVY Assistant Professor, H.E.C | <i>Examineur</i> |
| Pierre FLECKINGER Professor, MINES Paristech | <i>Directeur de thèse</i> |

Contents

| | | |
|----------|---|-----------|
| 1 | Introduction | 5 |
| 1.1 | An introduction to professional services: | 5 |
| 1.1.1 | Professional services firms: a definition | 5 |
| 1.1.2 | Key trends on the evolution of professional services amongst OECD countries: | 7 |
| 1.2 | Insights from the literature: | 9 |
| 1.2.1 | Professional services firms growth: | 10 |
| 1.2.2 | Transformation levers pulled by PSFs to become more competitive: | 14 |
| 1.2.3 | Current organizational principles in place in profes- sional services firms: | 20 |
| 1.3 | Contributions to the economic and managerial literature: . . | 21 |
| 2 | Growth patterns of PSFs. | 27 |
| 2.1 | Summary: | 27 |
| 2.1.1 | French version: | 27 |
| 2.1.2 | English version: | 27 |
| 2.2 | Introduction | 28 |
| 2.3 | US PSFs growth patterns. | 30 |
| 2.3.1 | 1975 -2000 Longitudinal data description. | 30 |
| 2.3.2 | PSFs age and size growth patterns. | 30 |
| 2.3.3 | PSFs growth through geographical expansion. | 33 |
| 2.4 | Large US PSFs growth. | 35 |
| 2.4.1 | A toy model of firm growth | 35 |
| 2.4.2 | Insights from US macro level data | 36 |
| 2.4.3 | Link to the overall firm size - age growth patterns of high productive large PSFs? | 37 |
| 2.5 | Conclusion. | 40 |
| 2.6 | Appendix. | 41 |
| 3 | PSFs' performance - a model | 49 |
| 3.1 | Summary: | 49 |
| 3.1.1 | French version: | 49 |

| | | |
|----------|--|-----------|
| 3.1.2 | English version: | 49 |
| 3.2 | Introduction | 50 |
| 3.3 | Delivering professional services. | 52 |
| 3.4 | Competition in PSFs. | 54 |
| 3.5 | PSFs profitable organic growth. | 57 |
| 3.6 | Competing for inorganic growth. | 60 |
| 3.7 | Investing in technology. | 64 |
| 3.8 | Heterogeneity in professional services performance. | 67 |
| 3.9 | Conclusion. | 71 |
| 3.10 | Appendix & Figures. | 71 |
| 4 | Scoping PSFs transformation. | 75 |
| 4.1 | Summary: | 75 |
| 4.1.1 | French version: | 75 |
| 4.1.2 | English version: | 76 |
| 4.2 | Introduction: | 76 |
| 4.3 | Theoretical foundations: | 78 |
| 4.3.1 | What do we know about the legal firms? | 78 |
| 4.3.2 | What do we know about labor displacement? | 80 |
| 4.3.3 | What do we know about labor replacement? | 82 |
| 4.4 | Methodology: | 83 |
| 4.4.1 | Understanding the tasks involved at core of the legal services industry: | 84 |
| 4.4.2 | Estimating the volume of work that can be done remotely or by a robot: | 85 |
| 4.4.3 | Assessing the volume of labor that can be displaced or replaced: | 87 |
| 4.5 | Results: | 88 |
| 4.5.1 | Results of the study: | 88 |
| 4.5.2 | What are the effects of task separability labor substitutability? | 90 |
| 4.6 | Discussion: | 94 |
| 4.7 | Conclusion: | 97 |
| 5 | Displacement and PSFs' performance. | 99 |
| 5.1 | Summary. | 99 |
| 5.1.1 | French version: | 99 |
| 5.1.2 | English version: | 99 |
| 5.2 | Introduction. | 100 |
| 5.3 | Theoretical framework: | 101 |
| 5.3.1 | MC firm's performance: | 102 |
| 5.3.2 | Labor displacement and its impact on performance: | 103 |
| 5.4 | Method & Results: | 105 |
| 5.4.1 | Hypothesis & results: | 107 |

| | | |
|----------|---|------------|
| 5.4.2 | Additional insights: | 110 |
| 5.5 | Discussion & conclusion: | 112 |
| 5.5.1 | Robustness checks: | 112 |
| 5.5.2 | Practical Implications: | 115 |
| 5.5.3 | Limitations & future research: | 116 |
| 5.5.4 | Conclusion: | 118 |
| 6 | Displacement & sector's evolution: | 119 |
| 6.1 | Summary: | 119 |
| 6.1.1 | French version: | 119 |
| 6.1.2 | English version: | 119 |
| 6.2 | Introduction: | 120 |
| 6.3 | A model of global competition: | 121 |
| 6.3.1 | Aligning services demand & supply through prices: | 121 |
| 6.3.2 | What are the key dynamics that drive MC prices evolution? | 123 |
| 6.3.3 | Model simplification in a stable "Zipf" market: | 125 |
| 6.4 | Application: the transportation market: | 126 |
| 6.4.1 | Data parameters estimation: | 127 |
| 6.4.2 | Model inputs subject to a sensitivity analysis: | 128 |
| 6.4.3 | Model results & sensitivity analysis: | 128 |
| 6.5 | Conclusion: | 131 |
| 7 | Technology & performance: | 135 |
| 7.1 | Summary: | 135 |
| 7.1.1 | French version: | 135 |
| 7.1.2 | English version: | 135 |
| 7.2 | Introduction: | 136 |
| 7.3 | Methods & results: | 138 |
| 7.3.1 | Data: | 138 |
| 7.3.2 | Hypothesis & methodology : | 139 |
| 7.3.3 | Results : | 142 |
| 7.4 | Discussion & conclusion: | 148 |
| 7.4.1 | Practical implications: | 148 |
| 7.4.2 | Limitation & future research: | 149 |
| 7.4.3 | Conclusion: | 151 |
| 8 | Adjusting PSFs' career frameworks. | 153 |
| 8.1 | Summary: | 153 |
| 8.1.1 | French version: | 153 |
| 8.1.2 | English version: | 153 |
| 8.2 | Introduction: | 154 |
| 8.3 | PSFs organization: a model. | 156 |
| 8.4 | Is a no external hiring policy sustainable for a PSF? | 157 |

| | | |
|-----------|--|------------|
| 8.5 | How to minimize the production costs of a PSF? | 159 |
| 8.6 | Conclusion and perspectives. | 161 |
| 9 | Evolving PSF's workers compensation. | 163 |
| 9.1 | Summary: | 163 |
| 9.1.1 | French version: | 163 |
| 9.1.2 | English version: | 164 |
| 9.2 | Introduction: | 165 |
| 9.3 | Theoretical foundations: | 166 |
| 9.3.1 | What do we know about PSFs/KIBS as organizations? | 166 |
| 9.3.2 | What do we know of the globalization of services de- livery chains? | 168 |
| 9.4 | The consulting career model: | 170 |
| 9.5 | Succession pipelines and MC firms' transformation: | 173 |
| 9.6 | Local employees' wages and competition across MC firms: | 176 |
| 9.7 | Discussion. | 178 |
| 9.8 | Conclusion. | 181 |
| 10 | Concluding remarks. | 183 |
| 10.1 | Personal considerations: | 183 |
| 10.2 | Lessons learned from the professional services sector: | 184 |
| 10.3 | Discussion: | 186 |

Chapter 1

Introduction

1.1 An introduction to professional services:

1.1.1 Professional services firms: a definition

Professional Services Firms (referred to as PSFs in the rest of this chapter) are a subset of Knowledge Intensive Business Services enterprises (KIBS) (Toivonen et al., 2004) operating according to a specific value chain (as conceptually defined by Porter (2001)). Their specificity lies in their value proposition. It revolves around offering an expertise that can be used to first co-define, then sell and finally co-produce a bespoke service through a succession of clients' interactions (Løwendahl, 2005).

The degree of customization of this value chain can of course vary. One categorization commonly used is the one of Maister (2012). In this set-up, PSFs can either heavily rely on client interactions to create true custom services (“brain firms”) or obey a form blueprint that can be altered to offer semi-custom (“grey hair firms”) or off-the-shelve services (“process firms”). In practice, most firms fall into the “grey hair” category. True customization is indeed relatively rare whilst the commoditization of off-the-shelve services make them ripe for a form of technological replacement, where the service becomes (for instance) a (digital) product.

The expertise and versatility required to successfully operate this bespoke value chain is high and calls for a specific managerial structure. Whilst firms offering commoditized services are mainly organized as corporation, PSFs are structured as partnership (Greenwood and Empson, 2003; Levin and Tadelis, 2005). In this format, an individual (the partner) privately owns the firm and is responsible for co-shaping and selling an offering to a client, whilst delegating its production to his/her employees. This concentration of knowledge and economic power on specific individuals (Becker, 2009) has made PSFs relatively complex to study and the academic community has only recently started to unpick the associated mysteries (Empson et al., 2015b). This broad academic definition of PSFs can be brought to life by

publicly maintained industrial classification systems. If each state/country can have its own referential, there are currently two main versions that are used when studying those firms. The first (and most prominent) one is the one offered by the Organization for Economic Cooperation and Development (OECD) called the ISIC (International Standard Industrial Classification) which presents a standard view for all its constituents (most mature countries and a few emerging ones). The second one is the US referential called the NAICS (Northern American Industrial Classification System).

In the OECD view, the professional services sector (ISIC code 69'75) is defined as the sum of several sub-sectors. It regroups legal (ISIC code 691) and accounting activities (ISIC code 692), management consulting activities (ISIC code 70), architectural and engineering activities (ISIC code 711), technical and testing activities (ISIC code 712), scientific research activities (either dedicated to natural science and engineering - ISIC code 721- or social sciences and humanities – ISIC code 722), advertising and market research activities (ISIC code 73), veterinary activities (ISIC code 75) and (finally) some other activities (ISIC code 74). As seen in Figure 1.1, the professional services sector is important in the OECD as it employs more than 13 M individuals. Its activities are very diverse as all sub sectors occupy a similar share of the OECD population (with the potential exception of veterinary and technical testing activities). Finally, from a geographical

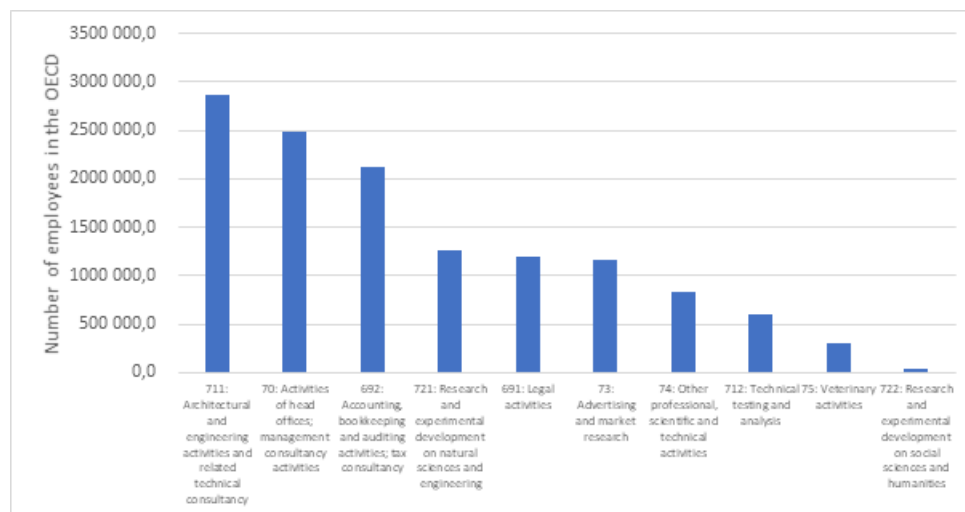


Figure 1.1: Number of employees per professional services sector (ISIC) in the OECD in 2017 - source OECD database

repartition standpoint, professional services markets are naturally centered around the US, Canada the EU5 countries within the OECD. From a penetration standpoint (i.e. the amount of employees in the sector compared to the rest of the economy), the US, the UK and Germany appear to rely far

more on professional services than any other OECD country.

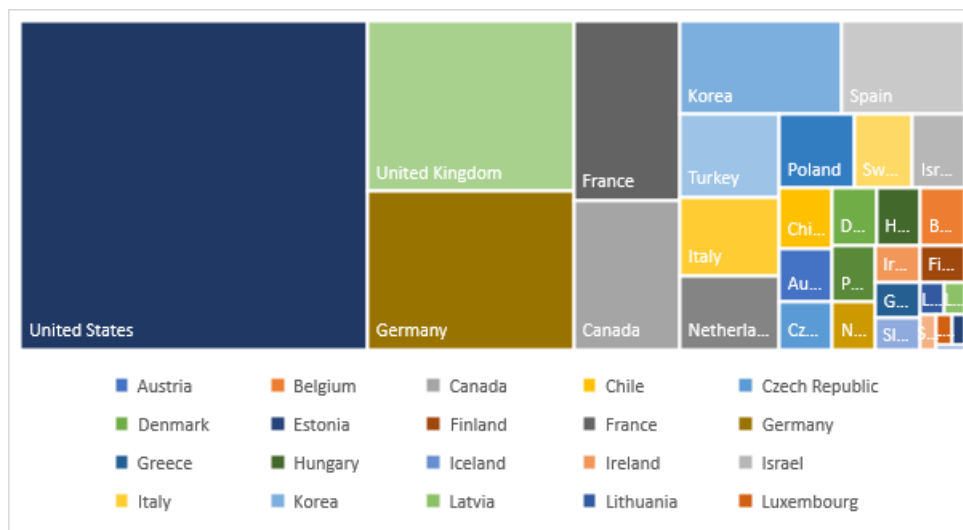


Figure 1.2: Normalized distribution of professional services markets across OECD states in 2016 (size defined as number of employees in the sector (ISIC)) – source OECD database.

1.1.2 Key trends on the evolution of professional services amongst OECD countries:

An indicator of the growing importance of PSFs in today's economy is the pace at which the employment share of the sector has been evolving over time. The OECD database indeed records the total number of persons employed E in the professional service sector over time across each country i (i.e. $E_{PS,i}(t)$) as well as across the overall business economy (i.e. $E_{BE,i}(t)$). Therefore, the employment share of the professional sector $S_i(t)$ can easily be assessed (i.e. $S_i(t) = \frac{E_{PS,i}(t)}{E_{BE,i}(t)}$).

The evolution of the employment share (i.e. $\frac{S_i(t+1)}{S_i(t)} - 1$) can then be used to assess whether or not the professional services sector is growing at a faster pace (employment wise) than the rest of the economy. Figure 1.3 shows that between 2009 and 2018, most OECD countries (apart from France Mexico) have experienced a growth with respect to the importance professional services activities. On average, PSFs employment share (worth 9.1% as of 2017) has increased by 0.16% per year.

But if professional services activities are becoming more and more prominent in today's business economy, they are also subject to an ongoing consolidation. If about 20% of PSFs employees can be found as of today in large firms (i.e. firms with more than 250 employees), the vast majority of the

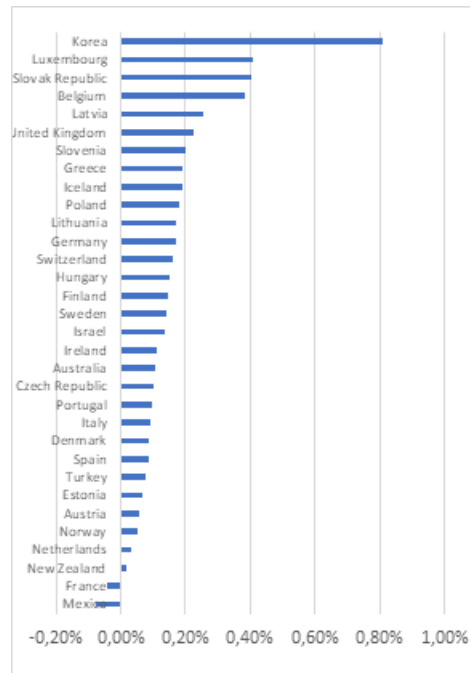


Figure 1.3: Annual professional services employment share evolution (average over the past 10 years) - source OECD

professional services landscape is made of Small and Medium Enterprises (SMEs). However, the rate at which employment grows in large firms is much higher than the rate at which it grows in SMEs (see figures 1.4 1.5). This consolidation dynamic is interesting as firms are subject of efficiencies of

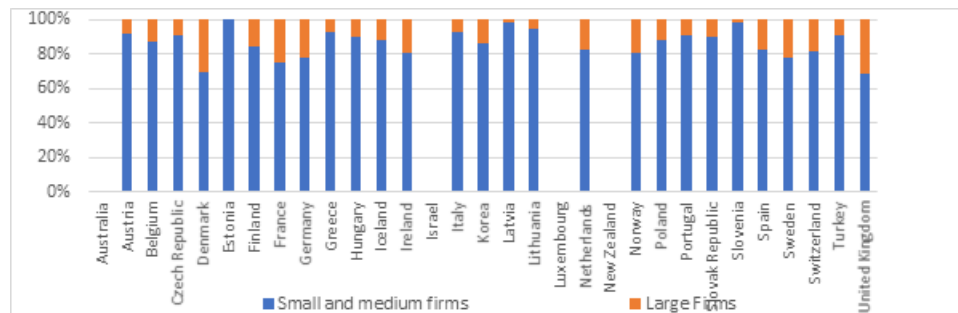


Figure 1.4: Repartition of employment across firms in the professional services sector in 2017 - source OECD

scale as they grow and become large. As such the consolidation of the sector is likely to come with changes in professional services roles/jobs and PSFs' financial performance. For instance, firms can off/near-shore certain activities that compose their production chain when the volume of services they

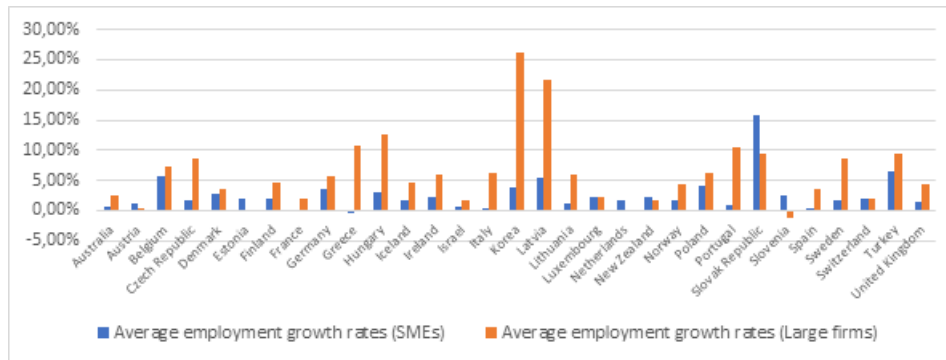


Figure 1.5: Average employment growth rate (past 10 years) across firm size - source OECD

offer reaches a critical mass (Ijiri and Simon, 1964; O'Farrell and Hitchens, 1988) for related discussions on minimum efficient scales). This can make PSFs more competitive (something that will be further discussed in the following sections of this introduction) as off/near-shoring is associated to a reduction in production costs but also creates more specialized roles. In summary, the professional services sector is a complex patchwork of industrial activities sharing one common trait: they leverage an expertise to co create and co deliver bespoke services with their clients. As of today, the sector is deemed understudied by academic community (whether it is from an economic and/or managerial point of view). This appears like a promising area of study given that the sector is not only growing at a faster pace than the economy of most mature countries, but also is ongoing a profound transformation as it becomes more and more consolidated.

1.2 Insights from the literature:

Section 1.1 has shown that studying the economic tenets of professional services sector presents some interest. But such an exercise should not be considered in isolation as it leverages several established strands of economic and managerial research. At a high level, firms are entities that sell, produce, and innovate. Their economic structure is then mainly assessed via notions of performance in terms of growth, profitability, and productivity. This section will therefore start by a crisp review of what the literature has highlighted in terms of firms' growth (notably from a revenue standpoint) in subsection 1.2.1. This will then naturally inform a discussion around the levers used to optimize and transform firms as they evolve (in a generic sense) in subsection 1.2.2. Finally, this section will conclude with a semi detailed review of what we know of PSFs specificities.

1.2.1 Professional services firms growth:

Stylized facts from macro-economic studies:

Firms have traditionally been described using biological analogies. One of the associated prominent concepts is that firms, like living organisms, have a lifecycle (Penrose and Penrose, 2009). They are born, they grow, they die. Death (or market exit) is generally seen as triggered by exogeneous and random productivity shocks (i.e. introduction of a new technology driving prices down) which can render a firm obsolete (i.e. non profitable) as its production abilities are no longer competitive (Hopenhayn, 1992). From a lifecycle perspective, empirical evidence (Farinas and Moreno, 2000) have shown that firms' likelihood of failure gets lower as they age and grow. As seen in Boeri and Bellmann (1995), this can empirically be explained by the fact that larger and older firms generally supply multiple products which makes them more likely to absorb productivity shocks (via downsizing for instance) than younger counterparts which are generally specialized into a niche product line. Interestingly, this also makes large firms more sensitive to macro-economic cycles than their smaller counterparts. Entry on the other hand is sector specific and strongly correlates with exits across time (Disney et al., 2003). As a result, the number of entrants naturally decline as the sector matures (Dunne et al., 1988).

From a professional services standpoint, data drawn from the O.E.C.D. database shows that in general entry and exit rates across the top 5 markets are in the same range (i.e. in the 8 to 10% - see Figure 1.6) leading to a relative growth when it comes to employment. However, a more granular analysis shows different patterns at a sub sector level, with notably an employment reduction in legal (1 to 2% of employment contraction per year) and accounting activities (3 to 5% of employment contraction per year outside of the US) (probably triggered by the introduction of new technologies) whilst other segments appear relatively stable (see Figure 1.7).

When it comes to growth, researchers usually track either the evolution of the revenue a firm can extract from the market and/or the evolution of the number of individuals it employs. Early theories of growth stipulated that firms were growing (on average) a constant rate and that from one period to the next there was no correlation between growth rates (Gibrat, 1931). However recent findings have shown that the growth of a firm is subject to more nuanced patterns as firms only reach a Gibrat's like growth once they have achieved a Minimal Efficient Scale (MES) (Lyons, 1980; Davies, 1980; Santarelli et al., 2006).

Until then, firms experience a high variability in terms growth rates (Sutton (2002), Bottazzi and Secchi (2006)) as they try to become viable. Besides when they grow, they do so at a fast and persistent pace (Wagner, 1992) (i.e. the current growth rate is correlated to previous ones – firms that grow

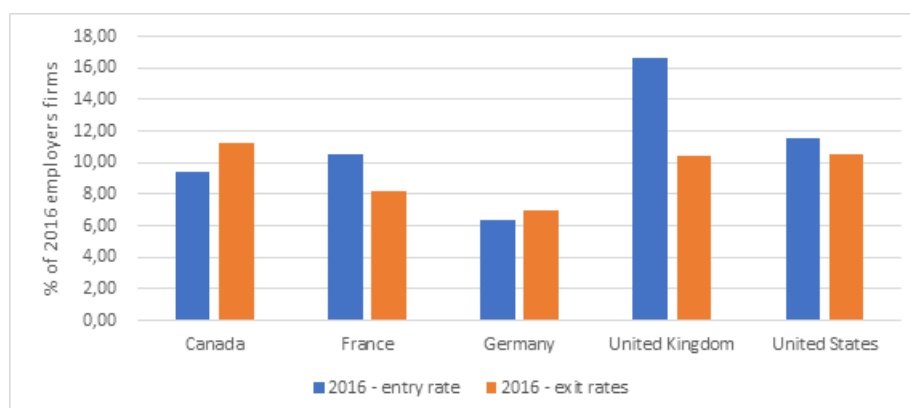


Figure 1.6: Professional services firms entry & exit rates in core O.E.C.D markets in 2016 - source O.E.C.D. database

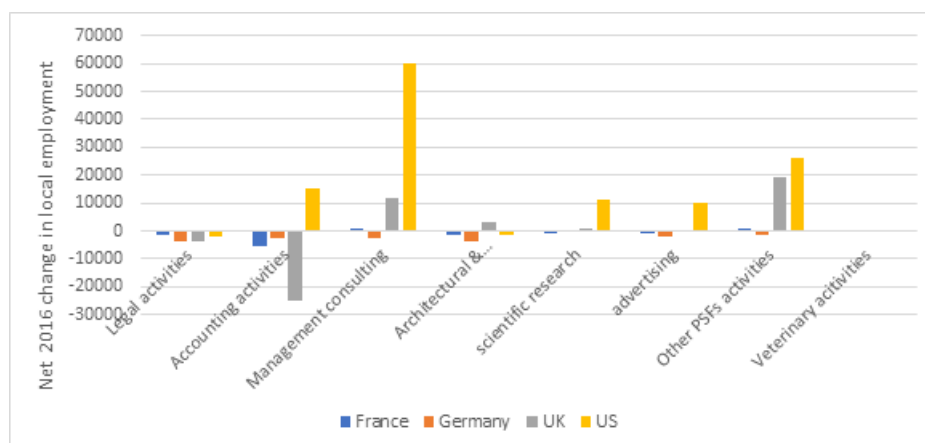


Figure 1.7: Employment level change in core European markets - source O.E.C.D database

faster than their competitors keep on growing faster). This has been empirically observed when both looking at firms' age (Evans, 1987; Agarwal, 1998) and size (Lotti et al., 2003). Finally, as firms expand and age, their growth rates slow down (Evans, 1987). This maturation process has been explained as a learning one (Jovanovic, 1995) where firms start within a niche and discover their competitive advantage in a random fashion (see the results of (Geroski, 1998)).

But as seen on the literature review of Santarelli et al. (2006), most discussions on firm growth have been backed by empirical analysis of capital-intensive industries (e.g. manufacturing). To my knowledge, there has been little done on knowledge-intensive sectors, let alone professional services. If this is something this thesis will address in more details, here are few pro-

professional services orders of magnitude. When looking at the MES as defined by [Comanor and Wilson \(1972\)](#) and leveraging public dataset such as the one provided by the US government (US statistics of businesses), it appears that for a professional services business to be competitive it must at generate about 250k\$ of revenue per year, point at which the firm generally employs 1 or 2 individuals. This would suggest that barriers of entry in the professional services industry are small if not nonexistent. Growth wise, most professional services firms appear static as their size does not (on average) change over the course of their first 5 years of activity (see [Figure 1.9](#) which summarizes data from the O.E.C.D database). The average firm starts with 1 or 2 employees and add 1 to 2 extra heads over the course of the next 5 years. This would suggest that most of the employment growth/ reduction recorded across professional services sub-sector it actually triggered by older firms, something that will get discussed at a later point of this thesis.

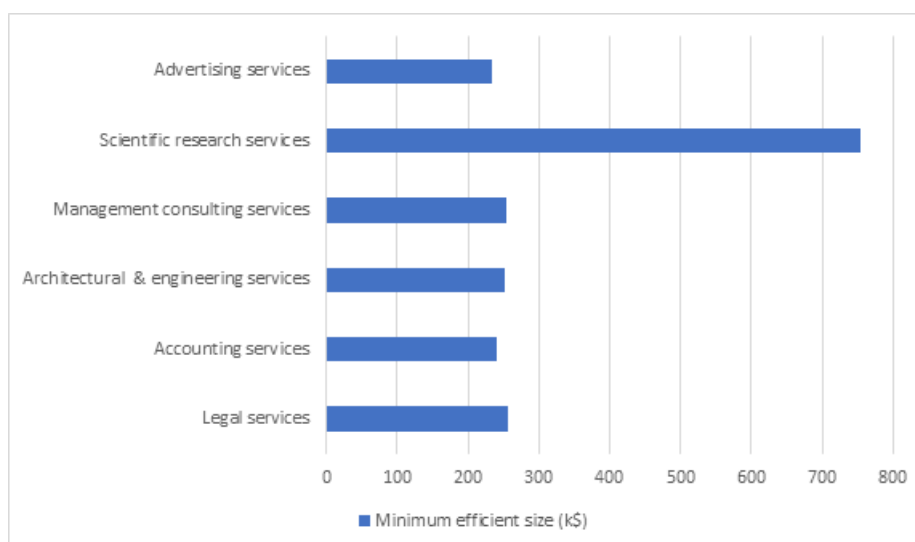


Figure 1.8: Minimum efficient size in professional services businesses (source 2017 US Business statistics dataset)

Drivers of growth – lessons from marketing studies:

If the theory on firm growth is extremely robust at a macroeconomic level ([Audretsch et al., 2004](#)), the field keeps on developing itself by exploring the micro economic drivers of growth sector by sector ([Audretsch et al., 2014](#)). At that level, there is no consensus amongst scholars on which business/product/services characteristics can be used to predict the evolution of a firm. To bring this to life, a simple example can be drawn from the manufacturing space and notably from the pharmaceutical industry. Early on, when patented pharmaceutical products are first brought to market,

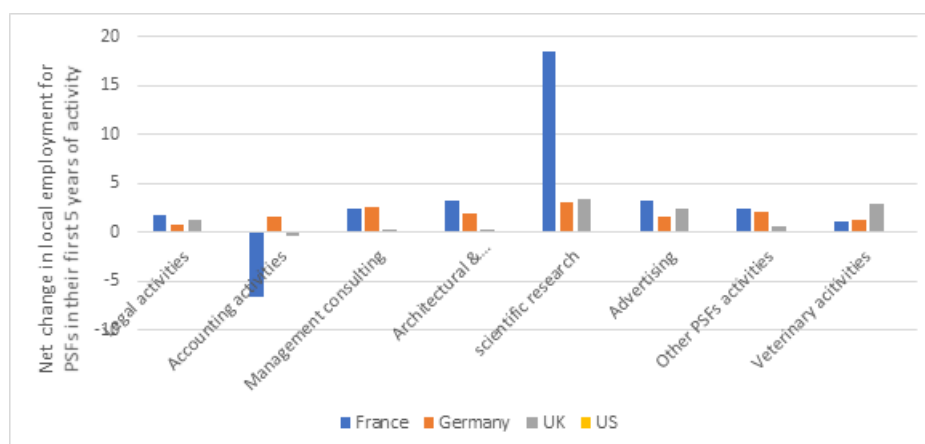


Figure 1.9: Average growth of PSFs over their first 5 years of activity (source OECD database – 2016)

marketing mix analysis can be used to predict the evolution of the revenue generated by those products. Key drivers in that set up are the price of the product, the detailing intensity of the firm (i.e. number of calls made by sales representatives to doctors), the advertising budget and the rate at which the product needs to be prescribed again (Narayanan et al., 2004). However, once the pharmaceutical product patent expires, price becomes exogenous to the firm and the key predictors for revenue growth consist in the number of competitors in the generic space as well as their order of entry (Bowman and Gatignon, 1996). This small example shows that industry-specific complexities have created some barriers in our understanding of the micro economic drivers of growth (e.g. it is not straightforward to see how the drivers of growth for pharmaceutical products may apply to a financial services company). Explorations (notably with a marketing lens) are therefore carrying on and, if some information is available on the certain services industries, there is, to my knowledge, very little documented on the growth of professional services firms.

A popular option available to explore growth at a micro economic level consists in applying the framework proposed by Bass et al. (1994). In this framework, a service/ product in a competitive market gets adopted by its customers according to two dynamics. A small portion of customers, called “innovators”, innovate and purchase the product on their own, whilst the bulk of the customers, called “imitators”, simply replicate the purchase of previous customers, a mechanism dubbed the “word of mouth”.

Adoption via “word of mouth” is a function of the 4Ps of marketing: price, place, promotion and product (incl. services). But in the case of professional services, some empirical studies have found that the core drivers of adoption were product promotion (Cengiz and Yayla, 2007) rather than

price (Stock and Zinszer, 1987; Sonmez and Moorhouse, 2010; Perner et al., 2014) and place. Recent evidence from the consulting industry (Wang et al., 2019) have indeed shown that sales were mainly triggered through online digital events, whilst price was mainly a factor driving repeat purchases (i.e. customer loyalty), which is usually rare (professional services are mostly “one time tailored projects” (Løwendahl, 2005)). As such growth in the professional services space mainly appears to be a function of the intensity of promotion the firm can generate in the market.

Promotion in itself can occur in 4 forms (Coviello et al., 2000): transaction marketing (e.g. promotion of services during a project (cross-selling)), database marketing (i.e. generic email marketing), interaction marketing (e.g. workshops with a selected audience) network marketing (e.g. participation to forums and associations events). On that front, empirical studies (McColl-Kennedy et al., 2008; Sweeney et al., 2011) have found that the most common promotion practice was interaction marketing and that is was sometimes coupled with relationship management through networking events. Networking marketing was however shown to be more difficult to perform as it requires accesses to groups and associations which must be constructed over time.

If the generic micro level tenets of growth in the professional services are understood, there is still a lack of benchmarks around their economic efficiency. This work will start to address this gap in its early chapters.

1.2.2 Transformation levers pulled by PSFs to become more competitive:

Discussions on growth have been ongoing for several decades. They highlight that a consistent trait across firms (independently of their industrial sector) is that they face a perpetual transformation aimed at improving their performance and maximizing their survival odds. If they adapt the way they sell products/services and grow their revenue (something that was illustrated with the example of section 1.1), they also continuously seek to improve the efficiency of their production structure. On that front, two major theoretical approaches complement each other within the scholarly space. The Resource-Based View (RBV) of Penrose and Penrose (2009) states that transformation of a firm’s production engine is mainly a managerial question of finding the right resources at the right time (e.g. people, competencies, skills...), whilst the Transaction Costs Economics (TCE) framework of Williamson (1981) states that the transformation is mainly a financial construct (e.g. finding the right level of productivity, the right costs etc...). Independently of the entry point (RBV or TCE), the academic community is aligned on the fact that transforming the production structure of a firm is the result of two actions. On one hand, firms adapt their location strategy (i.e. the displace activities off/near-shore). On the other, the invest in

technology to replace labor at scale.

Displacing labor :

The approach to off/near-shoring work has been thoroughly discussed over the past decades. It starts with a decomposition of the value chain of a firm (Porter, 2001) into activities and is followed by a discussion on whether an activity can / should be reallocated (Grossman and Rossi-Hansberg, 2008). From a TCE standpoint, the rationale for the change principally lies in costs savings (Ellram et al., 2008) (e.g. the labor costs associated to an engineer in South Africa are not the same from the ones of a Canadian engineer). From a RBV standpoint, the idea is to benefit from abundant pools of resources (e.g. India trains much more software engineers every year than the UK does, so shouldn't UK based software firms source their production roles with Indian nationals?).

If this type of transformation has been ongoing for several decades in the manufacturing space, it has only recently started to hit the services realm (Leshner and Nordås, 2006). Looking back at the benchmarks available in the field, the academic community has converged on the fact that 20% to 50% of today's services activities could be done elsewhere (Blinder and Krueger, 2013). Additional estimates drawn from Jensen et al. (2005) (see Figure 1.10) even show that the impact of this transformation in professional services is likely to be as profound as in the manufacturing space. More than 80% of the associated activities indeed appear tradable.

However, recent literature reviews are calling for caution when displacing

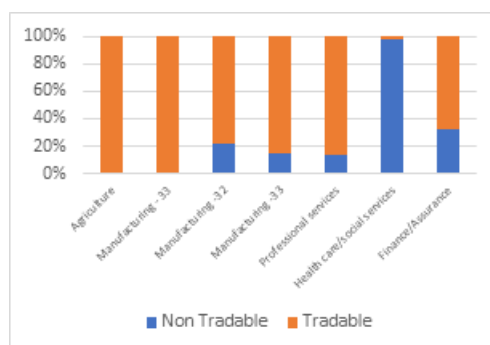


Figure 1.10: Impact of trade on employment in the professional services space compared to other selected industrial sectors.

work (see Pisani and Ricart (2016) for example). At a strategic level (i.e. multiyear time horizon), displacing labor is indeed known to cause potential hurdles when it comes to performance and notably growth. The principal impediment here consists in the local disappearance of skills and competencies (a phenomenon sometimes referred to as a “hollowing out” of local

capabilities) (Lieberman, 2004). The local lack of human capital indeed hinders innovation and in turn, stops growth. This has notably led several companies to recently re-shore/backshore activities (Ellram et al., 2013). Benchmarks from the manufacturing space (Dachs and Zanker, 2014) show that about 25% of the firms who have engaged in labor displacement end up back-shoring activities in the following years. Thinking about professional services, this means that even if 80%+ of the underlying activities are tradable, only a subset of it could actually be relocated off/near-shore. But beyond strategic issues of innovation and growth, labor displacement is also prone to unforeseen coordination and training costs (Pisano and Shih, 2012; Porter and Rivkin, 2012). The phenomenon is usually not well apprehended to the extent that, 50% of the firms who have engaged in labor displacement fail to reap the expected benefits of the transformation (Aron and Singh, 2005). As pointed by the literature, the primary problem here is one of scope. Displacing an activity just because it can be done remotely has indeed proven to be everything but thoughtful (Doh et al., 2009). Given that tasks are performed by workers and that some of them are interconnected (Blinder, 2007), a blunt decomposition of a service delivery chain ultimately leads to hidden costs and additional knowledge transfers (Larsen et al., 2013). But interestingly, the literature (De Backer et al., 2016) indicates that those operational hurdle does not massively push firms to re-shore activities (see Figure 1.11).

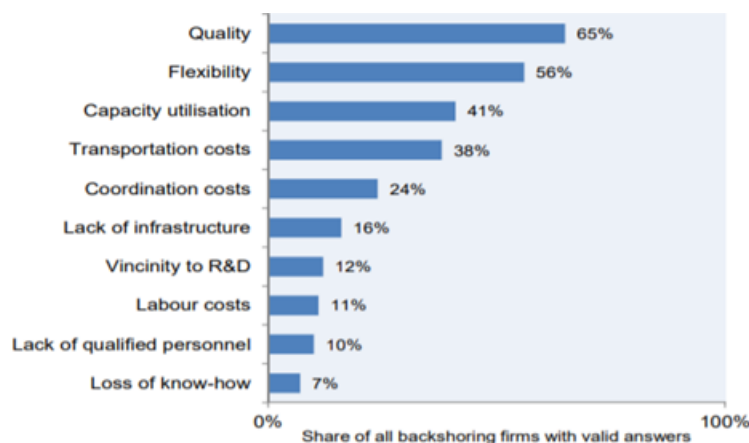


Figure 1.11: Reasons for backshoring production, 2010-mid 2012

Macro-economic learnings stylized facts associated to labor displacement:

From an economic standpoint, labor displacement comes with a few stylized facts. At an individual level, it first benefits customers. Displacing labor is

associated to the underlying commoditization of products and services. This means that even if labor displacement comes with lower costs, it also entails lower prices (Kohler, 2004). But if this is advantageous for consumers, off/near-shoring also has negative effects for individual workers. As firms start leveraging global resources, the competition for labor increases. This leads to a harmonization of salaries at a global level where local wages go down while off/near-shore workers' salaries increase (Amiti and Davis, 2012). But if globally true, studies based on the evolution of wages in the manufacturing space have shown that this phenomenon yields different results depending in local workers human capital. In economic streams of research (see for instance the work of Rosen (1989)), human capital is usually assessed by on educational achievements (i.e. graduation from high school, obtention of a master degree etc...) (Autor et al., 2014). Low skills workers have indeed experienced a continuous decrease of their wage, whilst higher skill workers (e.g. college graduates) have seen little variations in their wages. This phenomenon has been referred to as "wage polarization". Note that, relocating activities and replacing labor through technology have similar economic outcomes at an individual level. Interestingly, even if prices go down, wage pressures means that the overall welfare gains for individuals are, on average, small. For instance, Arkolakis et al. (2012) has shown that in the US, 7% of the overall production resulted from imports and that this change only generated an increase of about 1 to 1.5% in US individuals' welfare.

For firms, recent reviews (Kroes and Ghosh (2010), Mihalache and Mihalache (2016)) have shown that the effects of labor displacement on performance (growth, profitability, productivity) are highly heterogeneous. Findings range from no relationship (Bhalla et al., 2008), to positive (Kotabe and Swan, 1994; Tadelis, 2007; Coucke and Sleuwaegen, 2008; Di Gregorio et al., 2009; Bertrand, 2011), to negative (Markides and Berg, 1988; Murray and Kotabe, 1999). Some members of the academic community have attempted to explain those discrepancies by the fact that the outcome depends on whether firms offshore core or noncore activities (Jiang et al., 2007) or on the industry (Andersen, 2006). This heterogeneity could be explained by the previously mentioned fact that most firms do not appear to scope their offshoring efforts properly. Recent studies have also shown that labor displacement as a competitive tool may only be beneficial to early adopters (Eppinger, 2019) in a given industry. Given that this type of transformation has just begun in the professional services space, this appears a fruitful sector for empirical research.

If tremendous progresses in our overall understanding of the whys, whats and hows behind labor displacement have been registered over the past decades, investigations on off/near-shoring in services firms are still ongoing. The academic community indeed aims at further reviewing the causes, consequences, and magnitude of this transformation sector by sector as the heterogeneity

behind micro level evidence are still not well understood. Some chapters of this work will hence contribute to the field by proposing and illustrating a new design process for this type of transformation as well as review its implications in the professional services space, whether from a firm or an individual standpoint (see section 1.2.3 of this introduction).

Replacing labor through technology :

According to the work done by the academic community (e.g. (Graetz and Michaels, 2018)), technologies can actually be divided in two groups: automation technologies (e.g. "traditional" industrial robots, "modern" specialized software etc...) and information/communication technologies [I.C.Ts].

Stylized economic facts on automation technologies: On one hand, ICTs are enablers to labor displacement and play the role of entry barriers. As a results, recorded economic consequences of the adoption of ICTs (Autor, 2014; Michaels et al., 2014) are no different from the ones described in the previous section (e.g. local wage polarization, global wage harmonization etc..).

On the other hand, automation technologies are the ones firms leverage (and invest in) to directly control their costs, scale efficiently and improve on their productivity (Acemoglu and Restrepo, 2018). Automation technologies have long been studied in the academic community as they have had a decades-long impact on the manufacturing sector. Key findings, as summarized by Kaldor (1961), are twofold. First, at an industrial sector level, technology, when adopted, boosts productivity and reduces employment. But at an aggregate level, potential job loss due to automation in "applying" sectors (Acemoglu and Restrepo, 2020) is counterbalanced by job creation in "making" sectors as well in complementary and spillover sectors. Benchmarks, such as the one of Chiacchio et al. (2018), suggest that one additional robot per thousand workers reduces the employment rate by 0.16-0.20 percentage points in the "applying" industry and has no effect on wages, but that those losses are compensated by employment gains in the services sector (Dauth et al., 2018). As such, automating technologies are a core component of economic growth (Gallouj and Weinstein, 1997) and recent empirical evidence (Autor and Salomons, 2018; Vermeulen et al., 2018) suggests that the recent waves of technological progress seem to follow the same pattern in services.

Current strategic management views on automation technologies:

Size- wise, a number of influential authors Brynjolfsson and McAfee (2014); Ford (2015); Frey and Osborne (2017) converge into saying that the transformation induced by the adoption of automation technologies in services

is going to have a deep impact (i.e. up to 50%+ of services related activities could be automated). In terms of scope, discussions such as the ones of [Autor et al. \(2003\)](#), [Goos and Manning \(2007\)](#) and [Acemoglu and Restrepo \(2018\)](#) show that the specificity of the current wave of technological replacement in services is that it not only impacts routine/ ‘low skill’ activities but also complex ones. It therefore differs from the earlier waves of manufacturing related technological progresses which mainly impacted blue - collar workers. Note that if the average impact of labor replacement is important within the tertiary industries, nuances exist between industrial sectors (e.g. the financial services industry is not likely to experience the same transformation as the retail one – see [Figure 1.12](#)) and geographies ([Arntz et al., 2016](#)). Besides the associated change is likely to take several decades. Recent research ([Hawksworth et al., 2018](#)) has indeed shown that if the current “algorithmic wave” where simple routine computational activities are automated has reached maturity, two more waves are coming:

- The augmentation wave, which will mature in the 2020s and consists in automating repeatable tasks such as filling in forms, communicating and exchanging information through dynamic technological support etc. . .
- The autonomy wave, which will mature in the 2030s and is focused on automation of physical labor and manual dexterity, as well as problem solving in dynamic real-world situations that require responsive actions, such as in manufacturing and transport (e.g. driverless vehicles)

Interestingly studies (such as the one of PWC ([Hawksworth et al., 2018](#))) (see [Figure 1.12](#)) show that the professional services industry is likely to experience a very strong change (30% of the activities are at a high risk of automation) in the 2020s as the “augmentation” wave is underway, but that the phenomenon should slow down in the 2030s. Additionally, despite a very high degree of expertise, PSFs are likely to see the same level of transformation as firms from very different and less skilled sectors (e.g. wholesale and retail firms).

But given that the industry is made a patchwork of expertise (see [section 1.1](#)), additional studies at a sub sector level (e.g. the legal industry, the management consulting industry etc. . .) appear needed ([Balliester et al., 2018](#)) to break down sub-sector specific value chains into activities, to see which one can get automated ([Acemoglu and Restrepo, 2020](#)) and to truly size the impact of the shift. Besides, an interesting topic of discussion arises as PSFs may be both “applying” and “making” firms since they both benefit from and own the skills require to sustain the current augmentation wave. It would be therefore useful to understand the impact of the transformation and if, similarly to manufacturing firms, PSFs will see their employment base

shrink of to the contrary expand. Some of those elements will be discussed in the later chapters of this PhD.

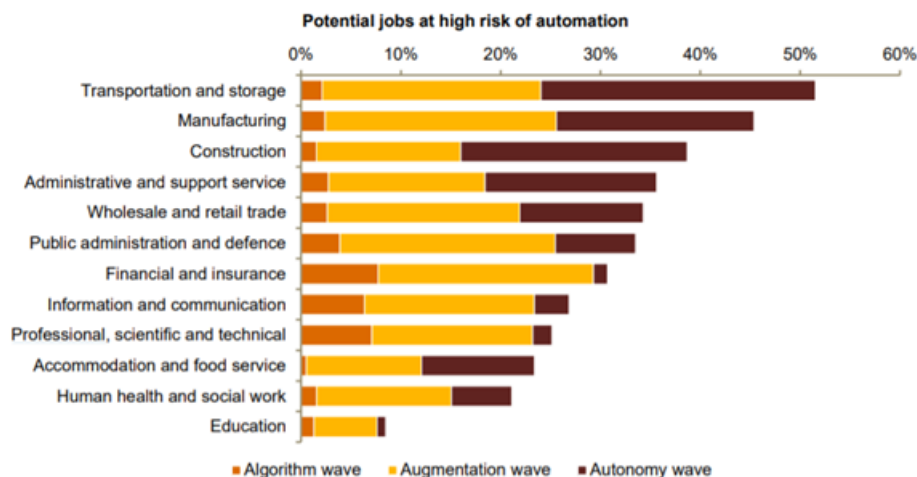


Figure 1.12: Potential job automation rates across waves – source (Hawksworth et al., 2018).

1.2.3 Current organizational principles in place in professional services firms:

The generic macroeconomic questions of growth and transformation (via labor displacement or replacement) have created an appetite for industrial sector specific insights. As such, the academic community has naturally started to investigate the specificities of professional services firms. Although a bit niche, this field of research is experiencing a rapid expansion. This was highlighted in various recent literature reviews (Empson et al., 2015b; Skjølvik et al., 2017; Mosonyi et al., 2020). Those reviews also show that current investigations on PSFs mainly revolve around topics of HR strategy (from a managerial standpoint) and internationalization (from an economic point of view).

The managerial structure of PFS is simple at first glance. Firms are mostly structured as partnerships (Levin and Tadelis, 2005) and delegate production tasks to their employees (Maister, 2012). The underlying model is one of apprenticeship referred to as the “up or out” (Teece, 2003). In this set up, individuals develop an expertise by experiencing service production and are groomed (from a relationship standpoint) to become a potential successor to an existing partner. This journey is incentivized via a mechanism of delayed compensation: earnings are postponed until individuals reach the partner status. However, the ongoing market pressure as well as the

transformation of those firms have recently led the academic community to question whether such a model was still appropriate. On one hand, the substitution of labor through capital (i.e. labor replacement via automation) has spurred some interrogations around the need for a partnership structure (Greenwood et al., 2017). On the other, the increasing complexity of the delivery model of those firms (off/near-shore labor and technology) coupled with an increase in competitive pressure have led the community to question whether the apprenticeship model was still relevant/efficient. For instance, questions around whether those firms should develop their human resources internally or buy them in the market as lateral hire have become recurrent (Bowman and Swart, 2007; Kang et al., 2012). The work proposed as part of this PhD increments and complements this last strand of research. It notably helps define to which extent the apprenticeship model is sustainable and shows when PSFs transformation may render it inefficient. It also explores to which extent the incentives (i.e. the delayed compensation scheme) of this model are shifting because of the sector's evolution.

Outside managerial questions, the academic community has also focused on economic questions specific to PSFs around their performance. Over the past decades, PSFs success was indeed mainly assessed by their ability to grow (Maister, 2012), especially as the revenue and employment levels of those firms were highly correlated (Løwendahl, 2005) and technology was not considered as an alternative to labor. However, competition has stiffened and recent empirical studies have found that certain PSFs have started to experience a reduction in growth as well as a decline in profitability and productivity (Sako, 2006, 2005). For instance, in the UK, productivity in the management consulting space has decrease by about 2% a year for the past decade. Internationalization as a market expansion/ growth technique (Muzio and Faulconbridge, 2013) has therefore started to trigger a lot of attention (especially since PSFs have traditionally been small local firms). Conversely internationalization has been discussed as a medium to limit (if not course correct) the decline in PSFs performance. Although the work in this PhD presents some contributions to the topic of PSFs growth in a globalized environment, it mainly builds upon the topic of internationalization as an instrument to improve PSFs financial performance in terms of profitability and productivity. Details will be further discussed in the next section.

1.3 Contributions to the economic and managerial literature:

Section 1.1 has shown that PSFs are a subject of interest in the overall economic landscape, whilst section 1.2 has highlighted that the evolution of the

associated sector is at the crossroad of several streams of existing research. Considering the theoretical and empirical foundations available today, the contribution of this PhD is therefore three folded. First, it offers some empirical and theoretical perspectives on the growth of PSFs and shows why those enterprises have an interest in managing their overall performance (growth / profitability / productivity). Second, it offers a new type of methodology to assess the potential for labor displacement and replacement and empirically shows what the associated transformation can bring as of today to PSFs performance over the short- and mid-term. This analysis is then extended theoretically to offer long term scenarios of where the industry may end up. Finally, this research explores the impact of the transformation on the managerial structure of PSFs, both from an incentive (e.g. wages careers standpoint) and sustainability standpoint.

From a growth standpoint, chapters 2 & 3 show that PSFs have development mechanisms that are slightly different from the patterns classically described by the literature. The literature indeed mainly records studies that are based on single-establishment manufacturing firms. In this set up, firms experience a period of rapid growth until their M.E.S is reached. If they survive, they then grow at an average stable demand driven rhythm (Gibrat's Law). At an establishment level, the regressions used in the longitudinal empirical study of chapter 2 shows that PSFs appear to follow the same dynamics (see [Gabaix and Ibragimov \(2011\)](#) for a methodological review). This can be explained, as seen in chapter 3, by the fact that the early days of an establishment are all about a partner hiring to structure its leverage model and maximize the profitability of its activity. This means for instance that a partner setting up a US based management consulting practice will quickly seek to hire the average of 5 employees ([Kipping and Kirkpatrick, 2013](#)) he/she will need to deliver his/her services. After that quick initial build up, establishments tend to experience a slow organic growth where a new partner emerges when the local market conditions bloom. This relates to earlier empirical studies which have shown that it takes decade(s) for a market to develop enough to sustain the introduction of a new partner or to see the retirement of an existing one (see [Galanter and Palay \(1990\)](#) for a US based benchmark in the legal industry). However, as seen through the empirical analysis of US based cross sectional and longitudinal datasets, larger PSFs seem to grow faster than small ones. A plausible explanation is proposed in chapter 3: PSFs, to the difference of manufacturing plants, are multi location/multi establishment and once locally set, they mainly grow through merger/ acquisition with external existing partnerships or by poaching partners from existing firms in other locations. As PSFs grow, this pattern becomes more predominant. To the point that external hires represent more than 80% of the influx of new partners of partnerships of more than 50 constituents. Given that this kind of exogenous growth occurs more rapidly than an organic one, PSFs tend to grow more quickly

as they scale. This appears atypical considering previous economic studies and differentiates the professional services space from other industrial sectors. This gets reflected in the distribution of those firms as markets such as the US are experiencing a consolidation in professional services industries. Finally, empirical results presented across chapter 2 & 3 show that PSFs profitability increases with the age of the firm rather than with its size. This suggests that the M.E.S. of a PSF is very quickly achieved (which echoes the benchmarks provided earlier in this introduction) compared to manufacturing firms and that profitability increases, driven by firms' transformation in terms of labor replacement and displacement, start early in the lifecycle of professional services practices.

Those considerations naturally open the doors to a set of discussions on PSFs transformation. Chapter 4 starts by reviewing current macro-level transformation benchmarks that can be found in the literature (i.e. displacing 20 to 50% of labor (Jensen et al., 2005) and replacing an extra 50% (Frey and Osborne, 2017)). The chapter empirically challenges those benchmarks in the context of the legal industry, one of the largest professional services' sub-sector, via a mixture of large scale surveys complemented by a round experts review. It shows that, if those benchmarks hold at first glance, they may have to be considered carefully as the fact that labor can be displaced does not necessarily mean that it should. Several tasks that can be performed remotely are indeed closely related to local activities. Displacing and delegating them may thus lead to rework and a sub-optimal production structure. For example, chapter 4 shows that if 40% of the activities done by paralegals can be performed remotely, less than 10% of them can efficiently be displaced off/nearshore since those activities are intertwined. As such, chapter 4 calls for attention when to scoping the transformation of PSFs to the risk, as seen in an earlier section of this introduction, of incurring large hidden costs. For instance, in the case of paralegal whose displacing 40% of labor (instead of 10%) would result in an increase of production costs of 11% (instead of yielding a 4-5% costs savings). This notably adds to the economic and managerial literature by extending the methodological discussions to the separability of activities and providing additional, PSFs-specific, benchmarks.

This methodological review is then followed by two empirical studies and a small theoretical model showing what can be expected from PSFs as they evolve either from a labor displacement (chapter 5 6) or replacement (chapter 7) standpoint. Chapter 5 shows that displacing labor is a multi-year journey that bears fruit (as of today) from a profitability standpoint but comes with a reduction in prices (some of the benefits of the change are passed to clients). The empirical study underpinning chapter 5 is based on the analysis via linear regression techniques of a private dataset recording the evolution of 40+ anonymous US management consulting practices between 2016 and 2019. The study shows that on a market where services

production costs about 175\$/h of work, every percent of labor displaced yields a reduction in costs by 3.7\$/h and is correlated to a reduction in prices by 3.3\$/h as firms displace on average 1 to 2% of labor every year. The outcome of the transformation appears for now profitable but limited to large firms. Besides time series modeling (auto regressive models) shows that in the management consulting space, labor displacement potential appears to be between 15% and 20%. Chapter 5 therefore adds to the empirical literature around labor displacement by providing evidence of the impact of such transformation on firms' performance.

Those micro economic (firm level) considerations are then extended in chapter 6. This chapter offers a dynamic macroeconomic toy model assessing how the collective behavior of PSFs with respect to labor displacement affects the supply demand equilibrium driving prices. The model used here is built using the mean field game methodology developed by [Lasry and Lions \(2007\)](#). This type of continuous game theoretical approach has indeed proven useful to describe and analyze the behavior of agents in a competitive environment (see [Gueant et al. \(2011\)](#) for handbook types of applications). When applied to large PSFs markets (US/Canada/UK/France/Germany), the model shows that price erosion is slow (i.e. in the -0.5%/year range). The result is that it would take about 30 years for the benefits of labor displacement to be completely passed to customers (in the form of a rebate). Besides, entry in professional services markets will still be possible (although less and less profitable) over the next couple of decades until services are fully commoditized. Through this analysis, chapter 6 builds upon macro-economic discussions on trade and notably stresses the dynamic aspect and transient nature of labor displacement. It therefore differs from most theoretical analysis found in the economic literature which focus on long term equilibrium patterns associated with notions of trade.

The final study (chapter 7) on PSFs transformation concentrates on labor replacement through automation. This study is based on the longitudinal analysis (via linear regressions) of a private dataset of 400 management consulting practices across a variety of European countries between 2014 and 2019. It shows that replacing labor is mainly a suitable option for PSFs where productivity is low (compared to the rest of the industry – i.e. productivity below 200\$/h) and that PSFs practices invest on average 1 to 2% of their profits in those technology (which appears on par with other industries). The study also shows that automation technology generates an increase in productivity (-1kh in workload for every 1M\$ invested in automation technology). Besides, automation technology appears to also yield some level revenue growth (+140k\$ on average for every 1M\$ invested). However, automation technology appears to be neutral profitability wise for those practices as every 1M\$ of investment in automation decreases workload by 1kh, which saves about 72k\$, generates an extra 142k\$ of revenue

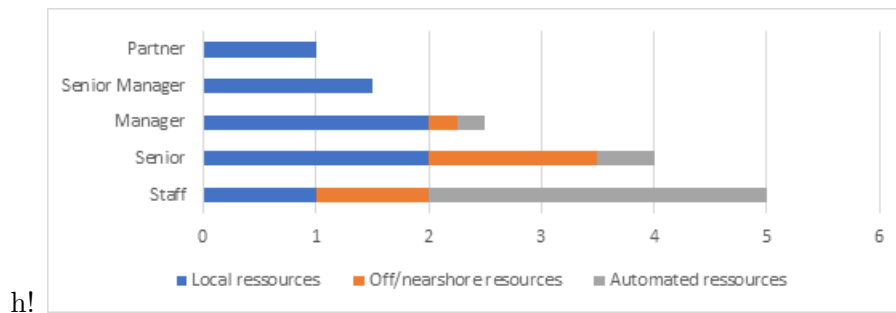


Figure 1.13: Transformation of PSFs service delivery model (illustrative²).

but comes with an extra 240k\$ in labor costs¹. On that front, chapter 7 therefore extends the empirical body of literature on PSFs and some additional benchmarks on the impact on automation technology with respect to firm performance.

This PhD finally concludes by exploring the implications of PSFs evolution on their management structure and practices. Chapter 8 first models PSFs classical apprenticeship/ “up or out” career structure thanks to systems of partial differential equations describing the lifecycle of an individual within a tiered organization. The model notably provides a set of rules showing when labor replacement and displacement are likely to render the system unsustainable. As highlighted in the previous section, the delivery of professional services is decomposed in several set of activities of increasing importance. Those sets structure hierarchical roles/ranks (junior, senior, manager, partner) and lead to a pyramidal structure. Traditionally PSFs have staffed the middle and higher ranks of their organization through internal promotion. With the exception of entry level roles (i.e. junior), an opening at a given rank was staffed by picking up an individual within the pool of people who had had a certain tenure (e.g 3+ years) within the previous rank. But the automation and displacement of service production activities are transformation the structure of PSFs from a pyramid to a diamond (see Figure 1.13 for an example). The pool of employees available for promotion, especially for managerial roles is therefore shrinking and PSFs will have to hire resources externally. The “up or out” may therefore no longer be true as entry level roles will almost always be subject to promotions, whilst managerial role will need to be resources via a hybrid model of promotion and external hiring.

Chapter 8 also provides additional information for PSFs operating in a mar-

¹This appears to be due to a shift in the workforce required to support the delivery model of PSFs. Investing in technology requires the on-boarding of workers who can build and maintain the associated (digital) robots. However in the current marketplace those workers are more expensive than traditional professional services workers (such as accountants).

ket where organic growth opportunities are rare. In this framework, it shows that operating strict “up or out” policies where employees’ wage incrementally increase year on year with additional salary hikes occurring in the case of a promotion can be optimized from a cost standpoint. The absence of growth indeed lead to several individuals stalling at a given rank given the absence of opportunities and yield extra costs as their salary keeps on increasing. A mitigation solution would therefore be to introduce alternatives careers pathways (notably expertise roles that no longer obey the up or out dynamic) with a different salary progression mechanism. Tests performed in chapter 8 show that it could help reduce labor costs by about 5%. This may be of notable interest to large PSFs in mature markets such as the US, the UK, Germany, Canada and France. Note that with respect to the existing literature, this chapter provides an economic explanation of the changing patterns behind human resources practices documented by management researchers ([Smets et al. \(2012\)](#), [Empson et al. \(2015b\)](#)).

Chapter 9 then explores the effect of labor replacement and displacement on PSFs workers’ wages. This exploration is supported by stochastic tools used to assess the price/value of options (see [Broadie and Detemple \(2004\)](#)) which have found a large usage across finance, operation research and management science. Chapter 9 finds that if those changes (i.e. labor dis/replacement) may be associated to a small decline in earnings, most of the PSFs employees wage variations can be explained by the chances they have to one day access the partner status. For instance, in the US, management consultants’ wages decrease by 200 to 500 US\$ per year for every percent of work displaced (with average wages in that space being in the 80k\$/year range), whilst for every percent of increase in succession chances, their salaries decrease by 2–3 k\$ per year. Additionally, chapter 9 shows that PSFs transformation leads to increased differences in earnings between entry level roles and partners in PSFs.

With respect to the existing literature, the micro economic model developed in chapter 9 complements and aligns with macro-economic frameworks and empirical evidence of wage polarization (such as the one of [Cozzi and Impullitti \(2016\)](#)) across a variety of industrial sectors. Besides the order of magnitudes offered by the study extend similar works realized mostly in the manufacturing space. Manufacturing benchmarks ([Hummels et al., 2014](#)) indeed show that labor displacement leads to a decrease in wages by 1.5 -2% per percent of work off/nearshored in low skills occupations. Chapter 9 thus shows that wage changes induced by PSFs transformation appear to be lower than what has been recorded in other industries.

Chapter 10 offers a small conclusion and proposes both a view on potential future avenue of research pertaining to the professional services space as well as personal perspectives on the likely scenarios associated to the transformation of the sector.

Chapter 2

Growth patterns of PSFs.

2.1 Summary:

2.1.1 French version:

Ce chapitre explore la croissance des entreprises de services professionnels aux Etats-Unis. Il montre, à l'aide d'un jeu de données longitudinales d'une profondeur de 20 ans, que la loi de Gibrat n'est pas valable pour ce type d'entreprise. Ces dernières ont en effet un taux de croissance qui dépend de leur âge et de leur taille.

Si ce type de comportement est assez standard à travers un certain nombre de secteurs industriels, les entreprises de services professionnels présentent la spécificité que leur croissance est avant tout liée à la création de petits établissements (≤ 50 employés) dans une logique de croissance géographique exponentielle.

La fin de chapitre se concentre sur les dynamiques de croissance des 25% plus larges entreprises de ce milieu pour laquelle la logique d'expansion géographique peut être sujette à discussion. La section attenante montre que pour ces entreprises, la croissance est générée par des investissements en technologie (R&D) qui accroissent la productivité des ressources existantes. La calibration du modèle sur des données d'entreprises américaines suggère qu'il existe aujourd'hui une course technologique parmi les firmes les plus larges.

2.1.2 English version:

This paper investigates the growth of professional services firms [PSFs] in the US. It first demonstrates, based on a 20 year longitudinal dataset, that Gibrat's law of firm growth doesn't hold for PSFs. Their growth rate at establishment level is indeed age and size dependent. While this behavior is shared across the US economy (with previous records in the manufacturing space), US PSFs exhibit a specificity in the development of their firms as

they exhibit persistence in growth and as their development relies, at firm level, on the creation of small establishments (≥ 50 employees) in a dynamic of exponential market expansion.

Finally, this paper drills down on the growth pattern of the 25% biggest PSFs for which the explanation of geographical expansion can be challenged. For those mature firms, growth is assumed to be spurred by investments in automation technology as well as research and development (R&D) in order to improve labor productivity. The model is calibrated to US cross sectional data and shows that under this hypothesis, an arms race exists between the top firms.

2.2 Introduction

This work investigates the growth of US professional services firms. This is addressed both theoretically and empirically using both longitudinal and cross sectional datasets made available by the US Census bureau. The analysis of the PSFs sector shows that firm age and size impact PSFs growth in a fashion similar to other firms in the US economy. However it shows that PSFs, to the difference of other US firms, mainly develops themselves by creating new establishment rather than a specific existing location. If this pattern holds for the main bulk of PSFs, those patterns can be challenged for large PSFs.

This work contributes to two main strands of the literature. First this work builds upon the studies which stress the effects of size and age on firms growth. Since the pioneering work of [Gibrat \(1931\)](#) who stated that firms grow, on average, a constant rate, it has been empirically shown that firm growth is actually industry specific and that growth patterns are in reality more complex ([Mansfield, 1962](#); [Stanley et al., 1996](#)). Size is indeed not the only relevant variable to describe firms dynamics. Starting with [Evans \(1987\)](#), authors have started to complement the classical firms growth dependency in size by observing a dependency in age. The relationship between firm development and its age has spurred an increased interest over the last years ([Coad et al., 2017](#); [Haltiwanger et al., 2013](#)). This has motivated numerous applications on firms entry and exit rates ([Anyadike-Danes and Hart, 2014](#); [van Stel et al., 2017](#)), firms internationalization strategies ([Grazzi and Moschella, 2015](#)) and resilience to extreme random events ([Cowling et al., 2018](#)). However most of the growth study focuses on the manufacturing space and little has been done on the service industry ([Nassar et al., 2014](#)). To my knowledge there has been no study on the professional services firm industry (see [Empson et al. \(2015a\)](#) for a definition), which therefore constitutes one of the main contribution of this chapter.

Second, this study goes beyond the descriptive mechanisms related to firm growth to explore its drivers. The initial explanations in terms produc-

tivity and technology shocks of [Hopenhayn \(1992\)](#) gave birth to numerous discussion between product and firm life cycle ([Cooley et al., 2004](#); [Bilbiie et al., 2012](#)). This then converged with the evolutionary literature highlighting that age is an important determinant in firm growth at it is a key indicator of firms' learning behavior ([Arkolakis et al., 2015](#)) with respect of their customer preferences ([Haltiwanger et al., 2013](#)). Growing beyond considerations on demand, the field has had a special interest in financial considerations associated to growth and transformation. The main areas of interest have lately revolved around convex entry costs ([D'Erasmus, 2007](#)) and capital management ([Cooley and Quadrini, 2001](#); [Clementi and Palazzo, 2016](#)). With respect to the literature on firm growth drivers, this chapter provides a discussion around the [Hopenhayn \(1992\)](#) framework by transforming the assumption of random exogenous shocks in productivity in an assumption of deterministic endogenous productivity investments. This is shown to depict properly the growth patterns of the largest US PSFs and can be used to infer that large US PSFs face an arms race with respect to their technology investments.

From a technical standpoint, this works builds upon the mean field game literature ([Lasry and Lions, 2007](#)) (referred to as MFG thereafter). This type of structure indeed mixes population dynamics through Kolmogorov forward equations (see [Gabaix \(2009\)](#) for a review in economy and [Malevergne et al. \(2013\)](#) for an example on firm growth) with profit optimization expressed as Bellman equations (see [Perthame et al. \(2018a\)](#) for an example). If this type of framework is particularly handy to provide a mechanistic description of the economic dynamics at hand, it also leads to interesting results associated to costs optimization (see [Doumic et al. \(2017\)](#) for an example). If the MFG related literature is growing, there has been numerous discussions about its inherent general complexity. However when paired with economic concepts that are technically related to power laws ([Saichev et al., 2009](#)), the MFG frameworks can be simplified to yield closed formulas that can easily be interpreted. This is applied in this paper to demonstrate how sectoral firm considerations can be used to estimate productivity investments. Note that one of the key features of the MFG apparatus lies in its capacity to indirectly tackle competition questions that appear to have yet eluded the evolutionary field in economic with respect to firm growth. MFGs indeed address actors behavior in a given environment. The MFG application developed in this paper therefore opens an interesting doorway for further research.

The remaining of this paper is organized as follows. Section 2.3 provides a descriptive analysis of the growth patterns of US PSFs sector and shows that PSFs growth is notably spurred by the creation of new establishments in a dynamic of market expansion. Section 2.4 further explore the growth of top 25% largest US PSFs, where market expansion may no longer be relevant and proposes an explanation of the observed patterns in terms of a series of

investments aimed at boosting labor productivity. Section 2.5 concludes.

Important Legal Remarks. The findings and opinions expressed in this chapter are those of the authors and do not reflect any positions from any company or institution.

2.3 US PSFs growth patterns.

To describe US PSFs growth patterns, this chapter leverages a longitudinal database made available by the US Census bureau. This database, which features are depicted in 2.3.1, covers 25 years of history and has records spanning across the overall US economy. It is used to discuss the application of Gibrat’s law to PSFs in 2.3.2 at establishment level, prior to a discussion of the growth dynamics in the field in 2.3.3.

2.3.1 1975 -2000 Longitudinal data description.

To analyze the growth of PSFs, this study leverages the US synthetic longitudinal database (U.S. Census Bureau (2015)) (synLDB). The synLDB covers the entire US economy over a 25 years period starting 1975 and provides establishment level records of employment. If the database leverages the old standard industrial classification (SIC) system, mapping tables are provided by the US bureau of labor statistics to link the data to the recent NAICS system. Therefore, describing PSFs through the NAICS code 54 is similar to describing PSFs through the SIC code 731 (Advertising), 733 (Computer Programming, Data Processing, And Other Computer Related Services), 811 (Legal services) and 871 (Engineering, Architectural, And Surveying), 872 (Accounting, Auditing, And Bookkeeping Services), 873 (Research, Development, And Testing Services) and 874 (Management And Public Relations Services).

Between 1975 and 2000, the PSFs establishments landscape has stayed relatively unchanged from a distribution standpoint (see Figure (2.1)) with an average of 8 to 9 employees per PSFs establishment. However its has grown steadily over time displaying an average 5.4% growth in the number of establishments (see Figure (2.2)). Interestingly the growth rate in the number of establishments has decreased over time.

2.3.2 PSFs age and size growth patterns.

PSFs establishment growth.

From a growth perspective, the rate at which PSFs establishments grow in the US changes with their size. This means that for small firms with one or

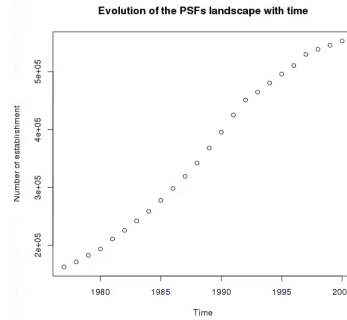
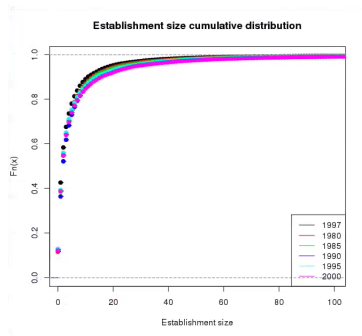


Figure 2.1: US PSFs establishment size distribution. Figure 2.2: US PSFs establishment number growth.

two establishments (i.e firms below 100 employees as per table (2.9), Gibrat's law won't apply. Establishments indeed have their growth rate decreasing and stabilizing as they become bigger. On the other hand, large PSFs, which are bundles of large establishments, follow Gibrat's law. As seen on tables (2.5) and (2.5), growth rates yet highly fluctuates on a year on a year basis. Establishments have different dynamics depending on whether they belong to a firm with multiple establishments or they are the firms themselves. The main difference is that when a new establishment is not the first one in a firm, its initial growth speed is much faster (i.e the sourcing of the first 20 employees).

From an age standpoint, professional services establishments growth rates decrease with age as seen on tables (2.7) and (2.6). Additionally establishments which are newly created within an existing firm have a higher growth rate than the one of a new established firm.

Those findings are similar to the one on the US manufacturing sector, where it was found that size does not effect growth rate for large firms (i.e. Gibrat's law holds) but that growth rates slightly decrease with size for small firms (Hall, 1986). Additionally, the growth rate in manufacturing decreases with age (Evans, 1987).

PSFs growth persistence.

Over the 25 years period covered in the US SynLDB, PSFs mono (resp. multi) establishments have grown by 16.1% (resp. 23.9%) on average (see Figure (2.3)). When testing the PSFs growth rate time series for auto and cross correlation, it came that the growth rate of mono establishments doesn't present autocorrelation nor cross correlation effects with the multi establishment time series. However the multi establishments time series presents strong autocorrelation patterns as seen in Figure (2.4). As seen on the previous subsection, Gibrat's law doesn't hold for professional services establishments as the growth rate changes with the establishment size

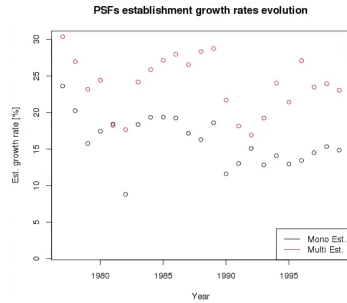


Figure 2.3: US Establishments growth rate evolution.

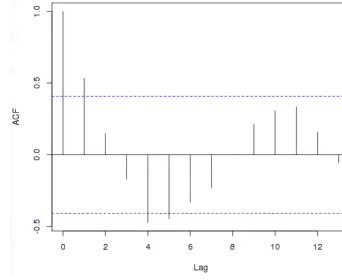


Figure 2.4: US multi establishments growth rates autocorrelation.

and age. Additionally, the analysis of the aggregated sector growth rate hints at a persistence in growth. To further investigate this characteristic, Gibrat's law was tested for growth persistence over time in a manner similar to [Chesher \(1979\)](#) by running the following regression at establishment level from 1979 to 2000.

$$z_{i,t}^u = z_{i,t-1}^u \cdot \beta^u + \gamma^u \cdot z_{i,t-2}^u + \epsilon_{i,t}^u$$

where t is an index for time, i is an index for the establishments, u an index differentiating mono versus multiple firm establishments, and $z_{t,i}$ is the deviation of the logarithm of the size of company i at time t from the mean of the logarithms of the sizes of companies at time t . With this test, if $(\beta; \gamma) = (1, 0)$ then Gibrat's law is considered valid, otherwise, if $\beta < 1$ (resp. $\beta > 1$) large establishments are expect to grow more slowly (resp. rapidly) than their smaller counterparts. The regression was performed on a sample of establishments who were still operating to avoid sampling bias as suggested by [Mansfield \(1962\)](#). The estimation results are displayed in table (2.11).

This analysis yields three main results. First, whatever their type, large establishments have a slower growth than smaller ones as $\beta^0 < 1$ and $\beta^1 < 1$. As PSFs are a collection of establishments, this means that smaller firms grow faster than their larger counterparts. Second, as suggested in the aggregated analysis, establishments that belong to a firm which has multiple locations display a positive persistence in growth, which means they will keep growing faster than their counterpart in the future if they already have grown faster in the past. However this is not something that holds for firms with only one establishment. Third Gibrat's law validity appears to fluctuate with time. This could suggest that PSFs establishments are subject to a business cycle.

From a comparison standpoint, the observed US PSFs persistence patterns in growth slightly differ from the current findings on US manufacturing. First of all, as discussed in [Bottazzi and Secchi \(2003\)](#), US manufacturing establishments do not overall exhibit persistence in their grow patterns. However,

when focusing on the largest firms with heavy investments in R&D, persistence in growth has been empirically demonstrated for US manufacturing firms (Blundell and Bond, 2000). This could mean that the persistence in growth between the two industries is triggered by different mechanisms. While in the PSFs case, persistence could be linked to geographical expansion, persistence in manufacturing growth could be linked to heavy capital investments. This is consistent with macro level findings that state that at an aggregated U.S economy level, business growth is the sum of a cyclic component and a deterministic trend (Pesaran et al., 1993).

2.3.3 PSFs growth through geographical expansion.

US PSFs growth dynamics at an aggregated level.

When looking at the 2007 Statistics of US businesses (SUBS), it has to be noted that large firms have many establishments and that those establishments are larger than the ones of smaller firms. As seen in table (2.9) PSFs have only one establishment until they reach 20 employees, then additional locations appear as the firms become bigger. On average, it seems that establishments grow until about 50 to 60 people at which point other branches are appearing. Note that on average in the US, PSFs do have 1 establishment and employ about 9 to 10 persons.

The professional services sector appears to have an establishment composition with firm size that differs from the overall economy and the manufacturing sector (see table (2.9)). Compared to the manufacturing sector, PSFs have much more establishments with suggest a geographical expansion associated to firm growth. However this growth pattern is not as strong in the PSFs than in the overall US economy. This would suggest that PSFs have to trade off between consolidating knowledge in hubs to enjoy returns of scale and winning local markets. Large PSFs indeed have a maximum number of establishments of 12 to 48 when their size grows above 2500 employees, while manufacturing firms have a maximum of 5 to 10 establishments.

PSFs do not concentrate employment in a specific location to the difference of manufacturing. As seen in table (2.10), PSFs have an employment footprint per establishment that is similar to the overall US economy. To this extent, large firms with more than 2000 people do employ an average of 65 persons per establishment, while the manufacturing sector concentrates between 180 and 280 persons at a same location. Therefore if PSFs growth is generated by the growth of its existing establishments, growth pattern at firms level may also be impacted by the development of a firm's establishment network. This may especially be true for small and medium firms (i.e < 250 employees). An additional analysis would be required here but is out of scope of this paper.

PSFs establishments: creation and destruction patterns.

To further study the geographical expansion of PSFs, it is important to look at the entry and exit dynamics of PSFs at establishment level. From an entry standpoint, there are two main options. PSFs can be created by single individuals from scratch or establishments are created as part of an existing firm with an average of 12 employees. The first option is more likely as seen in table (2.12). During the 1976 to 2000 period the number of PSFs has grown by 12% through the creation of establishments with one single employee. On the other hand, the chance for a firm to open a new establishment was of 9% during the same period of time. Note that while the entry of single employee firm has been quite stable proportion wise, market expansion through the opening of new establishments appears to fluctuate. Note that on average, the entry rate of new establishments has lowered over time as market expansion has slowed for existing firms.

From an exit pattern standpoint, PSFs establishments which disappear have 2 to 3 employees when belonging to single establishment firm or about 12 when belonging to an existing firm with multiple establishment. This suggests that PSFs cease their activity if they fail to launch. Overall about 7% of the PSFs establishments close on a year on year basis. Establishments belonging to a multi establishment firms are more robust as their exiting probability has been of 4.5% on average for the period, versus a 7.4% chance for the mono establishment counterparts. Interestingly, most of the variance in the exit patterns is associated to the multi establishment firms. It therefore seems that the risk of a failure in terms of market expansion may be fluctuating because of market changes.

Finally, from a dynamic point of view, both size and age have a clear effect on the PSFs landscape establishment exiting probability, as seen on table (2.8). The observed entry and exit patterns with respect to age, size and the difference between mono and multi establishments are consistent with the overall findings on US manufacturing (Dunne et al., 1988) and the rest of the US (Rossi-Hansberg and Wright, 2007) and developed economy in general (Geroski, 1995). The interesting element here is that when looking at entry and exit patterns of US manufacturing firms, one of the main elements is to consider whether or not the plants are being invested in and are diversifying, which spurs a reduction in exit rates. For PSFs, the driver of exit rate reduction appears slightly different as PSFs expand geographically to increase their chance of survival.

The firm growth patterns investigated in ?? depict most of the PSFs in the US, which are small to medium firms (i.e. 250 employees) composed of 1 to 4 establishments on average that expand geographically. However those findings can be challenged for large firms as they are composed of multiple established locations. For large enterprises, geographical expansion and the addition of another 10 to 20 employees (i.e. another location) may indeed

not be the main driver at stake.

2.4 Large US PSFs growth.

To discuss what could be happening for large firms, an option is to review how they manage their performance, and notably how their growth is linked to productivity improvements programs. In section (2.4.1), the Hopenhayn's model (Hopenhayn, 1992) is revisited by replacing the hypothesis of exogenous random productivity shocks by endogenous productivity investment. The US QWI and US BLS dataset are then used to calibrate the associated framework in (2.4.2). Finally, in (2.4.3), the macro level impact of those firm level productivity investments is modeled. Calibration results to a firm level cross sectional dataset made available by the US census are then discussed.

2.4.1 A toy model of firm growth

Similarly to Hopenhayn (1992), assume that PSFs supply an output $q(\phi, p, \omega)$ (i.e. charged hours) to their clients, where ϕ is the PSF productivity, ω the price of labor and p the price of the output (i.e the hourly rate). On the other hand, PSFs demand labor up to a quantity $n(\phi, p, \omega)$ (i.e. number of employees), so that PSFs profit π can be expressed as:

$$\pi(\phi, p, \omega) = p.q(\phi, p, \omega) - \omega.n(\phi, p, \omega)$$

Assume that PSFs are price taking, so that the pair p_t, ω_t is known and driven by the overall market demand. The problem for the firm is to change its productivity ϕ_t at a speed $\rho(t)$ ($d\phi_t = \rho(\phi)dt$)

$$v(t, \phi_t) = \max_{\rho(\cdot)} \int_t^{t+T} e^{-\beta \cdot x} (\pi(\phi_x, p_x, \omega_x) - c(\rho(x))) dx \quad (2.1)$$

where $c(\rho(x))$ represents the investment costs to change the firm productivity. According to Inklaar et al. (2008), those investments in the case of professional services are mainly of two nature: investments in automation technology and human capital. Assume that the price for the output is driven by the overall market demand $p = D(Q)$ where $Q = \int q(\phi, p, \omega) \cdot f(\phi) d\phi$ and that the price for the overall labor supply is driven by the firms demand $\omega = W(N)$ where $N = \int n(\phi, p, \omega) f(\phi) d\phi$.

Following the US bureau of labor statistics (BLS) methodology (BUREAU (1997)), productivity in professional services is defined as the amount of output divided by the amount of labor required to deliver this output. In the case of services, the BLS recommendation is to measure output is as the dollar amount of sold of services adjusted for price changes in these over time. In the case of PSFs, the productivity can therefore be interpreted as number of charged hours (i.e. output) sold at a given price p that have been

generated by a hour of work (i.e labor input). With respect to the previously developed notation, this means that:

$$\phi_t = \frac{q(\phi_t, p_t, \omega_t)}{n(\phi_t, p_t, \omega_t)}$$

Under this framework, competition between firms is in essence a competition in terms of productivity. Intuitively at equal level of supply (i.e equal number of employees), PSFs with the highest productivity will be able to generate more profit and to increase their size faster than their competitors. This will be shown in the case of highly productive firms in (2.4.3).

Note that under this view of productivity, comparing the productivity from one firm to another in a given year is not that straight forward. Sales and labor are easily obtained at firm level, but the output in terms of charged hours or the firm levels differences in terms of hourly rates are not accessible. Therefore in this particular study, the output in terms of charged hours is defined at a constant market price p which is shared across all firms. So that, if firm A and firm B are selling the same amount of charged hours and have the same amount of workers, if firm A is selling services at a price above the price of firm B, its productivity will be higher.

2.4.2 Insights from US macro level data

To estimate the PSFs demand function W in workers, the US quarterly workforce indicators (Q.W.I) provided by the US Census were used over the last 10 years (i.e 2007 to 2017). N was taken as the total number of US PSFs employees (where PSFs are defined according to the NAICS code 54), while labor prices ω were taken as the average monthly wage in the sector. On the other hand, the estimation of the PSFs supply function D was achieved by leveraging data from the quarterly service survey (Q.S.S) provided by the US census. Price p was estimated as the total PSFs revenue divided by the total number of worked hours, while the output Q was associated to the number of worked hours. Results are displayed in Figures (2.5) and (2.6).

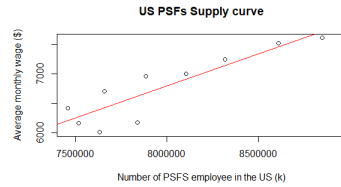
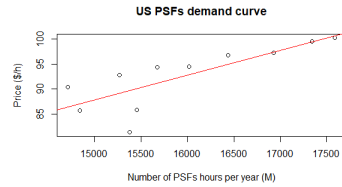


Figure 2.5: US PSFs demand curve. Figure 2.6: US PSFs supply curve.

At the national level, yearly time series provided by the US census, demand and supply curves were modeled in a linear fashion for the sake of simplicity (see table (2.1)):

$$\omega = W(N) = a.N + b \quad p = D(Q) = h.Q + k$$

| | Slope | Intercept | R^2 |
|------------|-------------------|-----------------|-------|
| Demand W | a=0.0011 (0.0002) | b=-1938 (1552) | 77.3% |
| Supply D | h=0.005 (0.001) | k=12.90 (19.91) | 64.2% |

Table 2.1: US PSFs Demand and Supply Curve estimates

Assuming that $q(\phi, 0, \omega) = 0$ and $n(\phi, p, 0) = 0$ and leveraging the previous definition of productivity as $q/n = \phi$, the linear models imply that:

$$n(\phi, p, \omega) = A(\phi) \cdot \omega \quad q(\phi, p, \omega) = A(\phi) \cdot \phi \cdot p \quad \int A(\phi) \cdot (\phi - 1) f(\phi) d\phi = 0$$

Firm (resp. PSFs sector) level profit π (resp. Π) therefore can be simplified as:

$$\pi = A(\phi) \cdot (\phi \cdot p^2 - \omega^2) \quad \Pi = \left(\int A(\phi) f(\phi) d\phi \right) \cdot (p^2 - \omega^2)$$

The optimization program (see eq. (2.1)) of the firm can therefore be expressed as:

$$\partial_t v + \max_{\rho} (\rho \cdot \partial_{\phi} v - \beta \cdot v + \pi(\phi, p, \omega) - c(\rho)) = 0 \quad (2.2)$$

This leads to $\partial_{\phi} v = \partial_{\rho} c$. As we assume that ρ is dependent in ϕ , it is possible to look for a form on productivity improvement investment $\hat{c}(\phi) = c(\rho(\phi))$. Further differentiating (3.12) towards ϕ yields:

$$\partial_{\phi\phi} \hat{c} - \frac{\beta}{\rho} \partial_{\phi} \hat{c} = \frac{\partial_{\phi}(\pi)}{\rho \cdot \partial_{\rho} \phi} \quad (2.3)$$

2.4.3 Link to the overall firm size - age growth patterns of high productive large PSFs?

Leveraging cross sectional data for the 2007 SBO public micro sample from the US Census, it is easy to access the distribution $f(\phi)$ (resp. the exiting firm distribution $T(\phi)$). Interestingly Figure (2.7) shows that new entrants have a lower productivity than existing firms. However this also shows that firms that cease operations have the same productivity than the existing ones. Although this may not be a consistent pattern over the years, this could suggest that that productivity shocks may not be the main exit drivers for PSFs.

When zooming on the top 25% most productive PSFs, extreme value theory yields that those firms are distributed, with respect to productivity, according to a power law which exponent can be estimated according to the log rank technique of Gabaix (2009). Results and graphical representations are displayed in table (2.2) and Figures (2.8) and (2.9). The main characteristic

of those top firms is that they generate more than 107k\$ per year and per employee, so that with an overall market price of 81.34\$/h as per the 2007 US QSS, those firms are actually able to charge, on average, 1320 hours per employee per year. Knowing that an average year of work represents 260 days of 8 hours each, this means that top PSFs firms have on average a productivity/utilization above 50%.

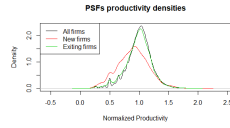


Figure 2.7: US PSFs productivity repartitions.

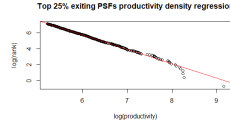


Figure 2.9: Top productive exiting PSFs - density estimation.

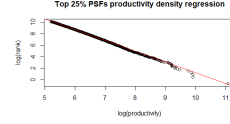


Figure 2.8: Top productive PSFs - density estimation.

| | $f(s)$ | $T(s)$ |
|-----------------|----------------|---------------|
| Pareto Exponent | -1.86 (0.0004) | -1.81 (0.003) |
| R^2 | 99.9% | 99.6% |

Table 2.2: Highly productive PSFs - Pareto exponent Estimation.

From a macro economic level and dynamic point of view, assuming that the PSFs distribution is time invariant, it comes that:

$$\partial_{\phi}(\rho.f) = T(\phi)$$

As the top productive firms are distributed and exiting according to a power law, it comes that the productivity growth speed follows $\rho(\phi) = \rho_0 \cdot \phi^{\gamma}$, where $\gamma \approx 0.95$ according on the estimates displayed in table (2.2). When looking at PSFs dynamics and further restricting the scope of the analysis to the highly productive firm which employ more than 250 employees and investigating the problem under a firm size lens n , it comes that under the assumptions of time invariance:

$$\partial_n(\mu.m) = \theta(n)$$

Where m (resp. θ) represents the distribution of existing (resp. entry) firm according to their size and μ is the growth speed of a firm (i.e $dn_t = \mu(n_t)dt$). Restricting the analysis to the top productive large firms (i.e the distribution tail) leads to a power law form for m , θ and therefore $\mu = \mu_0.n^\Psi$. The power exponents can be estimated from the SBO PUMS sample, which features 760 large high productive high firms (i.e about 0.7% of the overall SBO sample), using [Gabaix \(2009\)](#). The estimation results shown in table (2.3) yield a value for $\Psi \approx 1$. Interestingly this means, that for the subset of large PSFs with high productivity, Gibrat's law could hold.

| | $m(s)$ | $\theta(s)$ |
|-----------------|---------------|--------------|
| Pareto Exponent | -2.35 (0.015) | -2.43 (0.25) |
| R^2 | 96.9% | 90.8% |

Table 2.3: Highly productive large PSFs - Pareto exponent Estimation.

For a given firm, assuming the market is at the equilibrium ($\omega_t = Cst$), the framework developed in the previous section entails that:

$$dn_t = d\phi_t A'(\phi) \cdot \omega \cdot dt = \mu(n_t)dt \leftrightarrow \rho(\phi) \cdot A'(\phi) \cdot \omega = \mu(A(\phi) \cdot \omega)$$

On the high end (i.e. large ϕ , large n), this means that:

$$\frac{dA(\phi)}{A(\phi)} = \left(\frac{\mu_0 \cdot \omega}{\rho_0 \cdot \phi^\gamma} \right) d\phi \leftrightarrow A(\phi) = A(\phi_{min}) \cdot e^{\left(\frac{\mu_0 \cdot \omega}{\rho_0 \cdot (1-\gamma)} \phi^{1-\gamma} \right) \phi_{min}^\phi}$$

From a firm growth standpoint; for high productive large PSFs, as $d\phi = \rho_0 \cdot \phi^\gamma \cdot dt$ and $dn = \mu_0 \cdot n \cdot dt$, it comes that:

$$\phi(t) = \left((1-\gamma) \cdot \rho \cdot t + \phi_0^{1-\gamma} \right)^{\frac{1}{1-\gamma}} \quad n(t) = n_0 \cdot e^{\mu_0 \cdot t}$$

This complements the empirical findings of the synLBD, where establishment growth speed decrease with age and size. The rate of change in growth speed observed in the tables (2.4) and (2.6) indeed show that for old and large PSFs, the growth rate may not change much. It is then possible to conclude the analysis by pushing the framework with respect to productivity investments. As $\rho = \rho_0 \cdot \phi^\gamma \leftrightarrow \phi = \left(\frac{\rho}{\rho_0} \right)^{\frac{1}{\gamma}}$, the equation (2.3) becomes:

$$\partial_{\phi\phi} \hat{c} - \frac{\beta}{\rho_0 \cdot \phi^\gamma} \partial_{\phi} \hat{c} = \gamma \cdot \frac{A'(\phi)(\phi \cdot p^2 - \omega^2) + A(\phi)p^2}{\phi}$$

Assume for the sake of simplicity that $\beta = 0$ (i.e. large firms do not discount their future cash flows). Asymptotically, for highly productive large firms $A(\phi) = \hat{A}e^{\phi^{1-\gamma}}$. Under this approximation, it comes that:

$$\partial_{\phi\phi} \hat{c} = \gamma \cdot (\hat{A} \cdot (1-\gamma) \cdot \phi^{-\gamma} \cdot e^{\phi^{1-\gamma}} (\phi \cdot p^2 - \omega^2) + \hat{A} \cdot e^{\phi^{1-\gamma}} \cdot p^2) > 0$$

As the higher the productivity, the higher the value of the firm $\partial_\phi v = \partial_\rho c > 0$, it comes that $\partial_\phi c$ has the same sign as $\gamma > 0$. This means that for large highly productive PSFs, productivity investments are increasing with productivity. This means within the professional services space, firms tend to follow a market leader.

2.5 Conclusion.

In this paper, both a longitudinal empirical dataset ranging from 1977 to 2000 and a cross-sectional dataset from 2007 from the US were used to show that within the professional services sector Gibrat's law doesn't hold. PSFs growth rates are indeed slowing both with age and with size. Directionally, those findings are similar to what was observed in the US manufacturing sector, which constitutes the main reference in the study of US firms growth. If those size and age patterns disappear for large PSFs, growth becomes persistent and exhibits 3 to 4 years cycles, which appears different from the manufacturing field. Additionally, while manufacturing firms concentrate their growth on a handful of localization, PSFs growth, similarly to the average US firm growth appears driven by geographical expansion.

As for large PSFs, the pattern of geographical expansion can be challenged, this paper proposes a variant to the classical Hopenhayn framework. It notably shows that, in the context of large and highly productive US PSFs, growth patterns can be explained by investments policies in labor productivity improvement programs. Those investments come under the form of an arms race between the top competitors.

Finally it could be interesting to further detail the considerations initiated in this chapter in terms of productivity. For example, it could be worthwhile to investigate what is happening for firms with a low productivity and perhaps to challenge their goals as profit maximizing organization by leveraging some of considerations of [Simon \(1991\)](#). Additionally, productivity investments from firms do not yield deterministic results. The framework proposed in section (2.4.1) could be easily randomized and numerical simulations performed. Eventually, the main next step of this analysis would be to drill down at a firm level to investigate the main productivity levers a PSF can pull (e.g. developing a multi local model and/or investing in automation, increasing its market access capabilities through its quality perception/reputation (see ([Bar-Isaac et al., 2008](#)))).

Acknowledgments. I would like to thank Pierre Fleckinger for his continuous support throughout this work. I also would like to thank Angelo Secchi for his time and insightful remarks as well as two anonymous referees.

2.6 Appendix.

| Year/ Size | 0 | 1 | 2 | [3;5] | [6;10] | [11;20] | 20+ | Total |
|------------|---|------|------|-------|--------|---------|------|-------|
| 1977 | - | 9.42 | 10.0 | 2.89 | 2.18 | 1.03 | 0.77 | |
| 1982 | - | 4.69 | 2.66 | 2.41 | 2.05 | 1.79 | 1.28 | |
| 1987 | - | 4.94 | 3.67 | 2.94 | 2.44 | 1.77 | 1.60 | |
| 1992 | - | 5.02 | 2.95 | 1.92 | 1.89 | 1.33 | 1.03 | |
| 1997 | - | 1.65 | 1.66 | 1.32 | 1.20 | 1.15 | 0.96 | |

Table 2.4: US PS multi establishments Growth rate with size between 1977 & 2000 [%].

| Year/ Size | 0 | 1 | 2 | [3;5] | [6;10] | [11;20] | 20+ | Total |
|------------|---|------|------|-------|--------|---------|------|-------|
| 1977 | - | 3.03 | 2.66 | 2.12 | 0.46 | 0.71 | 0.12 | |
| 1982 | - | 2.32 | 1.70 | 1.06 | 0.97 | 1.07 | 1.05 | |
| 1987 | - | 2.58 | 1.36 | 1.04 | 1.09 | 0.77 | 0.94 | |
| 1992 | - | 2.43 | 1.24 | 1.16 | 0.94 | 0.89 | 0.66 | |
| 1997 | - | 1.13 | 1.02 | 1.05 | 1.05 | 1.09 | 1.07 | |

Table 2.5: US PS mono establishments Growth rate with size between 1977 & 2000 [%].

| Size / Age | 0 | 1 | 2 | 3 | [4;5] | [6;7] | [8;11] | [12;14] | [15;20] | 21+ | Total |
|------------|------|------|------|------|-------|-------|--------|---------|---------|------|-------|
| 0 | - | - | - | - | - | - | - | - | - | - | - |
| 1 | 1.78 | 1.89 | 1.88 | 1.84 | 1.82 | 1.92 | 2.04 | 2.19 | 1.80 | 2.04 | 1.89 |
| 2 | 1.60 | 1.62 | 1.61 | 1.57 | 1.54 | 1.55 | 1.68 | 1.77 | 1.61 | 1.77 | 1.62 |
| [3;5] | 1.50 | 1.49 | 1.44 | 1.39 | 1.40 | 1.49 | 1.47 | 1.56 | 1.48 | 1.40 | 1.46 |
| [6;10] | 1.34 | 1.32 | 1.31 | 1.30 | 1.25 | 1.29 | 1.32 | 1.34 | 1.30 | 1.27 | 1.31 |
| [11;20] | 1.24 | 1.25 | 1.25 | 1.25 | 1.22 | 1.21 | 1.22 | 1.20 | 1.14 | 1.16 | 1.21 |
| 20+ | 1.02 | 1.01 | 1.03 | 1.03 | 1.01 | 1.02 | 1.03 | 1.03 | 1.03 | 1.00 | 1.02 |
| Total | 1.34 | 1.31 | 1.30 | 1.28 | 1.24 | 1.24 | 1.23 | 1.24 | 1.17 | 1.14 | - |

Table 2.6: Average US PSFs multi establishments 1998 to 1999 Growth rate with size and age [%].

| Size / Age | 0 | 1 | 2 | 3 | [4;5] | [6;7] | [8;11] | [12;14] | [15;20] | 21+ | Total |
|------------|------|------|------|------|-------|-------|--------|---------|---------|------|-------|
| 0 | - | - | - | - | - | - | - | - | - | - | - |
| 1 | 1.29 | 1.26 | 1.26 | 1.25 | 1.25 | 1.24 | 1.24 | 1.23 | 1.23 | 1.22 | 1.25 |
| 2 | 1.11 | 1.10 | 1.11 | 1.10 | 1.09 | 1.09 | 1.09 | 1.09 | 1.07 | 1.06 | 1.09 |
| [3;5] | 1.06 | 1.06 | 1.06 | 1.06 | 1.05 | 1.05 | 1.05 | 1.04 | 1.03 | 1.04 | 1.05 |
| [6;10] | 1.03 | 1.02 | 1.03 | 1.05 | 1.04 | 1.03 | 1.03 | 1.01 | 1.01 | 1.01 | 1.03 |
| [11;20] | 1.09 | 1.07 | 1.06 | 1.06 | 1.06 | 1.05 | 1.04 | 1.02 | 1.01 | 1.00 | 1.03 |
| 20+ | 1.16 | 1.21 | 1.22 | 1.17 | 1.16 | 1.10 | 1.06 | 1.06 | 1.03 | 1.02 | 1.08 |
| Total | 1.20 | 1.18 | 1.18 | 1.18 | 1.17 | 1.15 | 1.14 | 1.13 | 1.12 | 1.11 | - |

Table 2.7: Average US PSFs mono establishments 1998 to 1999 Growth rate with size and age [%].

| Size / Age | 0 | 1 | 2 | 3 | [4;5] | [6;7] | [8;11] | [12;14] | [15;20] | 21+ | Total |
|------------|------|-------|-------|-------|-------|-------|--------|---------|---------|------|-------|
| 0 | 9.43 | 26.36 | 20.86 | 20.32 | 19.32 | 16.44 | 15.22 | 13.13 | 11.98 | 6.57 | 9.15 |
| 1 | 4.11 | 12.41 | 18.43 | 17.64 | 16.50 | 13.95 | 12.80 | 11.01 | 10.04 | 5.52 | 9.71 |
| 2 | 3.92 | 11.49 | 16.31 | 14.96 | 13.55 | 11.71 | 10.22 | 8.84 | 8.04 | 4.37 | 7.49 |
| [3;5] | 3.48 | 10.89 | 15.28 | 12.87 | 12.01 | 10.38 | 8.86 | 7.46 | 6.97 | 4.05 | 6.42 |
| [6;10] | 3.07 | 9.76 | 12.94 | 10.98 | 10.17 | 8.16 | 7.46 | 6.82 | 6.10 | 3.51 | 4.91 |
| [11;20] | 2.74 | 7.79 | 9.76 | 8.60 | 8.19 | 6.30 | 5.90 | 5.35 | 4.44 | 2.87 | 3.18 |
| 20+ | 2.20 | 5.66 | 7.57 | 8.33 | 8.12 | 5.99 | 5.17 | 4.87 | 4.28 | 2.14 | 2.50 |
| Total | 6.04 | 14.54 | 14.40 | 12.63 | 12.87 | 10.76 | 9.54 | 8.27 | 7.52 | 4.04 | |

Table 2.8: Average US PSFs establishments exit probability [%] between 1975 and 2000.

| Firm Size | Establishment(s) per PSFs | Establishment(s) per Manufacturing firm | Establishments(s) per firm in the US |
|-------------|------------------------------|---|--|
| 0-4 | 1 | 1 | 1 |
| 5-9 | 1 | 1 | 1,01 |
| 10-14 | 1,03 | 1 | 1,08 |
| 15-19 | 1,06 | 1 | 1,04 |
| 20-24 | 1,11 | 1 | 1,13 |
| 25-29 | 1,20 | 1,03 | 1,18 |
| 30-34 | 1,23 | 1,04 | 1,25 |
| 35-39 | 1,28 | 1,05 | 1,31 |
| 40-44 | 1,31 | 1,08 | 1,35 |
| 45-49 | 1,44 | 1,07 | 1,45 |
| 50-74 | 1,56 | 1,11 | 1,61 |
| 75-99 | 1,82 | 1,19 | 2,03 |
| 100-149 | 2,19 | 1,27 | 2,59 |
| 150-199 | 2,86 | 1,44 | 3,57 |
| 200-299 | 3,28 | 1,67 | 4,94 |
| 300-399 | 4,03 | 1,91 | 6,81 |
| 400-499 | 4,73 | 1,98 | 9,26 |
| 500-749 | 5,25 | 2,42 | 11,76 |
| 750-999 | 6 | 3,26 | 15,48 |
| 1,000-1,499 | 6,03 | 3,58 | 20,33 |
| 1,500-1,999 | 6,78 | 3,62 | 29,97 |
| 2,000-2,499 | 9,09 | 5,41 | 38,62 |
| 2,500-4,999 | 12,21 | 5,59 | 61,61 |
| 5,000 + | 48,07 | 9,39 | 405,24 |
| Total | 1,1 | 1,21 | 1,27 |

Table 2.9: Number of US establishments with firm size according to 2007 SUBS in professional services, manufacturing and the overall economy.

| Firm Size | Employment per PSFs establishment | Employment per Manufacturing establishment | Employment per US establishment |
|-------------|-----------------------------------|--|---------------------------------|
| 0-4 | 1,50 | 1,85 | 1,65 |
| 5-9 | 6,49 | 6,68 | 6,49 |
| 10-14 | 11,36 | 11,68 | 11,20 |
| 15-19 | 15,67 | 16,56 | 15,45 |
| 20-24 | 19,44 | 21,35 | 19,19 |
| 25-29 | 22,05 | 25,88 | 22,56 |
| 30-34 | 25,34 | 30,13 | 25,45 |
| 35-39 | 28,20 | 34,51 | 27,90 |
| 40-44 | 31,06 | 38,46 | 30,87 |
| 45-49 | 31,78 | 42,75 | 32,12 |
| 50-74 | 36,81 | 52,45 | 37,14 |
| 75-99 | 43,78 | 67,4 | 42,04 |
| 100-149 | 49,11 | 85,64 | 46,49 |
| 150-199 | 49,80 | 97,78 | 48,12 |
| 200-299 | 57,51 | 115,88 | 49,01 |
| 300-399 | 62,90 | 127,54 | 50,58 |
| 400-499 | 63,23 | 141,25 | 48,12 |
| 500-749 | 66,45 | 143,95 | 51,54 |
| 750-999 | 71,64 | 157,28 | 55,7 |
| 1,000-1,499 | 93,63 | 162,92 | 59,89 |
| 1,500-1,999 | 85,78 | 171,48 | 57,64 |
| 2,000-2,499 | 66,85 | 167,52 | 57,56 |
| 2,500-4,999 | 63,67 | 176,52 | 56,53 |
| 5,000 + | 53,24 | 269,88 | 50,55 |
| Total | 9,48 | 40,19 | 15,65 |

Table 2.10: Employment per establishment with firm size according to 2007 SUBS in professional services, manufacturing and the overall economy.

| Period | β^0 | γ^0 | β^1 | γ^1 |
|-------------|--------------|--------------|--------------|---------------|
| 1977 - 1979 | 0.76 (0.05) | 0.14 (0.05) | 0.90 (0.04) | 0.03 (0.05) |
| 1978 - 1980 | 0.94 (0.05)* | 0.04 (0.05)* | 0.85 (0.05) | 0.11 (0.05) |
| 1979 - 1981 | 0.93 (0.05) | -0.03 (0.06) | 0.83 (0.06) | 0.10 (0.06) |
| 1980 - 1982 | 0.80 (0.05) | 0.03 (0.05) | 0.92 (0.04) | 0.06 (0.04) |
| 1981 - 1983 | 0.94 (0.05) | 0.06 (0.04) | 0.88 (0.05) | 0.11 (0.06) |
| 1982 - 1984 | 0.81 (0.05) | 0.08 (0.06) | 0.95 (0.05)* | 0.05 (0.05)* |
| 1983 - 1985 | 0.87 (0.05) | 0.05 (0.05) | 0.89 (0.04) | 0.07 (0.05) |
| 1984 - 1986 | 0.93 (0.05) | -0.01 (0.05) | 0.83 (0.05) | 0.16 (0.05) |
| 1985 - 1987 | 0.80 (0.05) | 0.09 (0.05) | 0.76 (0.05) | 0.18 (0.06) |
| 1986 - 1988 | 0.77 (0.05) | 0.09 (0.05) | 0.90 (0.05) | 0.11 (0.05) |
| 1987 - 1989 | 0.80 (0.05) | 0.13 (0.05) | 0.88 (0.05) | 0.12 (0.05) |
| 1988 - 1990 | 0.87 (0.05) | 0.00 (0.05) | 0.95 (0.05)* | 0.02 (0.05)* |
| 1989 - 1991 | 0.87 (0.05) | 0.00 (0.05) | 0.91 (0.05) | 0.04 (0.005) |
| 1990 - 1992 | 0.86 (0.05) | 0.09 (0.05) | 0.80 (0.05) | 0.15 (0.05) |
| 1991 - 1993 | 0.87 (0.05) | -0.02 (0.05) | 0.96 (0.04)* | 0.00 (0.04)* |
| 1992 - 1994 | 0.82 (0.05) | 0.08 (0.05) | 0.94 (0.05)* | 0.04 (0.05)* |
| 1993 - 1995 | 0.80 (0.05) | 0.16 (0.05) | 0.95 (0.05)* | -0.01 (0.05)* |
| 1994 - 1996 | 0.88 (0.05) | 0.02 (0.05) | 0.89 (0.04) | 0.08 (0.04) |
| 1995 - 1997 | 0.78 (0.05) | 0.12 (0.05) | 0.89 (0.06) | 0.07 (0.06) |
| 1996 - 1998 | 0.87 (0.05) | 0.12 (0.05) | 0.91 (0.04) | 0.04 (0.04) |
| 1997 - 1999 | 0.93 (0.05) | -0.01 (0.05) | 0.98 (0.05)* | -0.02 (0.05)* |
| 1998 - 2000 | 0.89 (0.05) | 0.07 (0.05) | 0.89 (0.05) | 0.07(0.05) |

Table 2.11: Gibrat Law - Persistence test at establishment level.

| Year | N_t^0 | N_t^1 | E_t^0 | E_t^1 | $N_{c,t}^0$ | $N_{c,t}^1$ | $E_{c,t}^0$ | $E_{c,t}^1$ | $N_{c,t}^0$ | $N_{c,t}^1$ | $E_{c,t}^0$ | $E_{c,t}^1$ |
|------|---------|---------|---------|---------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|-------------|
| 1977 | 134926 | 15302 | 5.14 | 35.23 | 18116 | 3595 | 0.81 | 8.51 | 11678 | 633 | 2.40 | 15.86 |
| 1978 | 143406 | 16048 | 4.32 | 36.93 | 18857 | 1235 | 0.88 | 14.52 | 11317 | 567 | 2.61 | 10.76 |
| 1979 | 153002 | 16805 | 4.54 | 38.63 | 20155 | 1447 | 0.95 | 7.46 | 12140 | 698 | 2.65 | 11.7 |
| 1980 | 163153 | 17938 | 4.46 | 38.82 | 20900 | 1547 | 0.86 | 8.81 | 12205 | 427 | 2.69 | 12.51 |
| 1981 | 177449 | 18809 | 4.45 | 38.73 | 25771 | 2070 | 0.97 | 10.52 | 13420 | 1207 | 2.89 | 8.14 |
| 1982 | 191575 | 20930 | 4.42 | 36.81 | 24985 | 2659 | 1.12 | 11.48 | 12696 | 590 | 2.57 | 16.81 |
| 1983 | 206718 | 22143 | 4.77 | 37.23 | 26635 | 1768 | 0.80 | 10.85 | 12637 | 565 | 2.56 | 11.63 |
| 1984 | 221733 | 23236 | 5.01 | 37.14 | 26859 | 2011 | 0.86 | 8.63 | 12925 | 927 | 2.7 | 13.38 |
| 1985 | 239627 | 24866 | 4.69 | 35.66 | 29405 | 2040 | 0.84 | 7.8 | 12825 | 426 | 2.84 | 14.42 |
| 1986 | 257082 | 25990 | 4.89 | 37.04 | 29914 | 2446 | 0.92 | 10.37 | 13888 | 1356 | 2.93 | 10.91 |
| 1987 | 273424 | 29742 | 4.93 | 35.50 | 29958 | 3937 | 1.12 | 10.98 | 15839 | 204 | 2.82 | 9.73 |
| 1988 | 292110 | 31749 | 4.02 | 35.90 | 33029 | 2915 | 1.10 | 10.34 | 17350 | 1028 | 2.69 | 7.67 |
| 1989 | 315659 | 34627 | 5.14 | 35.81 | 37877 | 3630 | 1.13 | 15.34 | 16900 | 890 | 3.29 | 7.67 |
| 1990 | 339361 | 36181 | 5.33 | 36.71 | 39130 | 3430 | 1.13 | 12.92 | 17966 | 1980 | 3.00 | 12.53 |
| 1991 | 361186 | 38639 | 5.29 | 36.56 | 41512 | 4125 | 1.11 | 13.49 | 35805 | 1869 | 2.83 | 12.39 |
| 1992 | 372676 | 40343 | 5.01 | 33.96 | 41622 | 3794 | 1.00 | 20.97 | 35548 | 2204 | 3.01 | 15.93 |
| 1993 | 386150 | 40748 | 4.97 | 34.06 | 44455 | 2573 | 1.07 | 20.97 | 35548 | 2279 | 3.43 | 16.67 |
| 1994 | 399083 | 41636 | 5.69 | 33.92 | 44359 | 3307 | 0.98 | 10.35 | 37119 | 2553 | 3.01 | 15.91 |
| 1995 | 412609 | 41509 | 5.69 | 33.92 | 46309 | 3435 | 0.82 | 12.53 | 38364 | 3688 | 2.90 | 14.15 |
| 1996 | 424396 | 41029 | 6.17 | 34.76 | 47714 | 3245 | 1.10 | 13.27 | 41347 | 3934 | 3.11 | 17.89 |

Table 2.12: US PSFs - entry & exit patterns.

Chapter 3

PSFs' performance - a model

3.1 Summary:

3.1.1 French version:

Ce chapitre modélise l'évolution de la performance des entreprises de services professionnelles au cours de leur croissance. Le modèle se base sur une description du mode de production de ce type d'entreprise et sur des notions de productivité. L'état d'équilibre du modèle est analysé en termes d'optimalité entre croissance organique et externe. Ces stratégies sont ajustées pour tenir compte de l'effet de potentiels investissements technologiques.

Le calibration à des données représentant un ensemble d'entreprises comptables américaines suggère que le modèle reflète adéquatement les différences de performance observées de manière empirique entre pratiques petites (moins de 50 associés) et larges (plus de 50 associés). Le modèle montre enfin que les petites (resp. grandes) entreprises comptables croissent de manière inorganique (resp. organique).

3.1.2 English version:

This paper models the evolution of professional services firms performance as they grow. To do so, it first describes how those firms produce their specific outputs and how their productivity drives competitiveness. The associated equilibrium is then used to propose optimal organic and inorganic growth strategies. Those strategies are adjusted to account for the effect of potential technological investments.

Once calibrated to data stemming from US accounting firms, the model is shown to properly reflect the differences in performance observed between large (i.e. more than 50 partners) and small (i.e. less than 50 partners) accounting partnerships. It suggests that small (resp. large) US accounting partnerships mainly grow inorganically (resp. organically).

3.2 Introduction

Professional services are defined as per the North American Industrial Classification System (i.e. NAICS) as the sum of legal, accounting, management consulting, advertising, engineering and architectural, scientific research and veterinary services [NAICS code 54]¹. As per the US census, professional services have grown by 4.2% on average on a year on year in revenue between 2008 and 2018, outperforming the overall manufacturing landscape [NAICS code 31 to 33], which year on year revenue growth has been of 2.1% on averages over the same period. On the other hand, employment in professional services across the US has grown by 0.49% on average per quarter, while the manufacturing landscape has shown a reduction of about -0.22% per quarter.

At an aggregated level, those preliminary statistics stress that the manufacturing sector, which has been the bread and butter of the economic and management literature, and the professional services space obey different dynamics. Looking deeper at the literature, it appears that those differences are well known and have naturally led to the development of a small research niche, nowadays anchored in the academic landscape by the seminal works of [Løwendahl \(2005\)](#) and [Maister \(2012\)](#). If the performance and dynamics of manufacturing firms is a thoroughly discussed topic, there hasn't been to my knowledge any adaptation made specifically for professional services firms [referred to as PSFs in the rest of this paper]. This appears as a gap, which can be easily brought to life through a few examples. For instance, manufacturing firms mostly rely on technology (and therefore capital) to produce a good, while PSFs mostly rely on labor to deliver a tailored service. This naturally raises the question of the impact of the difference in the production engine on firms long term profitability. Similarly, if manufacturing firms rely on capital while PSFs rely on human capital ([Becker, 2009](#)), this has to entail a different growth strategy. Coming up with such examples is not difficult and this paper will start to start to bridge the associated gap. Note that the theory hereby developed will consistently be illustrated by examples pertaining to the development of US accounting firms.

To explain the performance patterns of PSFs, this paper will build upon three main strand of the economic literature. First it builds upon the theory of firm growth. Since the seminal empirical work of [Gibrat \(1931\)](#), which was later completed by [Evans \(1987\)](#), it has been thoroughly demonstrated that the growth rate of firms decreases as they become larger and that their performance becomes more predictable as they age. Additionally larger and older firms are the more likely to survive. From this empirical work has then stemmed a host of theories aimed at explaining

¹Please refer to the [US census website](#) for high level statistics on the professional services sector and ([Empson et al., 2015a](#)) for a broader definition

firms' development (Stanley et al., 1996; Coad et al., 2017; Haltiwanger et al., 2013) and survival (Anyadike-Danes and Hart, 2014; van Stel et al., 2017; Cowling et al., 2018). The center piece of this research stream is nowadays Hopenhayn's framework (Hopenhayn, 1992), which explains both growth and survival as the result of productivity shocks. However most of the studies pertaining to growth study focus on manufacturing and little has been done on the service industry (Nassar et al., 2014), even though it has been acknowledged that performance mechanisms are industry dependent (Mansfield, 1962). This is therefore the first area of contribution for this paper.

Second, this work contributes to the academic literature related to professional services firms. So far PSFs have attracted a limited amount of economic research. This is first due to data constraints. As PSFs are mainly organized as privately held partnerships (Maister, 1982), their performance is rarely publicly reported. Second, because of the non standardized nature of their output (i.e. PSFs tailor their deliverables to clients (Løwendahl, 2005)), the academic community has mainly focused on questions of agency theory and firm level reputation to explain the competitive mechanisms that drive the performance of professional services firms (Bar-Isaac et al., 2008, 2012). However when exploring the management literature around PSFs, it has been noted that PSFs are heavily diversified (Greenwood et al., 2005). Therefore approaching the question of PSFs performance at a firm level may not be easy as they behave as a large portfolio. Expert services are indeed provided by partners who employs around 10 individuals (see Zerni (2012) for an accounting example). As such, large firms with more than 500 employees are a collection of expertises which competes on very different market segments. As such, this paper proposes to explore performance at a service level and offers a bottom up picture of firm performance. This adds to both the economic and management literature related to PSFs. The field is indeed known to be heavily fragmented and can benefit from more holistic theories (Skjølsvik et al., 2017).

Finally, from a technical standpoint, this work builds upon the literature on continuous optimization. It leverages Hamilton-Jacobi-Bellman equations (see Intriligator (2002)), which are known to offer a suitable formalization of profit maximization problems (see Doumic et al. (2017) for instance) and can usually be solved analytically in most economic contexts as profit mechanisms are often modeled through power laws (see Gabaix (2009) for a review in economy and Malevergne et al. (2013) for an example on firm growth). The framework resulting from this paper therefore provides a unique addition to the literature and technically sits at the frontier between economy and operation research.

The remaining of this chapter is organized as follows. Section (3.3) provides a descriptive analysis of the delivery of professional services, while section (3.4) models PSFs revenue in a competitive landscape. This model is then

used to propose a profit-maximizing organic growth strategy for PSFs in section (3.5), a discussion which is subsequently extended in section (3.6) to tackle inorganic growth. Finally, section (3.7) further explores the impact of technological investments on PSFs performance (as well as related growth strategies) and section (3.8) provides additional elements to explain performance heterogeneity across firms. Note that throughout the paper, the proposed theory is illustrated by examples pertaining to US accounting firms and that future possible areas of research are suggested in the conclusion (section (3.9)).

3.3 Delivering professional services.

Labor in PSFs is made of production and sales activities (Löwendahl, 2005). Selling is a complex task as it means tailoring a credible promise to a network of prospective clients. On the other hand, production can be scripted to follow a plan and therefore can be supported by resources with less expertise. As a result, labor in professional services is allocated across two types of workers, often coined "finders" and "grinders" (see Maister (2012)). It takes a considerable amount of time for an individual to develop a recognized expertise in the professional services field and become a "finder" (i.e. 10 to 15 years (see Morris and Pinnington (1998))). To create an incentive for workers regarding this type of commitment, professional services are mostly structured as privately owned partnerships, where "finders" are equity partners that are able to fully ripe the benefits of their expertise. The concept of a professional services firm therefore emerges from a labor distribution across S partners that can both sell and produce services and E employees that can only produce services under the supervision of an expert.

Within a firm, a partner's revenue R is generated by the amount of client $N(L)$ to which he can sell services to at a price p when supported by L employees. To increase his revenue, a partner must therefore delegate production for $N_{prod}^{delegated}(L)$ of his $N(L)$ clients to focus on selling activities. Both partners and employees have an availability of τ units of time and it can be assumed that sales activities takes T_{sales} units of time per client, while delivery takes T_{prod} . Additionally employees labor needs to be coordinated. For an employee, this activity takes up a fixed portion of time T_{coord} for each person he has to interact with (see Dunbar (1993) for a discussion). The amount of clients a partner can managed is therefore constrained in the following fashion:

$$\tau = \overbrace{N(L).T_{sales}}^{\text{Sales activities}} + \overbrace{T_{prod}(N(L) - N_{prod}^{delegated}(L))}_{\text{Production activities}}; \quad (3.1)$$

$$L.\tau = \overbrace{N_{prod}^{delegated}(L).T_{prod}}^{\text{Delegated production activities}} + \overbrace{T_{coord} \cdot \sum_{1 \leq l \leq L} (L-l)}^{\text{Coordination activities}} \quad (3.2)$$

This means ² that the revenue generated by a partner follows ³:

$$\begin{aligned} \forall L \in [\underline{L}; \bar{L}] \quad & p.N(L) \\ &= \frac{p.\tau}{T_{sales} + T_{prod}} \cdot ((1+L) - \frac{T_{coord}}{2.\tau} \cdot (L^2 - L)) \\ &= \alpha.(1+L) + \alpha.\gamma.(L - L^2) \end{aligned} \quad (3.4)$$

Lemma 1: *If $\tau > T_{sales} + T_{prod}$, a partner is able generate revenue on its own. Otherwise, for service delivery to be possible, the following condition must be met: $\frac{1}{2.T_{coord}}(\tau + \frac{T_{coord}}{2})^2 \geq (T_{prod} + T_{sales} - \tau)$ and a partner requires a minimum of $(\frac{\tau}{T_{coord}} + \frac{1}{2}) \cdot (1 - \sqrt{1 - \frac{4.(T_{prod} + T_{sales} - \tau)}{2.\tau + T_{coord}}})$ employees.*

Proof. If a partner doesn't have enough bandwidth to service a client on its own (i.e. $\tau < T_{sales} + T_{prod}$), he/she needs to delegate the service production to a number of employees $L_{min} > 0$ solution of the following equation:

$$L \cdot (\tau + \frac{T_{coord}}{2}) - L^2 \cdot \frac{T_{coord}}{2} = (T_{prod} + T_{sales} - \tau)$$

For this solution to exist, the following condition must be met $\frac{1}{2.T_{coord}}(\tau + \frac{T_{coord}}{2})^2 \geq (T_{prod} + T_{sales} - \tau)$, which lead to the proposed solution.

Lemma 2: *A partner can not delegate more production activities than available (i.e. $N_{prod}^{delegated} \leq N$). If $\frac{1}{2.T_{coord}}(\tau + \frac{T_{coord}}{2})^2 \leq \frac{\tau.T_{prod}}{T_{sales}}$, there is no restriction on the maximum number of employees that a partner can leverage. Otherwise, the maximum leverage L_{max} is $(\frac{\tau}{T_{coord}} + \frac{1}{2}) \cdot (1 - \sqrt{1 - \frac{4.\tau.T_{prod}}{T_{sales} \cdot (2.\tau + T_{coord})}})$*

²This also implies that adding employees decrease the firm total labor productivity ρ but increase the revenue per employee ($\frac{R}{E}$) over the long run (i.e. $L \geq \sqrt{\frac{2.\tau}{T_{coord}}}$):

$$\begin{aligned} \rho(L) &= \frac{p.N.S}{\tau.(S+E)} \\ &= \frac{p.\tau}{T_{sales} + T_{prod}} \cdot (1 - \frac{T_{coord}}{2.\tau} \cdot L \cdot \frac{(1-L)}{1+L}) \quad \frac{R}{E} \\ &= (\frac{1}{L} + (1 - \frac{T_{coord}}{2.\tau}) + L \cdot \frac{T_{coord}}{2.\tau}) \frac{p.\tau}{T_{sales} + T_{prod}} \end{aligned} \quad (3.3)$$

³The proposed model is aligned with the economic literature stream which assumes that coordination/communication between individuals was associated to quadratic costs (see for example of Crawford and Sobel (1982) and Dessein (2002)).

Proof. The condition $N_{prod}^{delegated} \leq N$ can be translated into the following condition on leverage: $L \cdot (\tau + \frac{T_{coord}}{2}) - L^2 \cdot \frac{T_{coord}}{2} \leq \frac{\tau \cdot T_{prod}}{T_{sales}}$. This means that, if it exists, the maximum number of employees a partner can leverage is solution of:

$$L \cdot (\tau + \frac{T_{coord}}{2}) - L^2 \cdot \frac{T_{coord}}{2} = \frac{\tau \cdot T_{prod}}{T_{sales}}$$

This leads to the proposed solution and condition.

Example. Data on the number of partners and employees as well as on accounting firm revenue is published by the *Public Accounting Report* on a yearly basis for the top 100 US firms. This report covers about 75% of total US employment in the sector (Greenwood et al., 2005). The 2018 dataset showcases an average number of 9.1 (3.2) employees per partner and a revenue of 1.9 (0.9) M\$ per partner. It reflects the linear effects of delegation on revenue (see Figure 3.1) and shows that albeit crude, this type of model already explains $R^2 = 96\%$ of the observed variance in the accounting report. The estimation of the parameters of equation (3.4) via OLS shows that for every new employee, partner's revenue increase by $\alpha = 0.18\text{M\$}$ per year (0.007) and that across the overall panel of firms coordination does not appear to have a significant impact on partner's revenue ($\alpha \cdot \gamma = -0.0003$ (0.0004))⁴

3.4 Competition in PSFs.

The price p at which a PSF goes to market is the result of the characteristics of its service delivery model and the overall competition landscape. As seen in section (3.3), service delivery is impacted by two components: the firm overall delivery speed $T_D = T_{sales} + T_{prod}$ and labor coordination T_{coord} . Coordination is heavily reliant on individual traits to the point that it has classically been regarded as a variable over which organizations have little control (Williamson, 1967; Penrose and Penrose, 2009) [i.e. exogenous]. However, PSFs are known to continuously tailor their service offerings and adjust their delivery speed. This occurs either through specialization (for instance on an industrial sector or a specific offer) or through cross selling (selling an integrated package with multiple services to a client) (Greenwood et al., 2005). PSFs therefore come to clients (through requests for proposals for instance) with a delivery speed representative of their partnership structure $T_D(S)$ and a price $p(S)$.

⁴In this instance, when partner productivity α is assumed independent of the partnership size, running the same analysis on small partnerships (i.e. firms with less than 50 partners) and large ones, doesn't yield significant differences. In both cases, every new employee translates into an extra revenue of 0.17M\$ (0.01) per year to a partner and coordination does appear negligible.

On the other hand, clients get a value V for the service and he/she chooses the provider that offers the most productive alternative (i.e. maximizes the client's gains for a given delivery time):

$$\max_S \frac{V - p(S)}{T_D(S)} \leftrightarrow \max_S \frac{V \cdot \tau}{T_D(S)} - \alpha(S) \quad (3.5)$$

Lemma 3: *If delivery speed increases (i.e. $\partial_S T_D \geq 0$) [resp. decreases] with the size of the partnership, the price of the associated services increases ($\partial_S p \geq 0$) [resp. decreases] and so does partners' productivity ($\alpha(S)$), as professional services prices are given by:*

$$\forall S \geq S_{min} \quad p(S) = V - \frac{T_D(S)}{T_D(S_{min})} \cdot (V - p(S_{min})) \quad (3.6)$$

Proof. For clients to have an interest in purchasing the service, prices must be such that $p(S) \leq V$. Additionally the market productivity maximization (eq.(3.5)) leads to:

$$\forall S > 0 \quad \partial_S p = - \underbrace{\frac{[V - p(S)]}{T_D(S)}}_{\geq 0} \cdot \partial_S T_D(S) \quad \partial_S \alpha = \tau \cdot \frac{\partial_S p \cdot T_D - \partial_S T_D \cdot p}{T_D^2} \quad (3.7)$$

Note that this proposition appears consistent with the literature. It was indeed reported that specialized and tailored offerings (which takes longer to produce) in accounting (Zerni, 2012; Mayhew and Wilkins, 2003; Palmrose, 1986; Craswell et al., 1995) and law firms (Hadfield, 1999) led to higher prices. Cross-selling on the other hand, has been shown to lead to a decrease in prices (Gultinan, 1987; Akçura and Srinivasan, 2005) as it speeds up delivery (notably by reducing the time to sell). In essence, this means that the less commoditized the service, the higher its price, which is also in line with the seminal ideas of Maister (1982).

If the client productivity maximization drives services price, the match between clients and providers is made in order to maximize of the overall clients' productivity⁵ surplus (see Gabaix and Landier (2008) for an example of matching mechanism). As such a provider with S partners is associated to with a client of size z (of which there are $g(z)$) via a mapping $M : z \rightarrow S$ in a fashion that solves:

$$\max_{M(\cdot)} \int \frac{V}{T_D(M(z))} \cdot g(z) dz \quad (3.8)$$

⁵This is a classical situation that has been used to explain with firms growth (see Hopenhayn (1992))

Lemma 4: *Assuming that larger clients are more rare than smaller ones (i.e. $\partial_z g(z) \leq 0$), if delivery speed increases [resp. decreases] as the partnership grows (i.e. $\partial_S T_D \leq 0$ [resp. $\partial_S T_D \geq 0$]), there is a unique continuous mapping that maximizes market productivity. The mapping entails that the largest [resp. smallest] clients are matched with the providers that have the smallest [resp. largest] partnerships:*

$$\partial_z M = -\frac{g(z)}{N(L(M(z))).M(z).f(M(z))} \quad (3.9)$$

Proof. Assume $\partial_S T_D \leq 0$, that there are two providers of size S_1 and S_2 such that $S_1 > S_2$. Finally assume that there are two clients of size z_a and z_b (s.t. $z_a \leq z_b$). In this case, the most productive option is to pair client a with provider 1 as:

$$\frac{g(z_a)}{T_D(S_1)} + \frac{g(z_b)}{T_D(S_2)} \geq \frac{g(z_a)}{T_D(S_2)} + \frac{g(z_b)}{T_D(S_1)} \leftrightarrow (g(z_a) - g(z_b)) \left(\frac{1}{T_D(S_1)} - \frac{1}{T_D(S_2)} \right) \geq 0$$

This means that the mapping is based on volumes of work and it comes that: $\int_{Z_{min}}^Z g(z).dz = \int_{M(Z)}^{S_{max}} N(L(s)).s.f(s).ds$. This leads to the proposed result ⁶.

Special case. Productivity has been one of the core discussion items of the economic literature. Recent empirical evidences (Aoyama et al., 2009) have stressed that labor productivity was distributed across firms according to a power law. Applying this finding to the case of PSFs, this means that the number of partnerships that have a productivity α is $\propto \alpha^{\frac{1}{\phi}}$. Additionally, it is known that firms distribution follow a Zipf law with respect to their size (Axtell, 2001). The number of partnerships with S partners can then be assumed to be proportional S^{-1} . This therefore implies that partners' productivity follows: $\alpha(S) \propto S^{-\phi}$ and that partners' revenue can consequently be expressed as:

$$p.N(S) = \alpha_0.S^{-\phi}.(1 + (1 + \gamma).L - \gamma.L^2) \quad (3.10)$$

As $\partial_S p.(V^{-p} + \frac{1}{p}) = -\phi.S$, the equilibrium price can be analytically expressed as:

$$p(S) = \frac{p(S_{max}).V}{p(S_{max}) + (V - p(S_{max})).e^{-\phi.(S_{max}-S)}} \quad (3.11)$$

Example. Data sets such as the 2018 US *Public Accounting report* (which was also used in section (3.3)) can then be leveraged to estimate the sensitivity of partners' revenue to their partnership size and associated leverage

⁶Note that the proof is easy to adapt to the case ($\partial_S T_D \geq 0$).

model (see functional form specified in eq. (3.10)). To do so, a simple two step approach was used. First, for a given productivity elasticity (i.e. ϕ), the sensitivity of a partner's revenue to its leverage model (α_0, γ) was estimated. The procedure was then iterated over a range of value for ϕ (i.e. $\phi \in]-2; 2[$ with a step of 0.01 and the regression that yielded the highest explanatory power (i.e. R^2) was kept. This was done on the entire data-set (i.e. 100 firms) as well as on the subset of partnerships that had respectively less than 50 partners (i.e. 54 small partnerships with less than 500 employees) and more than 50 partners (i.e. 46 large partnerships (very large firms) with more than 500 employees). Results are summarized in the table (3.1).

Those estimates show that taking into account partner's productivity fluctuations into the proposed approach increases the explanatory power of the proposed model on the data-set (R^2 grows by 1 to 2%). This also shows that accounting for partnership size with respect to partners' productivity yields significant differences across small and large partnerships. First, in small partnerships, partners' productivity appears to decrease as the partnership expands ($\phi \geq 0$), while it increases in large partnerships (see Figure (3.2)). Second, adding an employee in a small partnership generates twice as much additional revenue that in a large one. Third, coordination does appear to be negligible in small partnerships while it becomes a significant topic in large ones ⁷. The observations on large partnerships are however subject to caution as they are known to have captive near-offshore centers in place (note that up to 20-25% of PSFs labor can be displaced as per Jensen et al. (2005)) which skews the report of the amount of workers a partner actually leverages to deliver services. This would benefit from a deeper discussion around the effects of globalization and trade. This topic is however not in scope for this paper and will be addressed in a future stream of research.

3.5 PSFs profitable organic growth.

Employees and partners get compensated for their effort in a different fashion. Employees perceive a fixed wage c , while partners are compensated based on their profit $\Pi = p.N(L) - c.L$, defined as the difference between the revenue they generate pN and the cost of the associated delivery model $c.L$. Assuming that $\partial_L(pN) = \alpha(S)((1 + \gamma) - 2.\gamma.L) > c$, partners have a natural incentive to delegate work and grow their practice. PSFs also provide a long-term incentive to their employees in the form of a promotion opportunity: after a certain time, they can start selling services and become partners. The value chain of PSFs therefore leads to a growth in revenue

⁷Interestingly this means that every time that an employee has to coordinate with another, it takes about 0.2% of their time. As a point of reference, this is of a same order of magnitude as the coordination time observed in societies. This was assessed and reported by Dunbar (1993) to take about 0.3% of an individual time.

and possibly in employment (Maister, 2012, 1982).

The promotion mechanism of PSFs has been thoroughly discussed in the literature and the most prominent school of thoughts on the subject (Galanter and Palay, 1994) stresses that it obeys a tournament structure, where a fixed portion of employees θ make it to partner [i.e. $dS_t = \theta \cdot E_t \cdot dt = \theta \cdot S_t \cdot L(S_t) \cdot dt$]. This means that the overall firm employment grows at a pace $\mu(L, S) = \theta \cdot S_t \cdot L(S_t) \cdot (L(S_t) + S_t \cdot \partial_S L)$ (where $dE_t = \mu(L, S) dt$) and that for partner to increase their profit, they must solve the following problem:

$$\begin{aligned} \Pi &= \max_{L(\cdot)} \int_{t=0}^T [p \cdot N(L(S_t), S_t) - c \cdot L(S_t)] \cdot dt \\ &\leftrightarrow \partial_t \Pi + \max_{L(\cdot)} (\theta \cdot S \cdot L \cdot \partial_S \Pi + p \cdot N(L) - c \cdot L) \\ &= 0 \end{aligned} \quad (3.12)$$

Partners yet adopt different strategies depending on the importance of the individual coordination (γ)⁸.

Proposition 1: *Given a set of initial condition (i.e. the firm partnership size (S_0) and the leverage structure when the firm is first established (L_0)), when individual coordination is not negligible (i.e. $\gamma \neq 0$), there is a unique optimal delegation strategy $L(\cdot)$ (eq. 3.12) given by:*

$$L(S_t) = \sqrt{\frac{1 + \gamma \cdot L(S_0)^2}{\gamma} \cdot \frac{\alpha(S_0)}{\alpha(S)} - \frac{1}{\gamma}} \quad (3.13)$$

However if coordination can be neglected (i.e. $\gamma = 0$), the optimal delegation strategy is given by:

$$L(S_t) = L_{max}(S_t) = \left(\frac{T_{prod}}{T_{sales}} \right) (S_t) \quad (3.14)$$

Proof. As $pN(L, S) = \alpha(S) \cdot (1 + (1 + \gamma) \cdot L - \gamma \cdot L^2)$, the maximization problem $[\max_{L(\cdot)}]$ in equation (3.12) leads to: $\frac{2 \cdot \gamma \cdot L \cdot \alpha(S) + c - \alpha(S) \cdot (1 + \gamma)}{\theta \cdot S} = \partial_S \Pi$. This means that the overall equation (3.12) translates into: $\partial_t \Pi + L^2 \cdot \gamma \cdot \alpha(S) + \alpha(S) = 0$. As $\partial_{tS} \Pi = 0$, this can be differentiated against S to yield: $\frac{\partial_S \alpha}{\alpha} = -\frac{2 \cdot L \cdot \gamma}{1 + \gamma \cdot L^2} \cdot \partial_S L$, which then leads to eq. (3.13). If coordination can be neglected (i.e. $\gamma = 0$), the partner profit maximization problem (eq. 3.12) leads to $L = L_{max} = \frac{T_{prod}}{T_{sales}}$. The problem (eq. 3.12) indeed becomes linear in L and doesn't admit a strict maximum. This forces L to be set at L_{max} . As partners define their optimal delegation scheme, the pace at which the partnership evolves becomes set.

⁸The accounting example developed in section (3.4) has indeed shown that coordination may only have an impact in certain specific cases (e.g. large partnerships with more than 50 partners).

Lemma 5: *If individual coordination is not negligible (i.e. $\gamma \neq 0$) and if partners' productivity (α) decreases as the partnership expands ($\partial_S \alpha \leq 0$), the firm's partnership size increases organically in an "exponential" fashion (i.e. has a increasing growth speed over time). Otherwise, the partnership grows but exhibits a decreasing organic growth rate.*

If coordination can be neglected (i.e. $\gamma = 0$), the partnership organic growth speed ($\frac{\partial_t S}{S} = \theta \cdot (\frac{T_{prod}}{T_{sales}})(S)$) evolves at the same pace as the ratio of production versus sales activities.

Proof. When coordination occurs, the partnership grows organically at rate of $\theta \cdot L$, therefore as the leverage increases, so does the partnership growth speed ($\partial_t (\frac{\partial_t S}{S}) = \partial_t S \cdot \theta \cdot \partial_S L = -\frac{\theta}{2 \cdot L} \cdot \frac{1 + \gamma \cdot L_0^2}{\gamma} \cdot \frac{\alpha_0 \cdot \partial_S \alpha}{\alpha(S)}$).

Lemma 6: *Partnerships' organic employment growth depends in the nature of the (dis)economies of scale that occur when extending the partnership.*

Proof. The employment growth speed ($\frac{\partial_t E}{E}$) depends in the evolution of the non-leveraged partner labor productivity as the partnership grows ($\frac{\partial_t E}{E} = \partial_t S \cdot (L - \frac{\partial_S \alpha}{S \cdot 2 \cdot L \cdot \gamma} \cdot (1 + \gamma \cdot L^2))$). If a non-leveraged partner's productivity decreases, employment grows. Otherwise, employment grows only if $\partial_S \alpha \leq 2 \cdot (1 - \frac{\alpha(S)}{\alpha_0 \cdot (1 + \gamma \cdot L_0^2)})$. Conversely, when coordination can be neglected, employment grows only if $\frac{T_{prod}}{T_{sales}} \geq -S \cdot \partial_S (\frac{T_{prod}}{T_{sales}})$. In this case, employment evolution is indeed given by $\partial_t E = \partial_t S \cdot (L_{max}(S) + S \cdot \partial_S L_{max})$, which yields the desired result.

Example. The 2018 US *Public Accounting report* used in the previous sections not only displays the leverage model of US accounting firms but also the growth rate of their partnerships (i.e. $\frac{\partial_t S}{S}$). In 2018, partnerships growth rates were recorded between $[-17.5\%; +50\%]$ with an average of 7.4% (11.5%). This can then be used to get a preliminary estimate of the promotion rates (θ) within those firms as $\frac{\partial_t S}{S} = \theta \cdot L$. If the promotion mechanism only explains about $R^2 = 20\%$ of the variations across partnership growth rates in the sample, a standard OLS yields that promotion rates (θ) are around 0.52% (0.14%). This is on par with the literature estimates (e.g. (Galanter and Palay, 1990)), which reports that it takes about 10 years for an individual to get a 5 to 20% change to get promoted (i.e this means that promotion rates (θ) are in the $[0.2\%; 0.5\%]$ range). Note that promotion rates across the sample are also independent of the partnership size⁹, which is in line with the literature that stressed that a fixed portion of employees are promoted to partners in PSFs between two periods of time.

⁹This was tested by running the following regression: $\frac{\partial_t S}{S \cdot L} = \theta = a + b \cdot S$. The proposed had no explanatory power ($R^2 < 1\%$) and did not yield significant results with respect to the sensitivity of accounting firms promotion rates to the size of their partnerships ($b = -0.00017$ (0.0002)).

As seen in section (3.4), coordination doesn't appear to impact small accounting partnerships (i.e. partnerships with less than 50 partners). Their leverage should therefore always be maximal (as seen in proposition (1)). When running a few tests ¹⁰, small partnerships leverage appears to be negatively correlated to the partnership size which would suggest that their organic growth speed is decreasing as they expand. The data-set appears to partially align with the proposed theory ¹¹. If partnership growth speed decreases as partnerships expands, the decrease appears to be slower than expected and the proposed model yields a very low explanatory power ¹². This would tend to suggest that partners in small partnerships are both promoted from within and brought in externally, a mechanism that will be reviewed in the next section.

In large partnerships (i.e. more than 50 partners), the proposed theory suggests that the leverage $L(\cdot)$ decreases with the partnership size as partner's productivity becomes higher $\partial_S \alpha \geq 0$. However this doesn't appear to hold ¹³ as leverage appears to increase with the partnership size. Additionally, in large partnerships, partnerships growth speed appears independent of their size ¹⁴. This suggests that large partnerships growth can be fully explained by organic patterns ¹⁵.

Organic growth therefore appears to only partially explains partnerships' dynamics. In larger structures, if organic growth appears to yield a higher place, the intake of external partners is significant and also appears to have a downstream impact on the firm resources that are dedicated to service delivery.

3.6 Competing for inorganic growth.

As seen in section (3.5), partnership organic growth is slow (promotion rates θ indeed average [0.2%,0.5%] per year). To speed up their growth, PSFs therefore compete in the labor market to source/attract partners externally.

¹⁰The regression $\log(L) = a.\log(S) + b$ (i.e. $L = e^b.S^a$) explains 43% of the leverage variations across small partnerships and displays significant parameters: $a = -0.69$ (0.10) and $b = 4.76$ (0.36).

¹¹The regression $\log(\frac{\partial_t S}{S_t}) = a.\log(S) + b$ (i.e. $\frac{\partial_t S}{S_t} = e^b.S^a$) explains 1% of the growth rate variations across small partnerships and displays significant parameters: $a = -0.28$ (0.38) and $b = 3.3$ (1.32).

¹²The regression $\frac{\partial_t S}{S_t} = \theta.L$ explains only 18% of the growth rate variations across small partnerships.

¹³The regression $\log(L) = a.\log(S) + b$ (i.e. $L = e^b.S^a$) explains 26% of the leverage variations across small partnerships and displays significant parameters: $a = 0.17$ (0.04) and $b = 1.42$ (0.23).

¹⁴The regression $\log(\frac{\partial_t S}{S_t}) = a.\log(S) + b$ explains less than 1% of the variations of the growth speed and doesn't have significant parameters

¹⁵This is additionally suggested by the regression $\frac{\partial_t S}{S_t} = \theta.L$, which explains less than 33% of the growth rate variations across large partnerships.

This competition has two effects: PSFs can bring in $H \geq 0$ new partners but they also loose $T \geq 0$ partners to other firms¹⁶. The partnership evolution dynamics thus become:

$$dS = \left(\overbrace{\theta \cdot S \cdot L(S)}^{\text{Organic growth}} + \overbrace{H(S)}^{\text{External hire(s)}} - \overbrace{T(S)}^{\text{Competition pressure}} \right) \cdot dt$$

The search for new partners on the market yet represents a significant investment (Groysberg et al., 2004). This comes at a cost assumed quadratic¹⁷ and the overall investment is shared equally by all the current partners. To find a profit-maximizing hiring strategy $(L(\cdot), H(\cdot))$, partners have therefore to solve an enhanced version of problem (3.12):

$$\Pi = \max_{L(\cdot), H(\cdot)} \int_{t=0}^T [(p \cdot N)(S_t) - c \cdot L(S_t) - c_H \cdot \frac{H(S_t)^2}{S_t}] \cdot dt \quad (3.15)$$

Based on the previous examples (see section (3.5)), two cases appears depending in the magnitude of labor coordination.

Lemma 7: *When coordination can be neglected (i.e. $T_{coord} = 0$), partners always delegate all the production tasks associated to the service delivery (i.e. $L = L_{max}(S) = (\frac{T_{prod}}{T_{sales}})(S)$). The optimal external hiring strategy $H(\cdot)$ is then given by:*

$$H(S_t) = T(S_t) - \theta \cdot L_{max} \cdot S_t + \sqrt{(T(S_t) - \theta \cdot L_{max} \cdot S_t)^2 - \frac{S_t}{c_H} \cdot ((\alpha - c) \cdot (L_{max} + 1) - \bar{C})} \quad (3.16)$$

With $\bar{C} = \frac{c_H \cdot H_0}{S_0} \cdot (H_0 + 2 \cdot \theta \cdot S_0 \cdot L_{max}(S_0) - 2 \cdot T(S_0)) + (\alpha(S_0) - c) \cdot (L_{max}(S_0) + 1)$. This leads to growing partnerships $\partial_t S \geq 0$ (and firms as $\partial_S E \geq 0$).

Proof. When coordination effects are neglected, profit maximization entails maximizing delegation. In this case, the condition $\partial_S \Pi = 2 \cdot c_H \cdot \frac{H}{S}$ holds and the problem becomes: $\partial_t \Pi + \frac{c_H \cdot H}{S} \cdot (H + 2 \cdot \theta \cdot S \cdot L_{max} - 2 \cdot T(S)) + (\alpha - c) \cdot L_{max} + \alpha = 0$. When differentiating against S , it comes that: $[\frac{c_H \cdot H}{S} \cdot (H + 2 \cdot \theta \cdot S \cdot L_{max} - 2 \cdot T(S)) - \frac{c_H \cdot H_0}{S_0} \cdot (H_0 + 2 \cdot \theta \cdot S_0 \cdot L_{max,0} - 2 \cdot T(S_0))] = [(\alpha_0 - c) \cdot L_{max,0} - (\alpha_t - c) \cdot L_{max,t} + \alpha(S_0) - \alpha(S_t)]$, which leads to the desired result.

When coordination can be neglected, sourcing new partners externally naturally boosts the growth speed of the partnership as well as the employment

¹⁶Note that the competition mechanism with respect to partners won't be discussed in this paper but will constitute a future avenue of research.

¹⁷The quadratic nature of search costs in labor markets is indeed a common assumptions in the economic literature (see Burdett (1978) for instance) in the number of external hires ($c_H \cdot H^2$) which has been supported by a body of empirical evidences (e.g. (Christensen et al., 2005)).

growth speed. However, when coordination can not be neglected, the solution of the profit maximization problem (eq. (3.15)) becomes more complex. Although its structure can be analytically derived, it indeed doesn't present simple properties with respect to firm growth.

Proposition 2: *When considering both promotion and coordination, partners' optimal delegation and hiring strategies ($L(\cdot)$ and $H(\cdot)$) are then given by:*

$$L(S_t) = \frac{-(c - \theta \cdot c_H \cdot 2 \cdot T(S_t)) \pm \sqrt{(c - \theta \cdot c_H \cdot 2 \cdot T(S_t))^2 - 4 \cdot (\theta^2 \cdot c_H \cdot S_t + \alpha(S_t) \cdot \gamma) \cdot M(S_t)}}{\theta^2 \cdot c_H \cdot S_t + \alpha(S_t) \cdot \gamma} \quad (3.17)$$

$$H = \frac{\alpha(S) \cdot (2 \cdot \gamma \cdot L - (1 + \gamma)) + c}{2 \cdot c_H \cdot \theta} \quad (3.18)$$

With $M(S) = (\bar{C} \cdot \frac{\theta^2 \cdot c_H \cdot S}{\gamma \cdot \alpha} + \frac{\theta \cdot c_H}{\gamma} \cdot (\theta \cdot S - T \cdot (1 + \gamma)) + \frac{c^2 + \alpha^2 \cdot (1 + \gamma)^2}{4 \cdot \gamma \cdot \alpha} - \frac{3 \cdot c \cdot (1 + \gamma)}{2 \cdot \gamma})$ and $\bar{C} = -\alpha(S_0) \cdot (\gamma \cdot L(S_0)^2 + 1 - \frac{T(S_0)}{S_0 \cdot \theta} \cdot (2 \cdot \gamma \cdot L(S_0) - (1 + \gamma))) - \frac{(\alpha(S_0) \cdot (2 \cdot \gamma \cdot L(S_0) - (1 + \gamma)) + c)^2}{4 \cdot c_H \cdot \theta^2 \cdot S_0}$

Proof. The problem (3.15) is equivalent to: $\partial_t \Pi + \max_{L(\cdot), H(\cdot)} ((\theta \cdot S \cdot L + H - T) \cdot \partial_S \Pi + p \cdot N(L) - c \cdot L - c_H \cdot \frac{H^2}{S}) = 0$. The maximization against H and against L yields that $\partial_S \pi = \frac{2 \cdot c_H \cdot H}{S} = \frac{\alpha(S) \cdot (2 \cdot \gamma \cdot L - (1 + \gamma)) + c}{\theta \cdot S}$, which leads to the proposed solution for external hires (see eq. (3.18)). The problem (eq. 3.15) then becomes: $\partial_t \Pi + (\gamma \cdot L^2 + 1 - \frac{T}{S \cdot \theta} \cdot (2 \cdot \gamma \cdot L - (1 + \gamma))) \cdot \alpha(S) + \frac{(\alpha(S) \cdot (2 \cdot \gamma \cdot L - (1 + \gamma)) + c)^2}{4 \cdot \theta^2 \cdot c_H \cdot S} = 0$. Differentiating against S and leveraging the fact that $\partial_{tS} \Pi = 0$, the proposed result appears as: $\partial_S ((\gamma \cdot L^2 + 1 - \frac{T}{S \cdot \theta} \cdot (2 \cdot \gamma \cdot L - (1 + \gamma))) \cdot \alpha) = -\partial_S (\frac{(\alpha(S) \cdot (2 \cdot \gamma \cdot L - (1 + \gamma)) + c)^2}{4 \cdot \theta^2 \cdot c_H \cdot S})$.

Example. In small US accounting partnerships (i.e. firms with less than 50 partners), section (3.4) has shown that coordination was not significant. Therefore if partners know how much productivity ($\alpha(S)$) is gained when the partnership extends, how their leverage model adjusts (i.e. $L_{max}(S)$ is known) and how competitive their environment is ($T(S)$), they can access their optimal hiring policy ($H(S)$) through lemma (7). In this case, productivity (and leverage) evolution with the size of the partnership can be estimated from the raw data provided by the 2018 US *Public Accounting report*. The leverage L_{max} is indeed directly reported along the partnership size. The leverage sensitivity to the partnership size can be estimated with the regression $L_{max} = a + b \cdot S$.¹⁸ An OLS estimation yields that $a = 22.86$

¹⁸Note that the proposed regression explains $R^2 = 35\%$ of the observed variations in the data-set. The remaining heterogeneity could be related to the diversity of services those firms provide (activities spans from accounting to tax and management consulting) and the associated different delivery model. See section (3.8) for a discussion.

(1.91) and for every new partner the leverage decreases by $b = -0.34$ employee (0.060). Additionally partners' productivity can also be estimated from the report as firm's revenue, partnership size and leverage are given (in the absence of coordination: $\alpha = \frac{(p \cdot N)(S)}{L+1}$). Running the regression $\alpha = a + b \cdot S$ yields that partner's productivity is worth $a = 0.19k\$$ (0.012) per year and decreases by $b = -480 \$$ per year (380) for every new partner that is added to the firm structure. Finally, assuming that the cost of an employee in the US is $c = 60k\$$ per year (as per the US census), that partners turnover rate (i.e. $T(S)/S$) is stable¹⁹ and worth 10% and that search costs (c_H) for new partners are worth 1M\$ (Groysberg et al., 2004), partnership dynamics can be estimated. As shown in Figure (3.3), the proposed theory and the observed relationships yield that small US accounting partnerships have a stable growth rate²⁰. External hiring indeed increases to compensate for the decrease in organic growth triggered by the improvements made with respect to the delivery speed. Additionally external hiring appears to be responsible for most of the growth of those small partnerships.

When it comes to large accounting partnerships (i.e. more than 50 partners), the proposed theory (see proposition (2)) shows that external hiring rates can be estimated when partners productivity (α) and leverage (L) are known. In light of the work of section (3.4), as leverage and revenue per partner are reported in the US accounting report, partners' productivity can be estimated and its sensitivity to the partnership size can be assessed through the following regression: $\alpha = a + b \cdot S$. This yields that $a = 97.8k\$$ (3.4) and partner's productivity increases by $b = 9.3\$$ (3.6) for every new member. Keeping the assumptions of $c = 0.06$ and $c_H = 1M\$$ that were used in the case of small partnership, the external hiring rates can be estimated for each of the large partnerships in the report (see Figure (3.4)). Results shows that in larger partnerships, external partner sourcing appear overall negligible. However, as noted in section (3.5), organic growth is not sufficient to explain the overall growth patterns of those larges firms. This calls for an extension of the proposed theory notably to take into account potential investments in technology, which may change the overall dynamics.

This means that there are two types of US accounting partnerships: small ones, with little coordination where growth is ensured by sourcing new partners externally and large ones, where coordination can not be neglected and growth is organic. This pattern is in line with previous related empirical ev-

¹⁹Note that this may be challenged as workforce turnover has been shown to be such that workers move to the place where they become the most productive (Jovanovic, 1979). In this case, that would mean that in small partnership, $T(S)/S$ would increase as partner productivity actually decreases.

²⁰Note that this aligns with the observed behavior in the data-set. As partnership growth rate are reported, it is indeed possible to run the regression $\frac{\partial_t S}{S} = a + b \cdot S$ which doesn't yield significant results (i.e. $b = 0.18$ (0.19))

idences (see Galanter and Palay (1990) for a discussion on law firms) where a change in growth pace and medium was noted as PSFs evolved. This also illustrates the differences that have been stressed (see Løwendahl (2005)) between PSFs and traditional manufacturing firms, which have been used as a reference point throughout the economic and management literature. Manufacturing firms indeed compete based on productivity (Hopenhayn, 1992) and therefore invest increasing amount of capital which leads to a decreasing growth speed (Evans, 1987). PSFs in this context do compete on productivity as well, but as labor is not standardized and their output depends in their human capital expressed as the size of the partnership, their growth patterns are different.

3.7 Investing in technology.

The previous sections (i.e. sections (3.3) to (3.6)) have stressed the pivotal role of partners' productivity (α) in driving PSFs performance. It has notably been shown to evolve as the partnership expands ($\alpha = \alpha(S)$) as a result of a mix of changes in pricing and delivery speed. The estimates provided in the context of US accounting firms have demonstrated that in small partnerships, partners faced a decrease in productivity as the firm expands, while partners in larger firms enjoyed a productivity improvement. Recent evidences (Frey and Osborne, 2017) have stressed the potential impact of technology on professional services (i.e. more than 15% of the current tasks associated to service delivery can be automated). This section therefore focuses on explaining partner's productivity evolution through technology investments I ²¹ and discusses the associated impact on PSFs growth.

To understand how technology impacts PSFs delivery speed, it has first to be noted that partners have little control over the sales process. It is indeed driven by client firms, so that the time partners spend selling (T_{sales}) can be assumed constant. Partners can yet invest in technology to reduce the amount of work required to deliver their services ($T_{prod}(I)$ with $\partial_I T_{prod}(I) \leq 0$). This impacts their productivity (α) which is now expressed as:

$$\alpha(I) = \frac{V.\tau}{T_{sales} + T_{prod}(I)} - \frac{(V - p(S_{min})).\tau}{T_{sales} + T_{prod}(I(S_{min}))} = \frac{V.\tau}{T_{sales} + T_{prod}(I)} - \bar{\alpha}$$

For partners to maximize their earnings, they must therefore find an optimal strategy around the delegation of their production tasks ($L(\cdot)$), their peers external search ($H(\cdot)$) and their investments in technology ($I(\cdot)$). Assuming that investments are shared equally within the firm, the work done in section

²¹Note that this extends the classical literature around firm growth and technology investments (see Lucas and Prescott (1971)) by providing a specific application to professional services firms

(3.4) to (3.6) entails that the optimal strategy is defined as the solution of:

$$\begin{aligned} \partial_t \Pi + \max_{L(\cdot), I(\cdot), H(\cdot)} ((\theta \cdot S \cdot L + H - T) \partial_S \Pi \\ + \alpha(I) \cdot \frac{(1 + L \cdot (1 + \gamma) - \gamma \cdot L^2)}{1 + (\frac{T_{prod}}{T_{sales}})(I)} - c \cdot L - \frac{(c_H \cdot H^2 + \partial_t I)}{S}) = 0 \end{aligned} \quad (3.19)$$

As stressed in section (3.6), two cases then appear depending in the magnitude of labor coordination.

Proposition 3: *In partnerships where labor coordination can be neglected (i.e. $T_{coord} = 0$) and growth is achieved through a combination of organic promotions and external partners sourcing, the profit optimal delegation strategy is purely dependent in the firm's technological investment: $L = L_{max}(I) = (\frac{T_{prod}}{T_{sales}})(I)$ and leverage decreases with technology investments. The associated optimal road-map (i.e. $I(\cdot)$ and $H(\cdot)$) is then driven by:*

$$\begin{aligned} \partial_S I \\ = 2 \cdot \sqrt{c_H \cdot S \cdot (\frac{V \cdot \tau}{T_{sales}} - \bar{p} + \bar{C}) + c_H \cdot (c + \bar{p}) \cdot (\frac{(c + \bar{p})}{4 \cdot c_H \cdot \theta^2} - \frac{T}{2 \cdot \theta})} \quad \& \quad H(S) \\ = \frac{c + \bar{p}}{2 \cdot c_H \cdot \theta} + \frac{\partial_S I}{2 \cdot c_H} \end{aligned} \quad (3.20)$$

With \bar{C} a constant and $\bar{p} = \frac{(V - p(S_{min})) \cdot \tau}{T_{sales} + T_{prod}(I(S_{min}))}$

Proof. As seen in the previous sections, the absence of coordination leads to $L = L_{max}(I)$ and the profit maximization problem becomes: $\partial_t \Pi + \max_{I(\cdot), H(\cdot)} ((\theta \cdot S \cdot L_{max}(I) + H - T) \partial_S \Pi + \frac{p(I) \cdot \tau}{T_{sales}} - c \cdot L_{max}(I) - \frac{(c_H \cdot H^2 + \partial_t I)}{S}) = 0$. As $\partial_t I = \partial_S I \cdot (\theta \cdot S \cdot L + H - T)$, differentiating against H and I yields: $\partial_S \Pi = \frac{2 \cdot c_H \cdot H}{S} = \frac{c + \bar{p}}{\theta \cdot S} + \frac{\partial_S I}{S}$. This leads to the desired formula for $H(\cdot)$ and $I(\cdot)$.

When coordination is not meaningful, technology investments drive external partners recruitment. The more the firm invests, the less it can rely on organic growth, which spurs an increase in external search activities. Additionally, as long as the competitive pressure is not too unequally applied (i.e. $\partial_S T \leq \frac{2 \cdot \theta}{c + \bar{p}} \cdot (\frac{V \cdot \tau}{T_{sales}} - \bar{p} + \bar{C})$), the speed of those investments is increasing (i.e. $\partial_{SS} I \geq 0$). When employees coordination (T_{coord}) can no longer be neglected, the strategy becomes more complex as two main sub cases appear. In the first instance, technology may only trigger small adjustment to the policies which were previously described in section (3.6).

Lemma 8: *In partnerships where labor coordination is significant (i.e. $T_{coord} > 0$), if there is a level of investment in technology I^* which minimizes the production time (i.e. $\partial_I T_{prod}(I^*) = 0$) and if the maximum leverage post investment ($L_{max}(I^*)$) is still superior to the current leverage ($L(S_0)$), then the optimal investment strategy for partners is to perform a single up-front investment (i.e. $\forall S \geq S_0, I(S) = I^*$). The optimal delegation and external hiring strategies ($L(\cdot)$ and $H(\cdot)$) then still follows the patterns described in section (3.5).*

Proof. When coordination is significant, partners profitability maximization leads to : $\partial_t \Pi + \max_{L(\cdot), I(\cdot), H(\cdot)} ((\theta \cdot S \cdot L + H - T) \partial_S \Pi + \alpha(I) \cdot (1 + L \cdot (1 + \gamma) - \gamma \cdot L^2) - c \cdot L - (\theta \cdot L + \frac{H-T}{S}) \cdot \partial_S I - \frac{c_H \cdot H^2}{S}) = 0$. Differentiating against I and assuming that delegation is $L < L_{max}(I)$, the condition: $\partial_I \alpha \cdot (1 + L \cdot (1 + \gamma) - \gamma \cdot L^2) = 0$ appears, which leads to the suggested result.

If technology effects are small, associated investments result in small discontinuities in the firm development patterns (see lemma (8)). But if technology is more disruptive, it results in deep changes to PSFs' evolution. As it drastically lowers the maximum amount of resources needed to deliver services (i.e. L_{max}), the previous proof can be reworked (in the case of ($L = L_{max}$)) to yield the following proposition.

Proposition 4: *When labor coordination is significant (i.e. $T_{coord} > 0$), if technology investments lead to a drastic reduction in the amount of work that is being delegated (i.e. $L_{max}(I(S_0)) < L(S_0)$), the optimal leverage strategy consists in delegating all production activities ($L = L_{max}(I)$), while the optimal sourcing strategy is given by:*

$$H(S) = \frac{\partial_S I}{2 \cdot c_H} + \frac{c}{2 \cdot \theta \cdot c_H} - \frac{\partial_I [(1 + (1 + \gamma) \cdot L_{max}(I) - \gamma \cdot L_{max}(I)^2) \cdot \alpha(I)]}{2 \cdot c_H \cdot \theta \cdot \partial_I L_{max}} \quad (3.21)$$

Finally the optimal investment I is the solution of the problem:

$$\partial_S I \quad (3.22)$$

$$= \sqrt{4 \cdot c_H \cdot S \cdot \bar{C} + \frac{(\partial_I R - c \cdot \partial_I L_{max})^2}{\theta^2 \cdot (\partial_I L)^2} + 4 \cdot S \cdot c_H \cdot (R(I) - \frac{T \cdot c}{\theta \cdot S} - (\frac{\theta \cdot S \cdot L_{max} - T}{\theta \cdot S}) \cdot (\frac{\partial_I R}{\partial_I L_{max}}))}$$

With \bar{C} a constant and $R(I) = \alpha(I) \cdot (1 + (1 + \gamma) \cdot L_{max}(I) - \gamma \cdot L_{max}(I)^2)$

Example. Looking back at the 2018 US *Public Accounting report*, the analysis performed in section (3.5) has shown that the growth rates of small accounting partnerships (i.e. less than 50 partners) are independent of the partnership size, while their leverage was decreasing. In light of proposition (3) this would suggest that technology investments in small partnerships keep on increasing (i.e. $\partial_{SS} I \geq 0$). In larger partnerships, growth rates also

appears independent of partnership size, but it is more difficult to infer a technology investment pattern out of aggregated data. One would indeed expect large firms to continuously invest in technology while also seizing ad hoc non disruptive opportunities to improve their service delivery model. However, without further information on the ratio of sales versus production activities in those PSFs, no strict conclusion can be drawn.

3.8 Heterogeneity in professional services performance.

After having reviewed the production mechanism of PSFs in section (3.3), the competitive equilibrium in the professional services space was analyzed under the assumption that, within a given market, service providers compete with each other based on their productivity (section (3.4)). The associated price patterns have then been used to determine the most profitable growth path for PSFs. Section (3.5) has focused on optimal organic growth, while section (3.6) extended the proposed theory to cover inorganic partnerships' expansion. Finally the impact of technology on firms dynamics was investigated and performance-optimal policies were suggested.

The proposed theory has been applied throughout this paper to the use case of US accounting firms. This has notably shown that small accounting partnerships (i.e. less than 50 partners) and large partnerships exhibit different behaviors. In small partnerships, partners always delegate all of their production activities as labor doesn't need a lot of coordination. Growth is then mainly ensured by sourcing new partners externally. On the other hand, if large partnerships grow organically, their service delivery must be coordinated. Finally accounting partner's productivity appears U-shaped. In small partnerships this is driven by a decrease in prices as PSFs grow, while in large partnerships delivery speed improvements through technology yield an increase in productivity.

If, as seen in the examples, the theory proposed in this paper can be used to explain and drive professional service providers evolution, the examples have shown that it does not explain all of the heterogeneity in performance across firms. This section therefore offers a brief discussion on performance heterogeneity based on three key pillars that emerge in the literature: professional services nature, market structure and firms characteristics.

Service nature & PSFs performance. 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). If this appears at first glance as a very diverse sector, it actually obeys simple standards. The seminal work of [Løwendahl \(2005\)](#) indeed provided a professional services typology that can be trans-

lated into service delivery model specificities (i.e. $\theta, T_{sales}, T_{prod}, \gamma$), which then entails a set growth trajectory as seen in sections (3.5) and (3.6).

As seen on figure (3.5), 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 3 categories according to [Maister \(2012\)](#), 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 to solve the most unique and difficult problems there are. Finally "Procedure" (type "P") offer "off the shelf" (i.e. commoditized) services.

The differences of those 3 services archetypes can be captured by the framework developed in this paper. First the more complex the problem at the heart of the service, the more time an individual requires to develop the required selling skills ([Løwendahl, 2005](#)). 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 (i.e. θ decreases). Second, the more complex the service, the lower the ratio of production over sales activities (i.e. L_{max} decreases) and the more difficult it becomes to invest in technology (i.e. $|\partial_I T_{prod}|$ decreases). 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:

$$\forall S > 0 \quad (\theta.L)_B(S) \leq (\theta.L)_G(S) \leq (\theta.L)_P(S)$$

Lemma 9: *The more complex the service, the slower its organic growth (i.e. brains [resp. gray hair] services promote less partners than gray hair [resp. procedure] ones).*

This means that to grow at a set rate, more complex services must rely more heavily on costly inorganic mediums than commoditized ones. Additionally, as PSFs grow, they diversify their activities to deliver on a portfolio of service (see [Greenwood et al. \(2005\)](#) for a discussion and the US accounting report for empirical data on the mix of services accounting firms offer for an example). Their overall performance can therefore differ based on their portfolio mix.

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 an extension of the discussion on performance heterogeneity.

Markets & PSFs performance. From a market standpoint, the growth of a professional service occurs in 4 steps through a mix of a customer segment and geography related activities (Carman and Langeard, 1980). 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 that can increase competitiveness by boosting the overall productivity (Skaggs and Youndt, 2004). 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 indeed experience a quicker growth than their counterparts (HUallacháin and Reid, 1991; Bryson et al., 1993). Looking back at the framework developed in section (3.4), the growth of a service is indeed capped by the overall market evolution as:

$$\underbrace{\int_{S_{min}}^{S_{max}} N(s)g(s)ds}_{\text{Number of clients that can be served by partners}} \leq \underbrace{\int f(z)dz}_{\text{Total number of clients available in the market}} \quad (3.23)$$

Therefore the location choice of a PSF can boost (resp. reduce) its growth opportunities if the market grows quickly (resp. is or becomes saturated) (i.e. the constraint (3.23) becomes binding). Note that the choice of the service extension to another customer segment has the equivalent effect as it relaxes the condition (3.23) for the firm. Therefore PSFs generally both expand geographically and across customer segment at the same time in order to maximize their growth potential (Dhandapani and Upadhyayula, 2015). Client demand therefore drives partnership organic growth rates (i.e. $\theta = \frac{\int \partial_t f(t,z)dz}{\int L(s)g(s)ds}$).

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. The same database reports that the segment grows by about 18 firms on average per year. For the sake of simplicity, all the firms that supply this service are assumed to have the same leverage ratio $L_{max} = 5$ (which is on par with the benchmarks observed in the literature (Kipping and Kirkpatrick, 2013)). Let us also assume that a partner can sell services to 8 to 10 clients when production is fully delegated (see Zerni (2012) for benchmarks). This means that the market has room for 85 partners and can add an extra 2 new partners per year, which result in an overall promotion rate of $\theta = 1\%$.

Firms characteristics & PSFs performance. Outside of markets and service nature considerations, three main firm characteristics are also known to explain the observed heterogeneity at which businesses are developed (Delmar et al., 2003). First partners' productivity fluctuates due to random shocks (Lucas and Prescott, 1971) (e.g. an un-foreseen tax reforms may have an effect on the activity of an accounting partner) patterns are impacted by their age (see Arkolakis et al. (2018) for example). This generates "noise" with respect to the overall performance signal of a partnership. However, as partnerships grow and age, their performance patterns become more predictable (see Ribes (2018a) for empirical evidences). Overall, this means that the accuracy of the theory developed in this paper is higher on large and old PSFs than on younger ones.

A second factor is associated to the actual medium of inorganic growth selected by the firm (i.e. merger and acquisitions). Rather than hiring partners one by one, PSFs can engage in larger corporate operations, which have notable consequences on PSFs' growth rates (see McKelvie and Wiklund (2010)). While employment for services that are developed in an organically growing firm increases, combining two firms comes with lay offs as efficiencies of scope are identified during the merger/acquisition process (see McKelvie et al. (2006)). On the revenue side, large takeover are also known to lower revenue growth speed (Coad, 2007).

The third and final known firm level source of heterogeneity in PSFs performance is the influence and ambitions of their constituent partners (McKelvie and Wiklund, 2010). Empirical work has indeed stressed that many leaders are not interested in business performance (Wiklund et al., 2003) as they focus on non financial questions such the well-being of employees, independence (Quader, 2007) and control. Note that even for leaders who focus on financial objectives, preferences for short term over long term profitability

can lead to different decisions. Besides leaders ambitions, a recent review of the literature (Gilbert et al., 2006) 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.

3.9 Conclusion.

Building upon a picture of professional services production mechanisms inspired by the seminal work of Løwendahl (2005) and Maister (2012), this paper provides performance optimal management policies for PSFs in terms of labor delegation, external partner search and technology investments. The associated theory has been applied to explain the recent growth patterns of US accounting firms.

Two new streams of research now naturally emerge from the proposed theory. First, a more granular perspective on the development of PSFs in terms of markets/location strategy appears of interest (Bodenman, 2000; Harrington, 1995) for empirical discussion elements). It would indeed prove useful to develop a business development as well labor cost optimization blueprint for PSFs considering an increasingly globalized service market. This would notably expands on the high level work around competition presented in sections (3.4) and (3.8) of this paper. Second, it would be interesting to understand at a more granular level the incentive mechanisms at play in professional service firms. This would indeed provide a better idea of what cements such firms service delivery model and potentially help understand why most PSFs start small, do not grow and die (Storey, 2016).

3.10 Appendix & Figures.



Figure 3.1: Revenue evolution with lution in US ac-
delegation in US accounting firms.

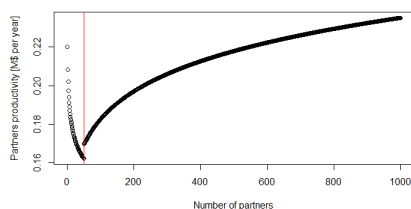


Figure 3.2: Partner productivity evo-
lution with partnership size in US ac-
counting firms.

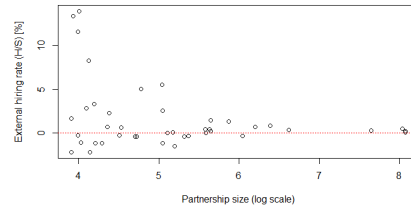
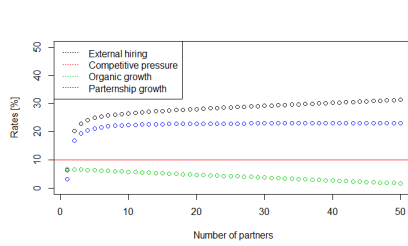


Figure 3.3: Partnership growth rates evolution in small US accounting partnerships (i.e less than 50 partners).
 Figure 3.4: Partnership estimated external hiring rates evolution in large US accounting partnerships (i.e more than 50 partners).

g

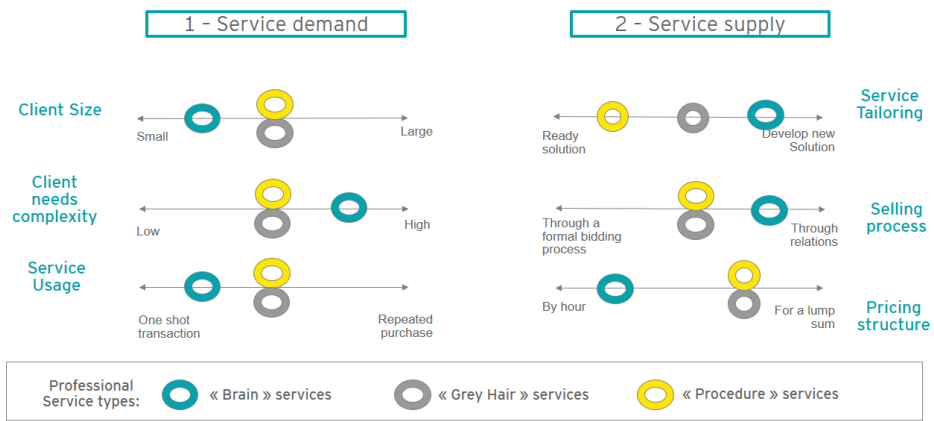


Figure 3.5: Main professional services types.

| Parameter | Estimates across all partnerships | Estimates across small partnerships | Estimates across large partnerships |
|-------------------------|--------------------------------------|--|--|
| ϕ | -0.048 | 0.078 | -0.11 |
| α_0 | 0.14 (0.01) | 0.22 (0.01) | 0.11 (0.01) |
| $\alpha_0 \cdot \gamma$ | -0.0005 (0.0003) | 0.0002 (0.0006) | 0.0007 (0.0003) |
| R^2 | 97% | 97.1% | 98% |

Table 3.1: 2018 US accounting partners revenue sensitivity analysis.

Chapter 4

Scoping PSFs transformation.

4.1 Summary:

4.1.1 French version:

Les entreprises de services professionnelles sont engagées sur une transformation profonde. Leur objectif: rester compétitives et survivre. Cette évolution est rendue possible par deux instruments. D'un côté, ces firmes déplacent des activités off/near-shore. De l'autre, elles automatisent des tâches (via notamment des applications digitales). Reste que le potentiel de cette transformation est sujet à question à travers de nombreuses professions. C'est typiquement le cas dans la profession légale (i.e avocats etc. . .). Les estimées initiales disponibles dans la littérature suggèrent en effet que 90%+ des activités de ce secteur pourraient être déplacées ou automatisées. Sauf que l'industrie associée semble évoluer très lentement. D'où la question : est ce que le scope annoncé est le bon ?

La perspective offerte dans ce chapitre est que le potentiel de transformation des entreprises légales est important (i.e. de l'ordre de 30%) mais somme toute plus restreint qu'initialement anticipé (i.e. versus le 90% rapporté dans la littérature). Si la plupart des tâches effectuées par les travailleurs du secteur peuvent être faite à distance, grandes nombres d'entre elles ne peuvent être séparées des activités réalisées en local. Enfin, ce chapitre montre que les ambitions associées à l'automatisation dans le domaine légal devraient être considérées avec recul. Les données empiriques remontant du terrain semblent en effet suggérer que le potentiel d'automatisation de tâches existantes est assez restreint, mais que la technologie pourrait toutefois être un véhicule pour créer de nouveaux services et apporter de la croissance.

4.1.2 English version:

Services firms are engaged in an ongoing transformation. This allows them to remain competitive and to survive. This change is enabled by two instruments. On the one hand firms can displace labor off/near-shore and on the other, they can replace labor thanks to information technology (e.g. digital application etc.). There is however an open question around the scope of this transformation on several services sectors, one of which pertains to the legal industry. Existing benchmarks indeed suggest a drastic change where most of the work (90%+) currently done locally could move abroad or be replaced. But does this really hold given that the industry seems to change at a slow pace?

The view offered through this chapter is that the potential transformation of legal services firms should be much more conservative than originally anticipated. If most of the tasks associated to the delivery of legal advice can be done remotely, many of them cannot be separated from certain activities that must be performed locally. For example, if a significant portion of lawyers' responsibilities can be assumed remotely, only 30% of them can be off/near-shored. Looking at the overall legal landscape, it therefore appears that no more than 20% of the work done within the legal industry can be moved abroad. Beyond reviewing the extent to which work can be displaced, this paper also highlights that ambitions around the use of information technology in the legal space should be carefully weighted. Digital instruments do not indeed appear to have a large potential when it comes to replacing labor but could be used as a medium for growth.

4.2 Introduction:

Today's economic landscape is heavily geared towards services directed at business and individuals. For instance, the data recorded by the Organization for Economic Cooperation and Development (OECD) shows that services account for about 60 to 80% of the economy of its constituents (both from an employment and revenue standpoint). If the services sector keeps on growing, its expansion appears mainly fueled by the development of new services reflecting the ability of the economy to increasingly segment and cater for customers' preferences. Meanwhile, the bulk of the existing services is subject to competitive pressures. As a result, the main challenge of existing services firms is to transform/optimize their current operations (i.e. improve on their profitability and productivity), whilst striving for growth. This transformation comes mainly from two changes. On one hand, firms invest in technology to replace labor at scale and gain both in labor productivity and profitability. On the other, they reallocate some of their activities in cost efficient geographies to increase their bottom line/margin.

The current benchmarks available in the literature around labor replacement (Frey and Osborne, 2017) and displacement (Jensen et al., 2005) are highly ambitious (if not alarming) across several services sub-sectors. They go as far as considering that 90% of services activities could be done displaced off/near-shore (e.g. workers in US replaced by workers in India) or automated. However, empirical results show that about 50% of firms fail at transforming (Pisano et al., 2009) and one of the key arguments advanced to explain those difficulties is that the scope of change was not right and this mistake led to unanticipated costs (Pisani and Ricart, 2016). So, one can but wonder if some of the current benchmarks are not overstated and if the transformation of many sub-sectors of the service industry is, in the end, likely to be much more conservative than originally anticipated. On that front, a question has been emerging in the academic community which could be very fruitful to consider to advance the debate: to which extent are the tasks that compose occupations interlinked?

Replacing or displacing labor indeed calls for a review of the value chain (Porter, 2001) of a given business model and starts by decomposing the associated sales and delivery process in tasks (Grossman and Rossi-Hansberg, 2008). Those tasks are then reviewed to assess whether they could be done by a (digital) robot or moved elsewhere. The interesting point here is that today's literature on labor replacement and displacement has mainly assumed that tasks are completely separable. But, in practice, that is not true (see Pisano and Shih (2012) for instance). The question therefore becomes: do the current benchmarks need to be revised considering task separability?

Of course, the notion of transformation varies from sub-sector to sub-sector since it is based on its underlying value chain. For instance, the transformation of the insurance industry has a different spin from the one of the management consulting industry. So, the review of existing benchmarks needs to be undertaken with a specific sectoral lens. An interesting playground for such studies appears to be the legal services industry. The key references available (Jensen et al. (2005), Frey and Osborne (2017)) here indeed hint at a major transformation of the field (most activities could be displaced and/or replaced) and therefore anticipate sizeable repercussions on local workers and businesses given the size of the legal services sector employment and revenue wise in most mature economies.

To understand the scope of the legal industry's transformation, this paper will first review in details what we know about the sector and the instruments available for firms to operate the change (section 4.3). Then, it will explain the data points this study leverages as well as the methodology used to perform the associated assessment¹ (section 4.4). Third, results of the assessment will be compared and contrasted against existing benchmarks

¹Note that this study is currently oriented towards the US legal industry because of the wealth of publicly available data maintained by the government on the topic.

(section 4.5). Finally, potential next steps will be discussed in section 4.6 and followed by a crisp conclusion.

4.3 Theoretical foundations:

Properly scoping and planning the transformation of a legal services firms relies on three distinct streams of academic knowledge. First, this type of exercise requires an in depth understanding of legal firms and their challenges. A quick review of the available body of knowledge pertaining to this sector will therefore be presented in sub section 4.3.1. This will notably show that this transformation is nowadays articulated around two elements: displacing labor off/near-shore and investing in technology to either grow or/and automate part of the delivery model of those firms.

This type of change is however known to be difficult. Debates around the redistribution of labor across the globe and around innovation have been ongoing for the past decades in the academic community. If progresses have certainly been made on those subjects, there are still areas of grey that will be highlighted in sub sections 4.3.2 and 4.3.3 and further discussed throughout this paper.

4.3.1 What do we know about the legal firms?

The legal services industry has been the subject of a few specific investigations over the past decades, notably around their managerial practices ((Galanter and Palay, 1994), Landers et al. (1996), Kuruvilla and Noronha (2016), Armour and Sako (2020)). But the bulk of the academic knowledge on those firms is derived from articles pertaining to the professional services industry and knowledge intensive businesses (KIBs). Legal services indeed share several characteristics with other sub-segments of the economy (e.g. the management consulting, the accounting industry etc. . .) both in terms of economic/financial mechanisms as well as in terms of managerial instruments (Løwendahl (2005), Maister (2012)), to the point that they are all clubbed together to form the professional services sector.

Professional services firms (referred to as PSFs in the rest of this paper) are nowadays occupying a growing place in the economy (Empson et al., 2015b). Recent data from the OECD (organization for economic cooperation and development) shows that, amongst a number of mature countries (e.g. France, Germany, the UK, the US. . .), the professional services sector employs about 10% to the active population and outpaces the overall economy when it comes to growth. This has therefore sparked the interest of the academic community.

In terms of known characteristics, PSFs usually operate as privately held partnerships (Greenwood et al. (1990) Greenwood and Empson (2003), Levin and Tadelis (2005)), where partners are responsible for the sale of specific

services and where production is delegated to their employees (Greenwood et al., 2005). Given that services are first sold and then co-produced with the client (Løwendahl, 2005), the business model of PSFs tend to favor sales activities over production ones (given their upstream nature). Financially speaking, partners' earnings usually differ from the ones of their employee by a factor ten. But despite economic disparities, the model is made stable by its specific managerial practices, where employees earn a chance to succeed an existing when they join a PSFs. This career scheme, dubbed the "up or out", locks employees in a form of rate race (Landers et al., 1996) and ensure they stay and remain productive as most of their compensation is deferred until the moment where they access the status of partner (Galanter and Palay, 1994).

This can easily be brought to life in the context of legal services space with a few benchmarks coming from the US market. The *American Lawyer* indeed publishes a yearly ranking of the top 100 US law firms and their characteristics. For example, in 2019, US partners in those firms made an average profit of 1.9M\$, leveraged around 3 lawyers (called associates) each and the overall productivity of a lawyer was of 1M\$ of revenue generated per year. Each lawyer, who tend to earn 122k\$ a year on average, then usually has to prove him or herself during a period of ten years before qualifying for a potential promotion (Galanter and Palay, 1990).

However, if the generic tenets of PSFs are understood, the recent review of Skjølsvik et al. (2017) shows that there are still open areas of discussions. Two of them appears on the rise. First, the rapid growth of PSFs has triggered questions around their expansion strategies and the notion of profitable growth. Beyond natural questions of innovation (Barrett et al., 2015), a key component of growth (both revenue and employment wise) revolves around "internationalization" (Brock and Alon (2009), Boussebaa and Morgan (2015)). This has indeed been used not only to acquire new clients abroad but also to improve competitiveness by setting up off/near-shore hubs to deliver services at a lower-costs (Sako, 2015). Yet, to date, the consequences and causes of such strategies are still open for debate. Evidences around their success are mixed. On one hand, some evidences point to a decrease in PSFs performance (see Sako (2006) for a discussion on productivity), on the other some tend to show that internationalization is beneficial (see Ribes (2020) for a discussion on profitability). Besides, the debate here is not limited to the professional services industry and expands to all sectors of the economy (something that will be reviewed in more details in the next sub-section). Recent literature additions have shown that the impact of such a transformation must be appreciated contextually and carefully. As all firms have the same perspectives available, the first movers rip most of the benefits of the change (Eppinger, 2019). But internationalization is not a sort of gold rush. It must be scoped carefully as failure to do so can be costly (Stringfellow et al., 2008). This chapter therefore

contributes to the literature on PSFs firms, by providing up to date benchmarks in terms of the opportunities internationalization can be present in terms labor reallocation (and therefore costs savings).

Besides questions of profitable growth and internationalization, the second topic on the rise in the literature dedicated to professional services firms revolves around their management and organizational practices (Swart et al. (2015), Kaiser et al. (2015), Alvehus (2018)). Of course, the revision of PSFs managerial model and the growth registered by the sector are interlinked. On one hand, growth came with questions around the commoditization of professional services and the potential use of technology to automate part of the associated delivery activities (Sako (2009), Barrett et al. (2015), Hings et al. (2018)). This recently led to challenges towards the partnership structure (e.g. need for investment/funding) and the reputation model that underpins the sales of professional services (Greenwood et al., 2017). On the other, growth has created the need for another type of “specialist” career track (Malhotra et al., 2010). Those careers may not lead to a partnership position but have emerged as a vehicle to spur internal innovation and to generate costs savings for PSFs (Malhotra et al., 2016) while offering a more stable income progression for employees. There is yet a point when the traditional up or out apprenticeship model breaks (Ribes et al., 2020). By clarifying the scope of the transformation legal firms are going through, this paper should help both the academic community practitioners assess if the transformation of the legal industry is actually manageable in a traditional set up or if it will call to tearing down the partnership model and move towards a more classical publicly owned firm set up.

4.3.2 What do we know about labor displacement?

The previous sub-section has shown that there was an interest in scoping the transformation of the legal industry as it incrementally builds on the current streams of discussion on professional services and knowledge intensive firms. But beyond sector specific conversations, this paper also builds on the economic literature associated to trade as well as managerial deliberations associated to the topic of labor displacement off/near-shore.

Sub-section 4.3.1 has highlighted that one of the current research themes on PSFs pertains to their internationalization. If some of it is naturally dedicated to growth (i.e. how to acquire international clients?), another key motivation is to increase the competitiveness of the service delivery model of those practices (i.e. how to source labor/resources in the right place and at the right cost?). Labor displacement, however, is not new. It is an instrument that has been thoroughly used in the manufacturing industry since the 70s. But, as stressed in the literature review of Pisani and Ricart (2016), it has only “recently” started to impact the realm of services.

What we know from the field is that there are in general two interconnected

motivations for displacing labor. On one hand, the resources based view (RBV) initiated by Penrose and Penrose (2009) states that firms go to locations where resources are abundant to maximize their innovation potential as well as to support their growth. On the other, the transaction cost economics (TCE) approach (Williamson, 1981) assumes that firms go to locations presenting cost advantages. Those approaches are of course not exclusive and have jointly been used to describe what's happening today in the legal industry (see Sherer (1995) for a RBV type of discussion and Kuruvilla and Noronha (2016) for a TCE one).

Independently of the reason and the sector of application (e.g. manufacturing vs services), the approach to assess the potential for labor displacement is always the same. The key idea is to decompose the value chain of a service/product (Porter, 2001) into tasks and reflect on where tasks could go (Grossman and Rossi-Hansberg, 2008). But as the process of off/near-shoring activities has matured, so has its scope. If initially, the focus was to displace routine production activities (mainly) for costs purposes, recent transformations have shown that there is an increasing focus on displacing complex value-added tasks (Becker et al., 2013) in a context of innovation (e.g. what is the best place to form research hubs?). The impact of this change is quite sizeable as currently available benchmarks show that between 20% and 50% of activities could be delivered remotely in the professional services space (Jensen et al. (2005), Gervais and Jensen (2013)). In the specific of legal services, Jensen and Kletzer (2010) even estimated that potentially 96% of the legal activities done in the US could be displaced.

While there is an agreement that this kind of transformation is bound to occur and will have an impact, it comes with a number of open questions. In practice, studies have found that 50% of the firms that actually displace work do not get the desired benefits (Pisano and Shih (2012), Pisani and Ricart (2016)). The primary problem here is one of scope. Displacing an activity just because it can be done remotely has indeed proven to be everything but thoughtful (Doh et al., 2009). Given that tasks are performed by workers and that some of them are interconnected (Blinder, 2007), a blunt decomposition of a service delivery chain ultimately leads to hidden costs, additional knowledge transfers (Larsen et al., 2013) and potentially leads to a problem of hollowing out (Castellani and Pieri, 2013) as well as ultimately needing to re-shore activity (Foerstl et al., 2016). This therefore raises a number of flags as per Jensen and Kletzer (2010) initial estimate. Is it realistic to assume that 90+% of the legal work could be delivered from say India? What's happening if we move beyond pure costs and geographical concentration considerations and look at the content of legal activities and the inherent nature (including the separability) of the associated tasks? This is where this paper will make one contribution to the academic literature. If there is a clear problem of scope in any displacement effort, there is also one of speed (Eppinger, 2019). Off-near/shoring activities is an instrument

available virtually to all firms, which means that over the long run, its benefits will be passed to clients, notably through lower prices (see [Kohler \(2004\)](#) for a discussion on products and [Ribes \(2020\)](#) for a discussion on professional services). Labor displacement is thus primarily a tool for firms to survive over the long run and potentially, under certain conditions, a tool to get a performance boost (growth, profitability, productivity) over the short run ([Arkolakis et al., 2012](#)). Looking at the phenomenon, it seems that the hype associated to the instrument has potentially misled practitioners into thinking that they would get performance increases no matter what the conditions of the marketplace. This paper therefore proposes a pragmatic and hopefully more realistic picture of what off/near-shoring would mean in the context of legal services and offer some views in terms of the potential pace of such a change.

4.3.3 What do we know about labor replacement?

The globalization of delivery/production chains is not the only element at play in the transformation of legal (and more generally professional services) firms. Recent technological progresses indeed bring promises in terms of performance improvement (via labor replacement) and generate opportunities for growth (via labor complementation) ([David, 2015](#)). The literature differentiates two main types of technological prospects: robots, used to automate tasks (whether physical or analytical), and information and communication technology (ICT), used to connect individuals. If ICTs are mainly enablers, the goal of robots is to replace repetitive and routine tasks, especially the one requiring a lot of investment in the form of training ([Feng and Graetz, 2015](#)), and to complement complex ones ([Autor et al., 2003](#)).

From an individual standpoint, robots are known to compete with low skills workers and drive wages and prices down. US based evidences such as the one reported by [Acemoglu and Restrepo \(2020\)](#) show that one more robot per thousand workers reduces the employment to population ratio by about 0.2% and wages by about 0.3% percent. But if robots have a negative impact on low skill workers (lower wages), they tend to benefit the overall population (price going down) and the economy. [Graetz and Michaels \(2018\)](#) have for example shown that leveraging robots in the US resulted in an average 0.4pt of production increase for firms and that the associated investment had a very high rate of return (investment recovered in about 18 months). Yet, the impact of automation robots may not be limited to low skill activities ([Smith and Anderson, 2014](#)). Automation is also starting to complement the analytical tasks primarily performed by highly educated workers and to substitute for routine tasks generally performed by middle educated workers ([Michaels et al., 2014](#)). As such, robots could have a different footprint on individuals compared to what was previously anticipated. But outside of considerations on the polarization in skills ([Autor et al., 1998](#)) and jobs

(Akerman et al., 2015), it has proven very difficult to assess the impact of this new wave of "robotization" on firms' performance (Draca et al., 2007). This has led the academic community to recently call for more case studies on the topic (see the review of Loebbecke and Picot (2015)).

Now looking back at the legal industry and the nature of its activities, it appears clear that there is some potential for automation. Besides, recent benchmarks such as the one of Frey and Osborne (2017), show that (digital) robots could potentially be used to assume about 20% of the work activities done in today's professional services industry. But of course, not all jobs are impacted in the same fashion. Looking deeper at the available benchmarks, it was indeed found that if the potential for labor replacement for lawyers was small (3.5% of their activities could be replaced by technology), the impact of technology on paralegals and legal secretaries was much higher (about 95%+ of their activities could be replaced). Nonetheless, if there are some initial ideas on how technology can impact the legal industry, there is, to my knowledge, no discussion around how it competes with labor displacement. This paper will therefore contribute to the field by assessing the overlap between the two instruments and start a discussion on which instrument could be the most appropriate as a legal firm grows.

The brief literature review performed through section 4.3 has shown that scoping the transformation of legal services firms can benefit both scholars and practitioners in two ways. On one hand, the associated discussion expands on the current body of research dedicated to the internationalization of those types practices as well as the general discussion around labor displacement off/near-shore. It notably provides a revised picture of previous generic estimates by accounting for recent advances made on the topic of tasks separability. On the other, it blends consideration of labor replacement via technology and displacement off/near-shore to provide a holistic picture of the change currently occurring in the legal industry. This fusion of the two topics appears original and an untapped area of research. Finally, this paper also provides some incremental thoughts (see section 4.6) around the sustainability of the managerial model of legal firms (i.e. the partnership model and its associated succession scheme) and the pace of their transformation.

4.4 Methodology:

Scoping such a transformation calls for a review of the activities at the core of the sales and production process of legal services. To do so, this paper proposes a three steps approach that will be detailed throughout this section. This first step, highlighted in sub-section 4.4.1, consists in leveraging publicly available data maintained by the US government to understand the

core tasks involved in the delivery of legal services and infer the associated volume of work. The second one revolves around estimating whether a task can be done remotely and/or by a robot. This was done via a survey, the details of which are summarized in sub-section 4.4.2. Finally, sub-section 4.4.3 will show an option to account for the non-separability of tasks to fully assess the potential for labor displacement and replacement of legal activities. Note that section 4.4 is fully dedicated to a methodological review and that results will be analyzed in section 4.5.

4.4.1 Understanding the tasks involved at core of the legal services industry:

The US administration maintains several data sets and off-the-shelf referentials that can be used when studying the transformation of a sector or an industry. The US Bureau of Labor Statistics notably runs a program called O.E.S (Occupational Employment Statistics). The program maps occupational data (jobs, defined according to the Standard Occupational Classification – SOC, wage, employment...) to industrial sectors (defined as per the North American Industrial Classification System – NAICS) and can be leveraged to assess a sector’s blueprint in terms of employment. In the case of legal services (defined under NAICS code 5411), the 2019 OES dataset shows that 3 core jobs (lawyers, paralegals and legal secretaries) make up 73% of the overall US workforce working in the legal industry (see table 4.1). Given their prominence of those 3 occupations, they will be the focus point of this study. OES occupational data can then be coupled with

| | SOC code | % of overall employment | Average wage (\$/h) |
|-------------------|----------|-------------------------|---------------------|
| Lawyers | 23-1011 | 37% | 59.1 |
| Paralegals | 23-2011 | 23.4% | 24.9 |
| Legal secretaries | 43-6012 | 12% | 22.7 |

Table 4.1: US 2019 Occupational data in legal services. Occupation

the 2020 O*NET referential (a US Department of Labor program) to understand the main tasks involved in the value chain of a given sector. The O*NET database has been continuously collecting information around each job j present in the SOC structure since 2001 and providing a standard view of the $n \in [1; N_j]$ tasks associated to a job j . This can be used to provide a rating of the importance (I_j^n) and frequency (F_j^n) of each task n in each job j . Note that the O*NET database has proven over the years to be a cornerstone for research aimed at understanding the impact of trade and technology on occupations (Blinder (2007), Jensen and Kletzer (2010), Frey and Osborne (2017)).

In the O*Net referential, the importance of a task n in a job j is assessed

through continuous surveys on a scale from 1 (Not important) to 5 (Extremely important). Each of the K responses (generally a hundred of them) are then averaged and normalized on a scale from 1 to 100 as per the O*Net methodology to provide the final importance score (where $O_{j,k}^n \in [1; 5]$ is the original rating provided by an incumbent) :

$$I_j^n = \frac{E_k(O_{j,k}^n - 1)}{4} * 100 \quad (4.1)$$

Tasks frequency is also assessed through continuous surveys run by the US department of labor. In this case, the survey asks the incumbent to detail whether the task is performed frequently (option A defined as “daily, several times a day, hourly or more”), occasionally (option B defined as “more than once a month, more than once a week”) or rarely (option C defined as “once a year or less, more than once a year”). For each job j and task n , O*Net then reports the percentage of response received on each category $p_{j,A}^n, p_{j,B}^n, p_{j,C}^n$. To estimate to the average frequency of a tasks (F_j^n), the following quantitative assumptions were taken for the purpose of this study: when rated frequently, the tasks were assumed to be performed every day, when occasionally, every week, rarely, twice a year. The overall frequency was then defined as the average number of times the task was performed during the year according to the following formula:

$$F_j^n = p_{j,A}^n * 365 + p_{j,B}^n * 52 + p_{j,C}^n * 2 \quad (4.2)$$

4.4.2 Estimating the volume of work that can be done remotely or by a robot:

The importance and frequency estimates derived in the sub-section 4.4.1 can be used to estimate the overall volume of work doable either remotely and / or by a digital product. This will be done in two steps. First, the volume of work V_j^n (expressed in hours per employee per year) associated to each task in each job will be estimated. Then, each task n in each job j will be reviewed and its characteristics (i.e. can it be done remotely/ be done through ICT?) will be appraised.

The overall workload of tasks is not a readily available measure in the O*Net database. It must therefore be estimated. To do so, this paper builds upon the core assumption that workers spend an amount of time on the activity that is proportional to its importance. Calling T_j^n the amount of time a worker in job j spends on task n and assuming a worker can dedicate 1750 h to its occupation per year, two options arise. On one hand, tasks workload can be assessed using only their reported importance (i.e. $T_j^{n,m1} = \frac{I_j^n}{\sum_{k < N_j} I_j^k} * 1750$). This will be referred to as method 1 (with the superscript $m1$). On the other, tasks workload can be assessed based on both

their importance and frequency (i.e. $T_j^{n,m2} = \frac{I_j^n \cdot F_j^n}{\sum_{k < N_j} F_j^k \cdot I_j^k} * 1750$). This will be referred to as method 2 (with the superscript $m2$). Note that both methods will be later used to discuss the potential for labor displacement and replacement in occupations tied to the legal sector. This will prove useful in discussing whether or not a change in methodology can lead to different results (from an order of magnitude standpoint) and will provide additional perspectives to this study.

Beyond estimating workload, scoping the transformation of legal firms also calls for a review of the labor displacement (i.e. $d_j^n \in 0; 1$) and replacement (i.e. $r_j^n \in 0; 1$) potential of each task n in each job j . This was enabled by administering a survey (through Monkey Survey - a popular survey tool) directed at a panel of lawyers. Given the nature of the resources used in this study (benchmarks from the literature pertaining to US workers, O*Net activity referential maintained by the US bureau of labor statistics...), the survey was aimed at US practitioners. Note that running such a survey to a different audience (e.g. UK, German, French lawyers) may constitute a valid future area of research, but it was not in scope for this study.

The panel of lawyers used in this paper was generated by building a custom web-crawling program in R against the Washington bar directory. The directory stores the contact details of 33638 active lawyers in the state of Washington US who are eligible to practice. Out of this population a random sample of 1000 lawyers was drawn. The choice of this sample size was motivated by the fact that surveys have in general a low response rate (5 to 10%) and a panel of about 50 to 100 respondents is usually needed to get statistically relevant results (on binomial tests). Given the statistical rules of thumb mentioned before, it was therefore chosen to leverage the free capability of monkey survey to its fullest. Finally, note that in this study, there was no specific attention paid to the primary field of expertise of lawyers (e.g. aviation law, animal law etc...). The aim of this paper was indeed to draw generic facts on the legal industry. However, discussing the details and potential differences of each sub-segments of the sector may also constitute a valid future avenue for investigations (notably for practitioners).

The survey in itself was designed around 4 sections. Section one highlighted the objectives of the study, sections 2 (resp. 3 4) then asked individuals to assess whether a task $n \in 1; 26$ performed by a lawyer [$j = 1$] (resp. a paralegal [$j = 2$] legal secretary [$j = 3$]) could, in their view, be delivered remotely (Yes — No) and/or be performed by an application (Yes — No). For each tasks n and each job j , the statistical relevance of the hypothesis “the task can be performed remotely” (i.e. $d_j^n = 1$) and “the task can be performed by a program” (i.e. $r_j^n = 1$) was then assessed via a binomial test. Results were then used alongside workload estimates (i.e. $T_j^{n,m1}, T_j^{n,m2}$) to generate a picture of the volume of work that could potentially be subject to labor displacement or replacement in each job. Results are presented in

detail in section 4.5.

4.4.3 Assessing the volume of labor that can be displaced or replaced:

The methods presented in section 4.4.2 enable an assessment of the tasks (and the associated volume of work) that could potentially be replaced and/or displaced. But to really scope the transformation bound to occur in the legal services industry, one must account for the fact that some tasks cannot be separated.

The linkages between tasks within a job j can be represented in a matrix M_j , where the element $M_j(n1, n2) \in 0; 1$ represents the connection between a task $n1$ and a task $n2$ and where $M_j(n1, n2) = 1$ means that the two tasks need to be performed by the same worker (i.e. they cannot be separated). Getting those matrices filled for in the context of 3 legal occupations in scope for this study is however a taxing data exercise. An individual indeed needs to fill 3 matrices of respective size 22*22, 16*16, 12*12. Therefore, running a survey to gather the associated information did not appear as a suitable option. Instead, an approach similar to the one of [Blinder \(2007\)](#) was used. Two independent experts were asked to assess the separability of the tasks in each job. Results were collected and aggregated in the following fashion. If both raters agreed that tasks $n1$ and $n2$ in a job j could not be separated, they were considered as non-separable (i.e. $M_j(n1, n2) = 1$), otherwise they were assumed separable. Note that inter-rater agreement was measured via a Kappa coefficient (a standard statistic used in this type of set up ([Brennan and Prediger, 1981](#))) and that they associated results are reported in section 4.5. As a side note, an interesting future avenue of research here could be to programmatically assess task separability. If the exercise can be “manually” performed in the context of a few jobs, it becomes very difficult for sectors that leverage multiple occupations (e.g. the management consulting sector). Based on those ratings, the labor replacement (R_j) and displacement (D_j) opportunities for a job j were assessed in the following manner:

$$R_j = \frac{\sum_n r_j^n \cdot 1_{(\sum_k M_j(n,k) \cdot r_j^k = 1)} \cdot T_j^n}{\sum_n T_j^n} \quad (4.3)$$

$$D_j = \frac{\sum_n d_j^n \cdot (1 - r_j^n) \cdot 1_{(\sum_k M_j(n,k) \cdot d_j^k = 1)} \cdot T_j^n}{\sum_n T_j^n} \quad (4.4)$$

Note that both ratings are in this case expressed in terms of hours per year. Moreover, both estimates were calculated according to the two methodological options ($m1$ and $m2$) highlighted in section 4.4.2 and used to assess the workload of a task. Associated results are of course discussed in section 4.5.

Finally, the underlying assumption in those assessments was that if a task could be both displaced and replaced, it would end up being done by a digital product. This of course assumes that technology is mature enough to be a cheaper alternative than physical labor and may not completely stand true. To enrich the conversation, the overlap ($O_j = \sum_n d_j^n \cdot (r_j^n) \cdot 1_{(\sum_k M_j(n,k) \cdot d_{jk}=1)}$) between labor displacement and replacement in a job j was estimated and will be reviewed in section 4.5.

4.5 Results:

Based on the methods presented in the previous section, available results on the transformation of the legal services industry will now be presented. This will be done in two steps. First, the results of the survey and the experts' ratings will be displayed. This will enable a review of the associated assessment of the sector's evolution. Second, the effects of task separability and labor substitutability (i.e. labor can be done either off/near-shore or by a digital application) will be highlighted. This will allow a discussion around the impact of the transformation on legal services delivery costs and productivity. Additionally, it will show what's happening if a firm does not have the right scope for its change efforts.

4.5.1 Results of the study:

To understand if tasks associated to the delivery of legal services could be done remotely or performed by a digital tool, a survey was run using a sample of 1000 lawyers (see section 4.4 for details on the methodology). The sample was generated by randomly picking out email addresses out of the list of contacts the Washington (US state) bar. The associated list contains more than 30000 contacts. The survey was run over a week in January 2021 (with one reminder in the middle). It generated a total of 45 responses (i.e. engagement level at 4.5%). The survey was divided in three parts.

The first part of the questionnaire asked respondents to rate whether the tasks performed by lawyers could be performed remotely (yes/no) and/or by a digital tool (yes/no). This first set of questions was fully completed (i.e. 100% response rate), detailed results can be found in the appendix. Given the response rate (and the associated statistical power), it was therefore assumed that an activity n for lawyer could be done remotely [resp. by a digital tool] (i.e. $d_j^n = 1$ [resp. $r_j^n = 1$]) if more than 75% of the respondent thought so. Note that, on average, 75% (resp. 22%) of the respondents thought that tasks done by a lawyer could be done remotely (resp. by a digital application). Note that respondents mentioned that all tasks that could be done by an application could also be done remotely.

Part 2 & 3 of the survey asked respondents to rate tasks for paralegals and legal secretaries. Both sets of questions were only completed by 75% of the respondents (33 responses accounted for an overall engagement level of 3.5% amongst the surveyed population). Given the response rate, the same criteria was used across lawyers, paralegal and legal secretaries to assesses the displacement and replacement potential of a task (i.e. an activity n done by a paralegal or a legal secretary can be performed remotely [resp. by a digital tool] (i.e. $d_j^n = 1$ [resp. $r_j^n = 1$]) if more than 75% of the respondent thought so). In this case, an average of 74% (resp. 79%) of the responses stated that tasks performed by a paralegal (resp. legal secretary) could be done remotely and 39% (resp. 45%) by an application. Here again, most of the tasks that could potentially be assumed by an application could also be done remotely.

It the survey generated a statistically relevant picture of whether or not an activity could be done remotely or by a tool, linkages between tasks needed to be reviewed. The separability of tasks within legal occupations was therefore assessed by 2 experts (see section 4.4). In this type of experiment, the literature suggests that the agreement between raters should be reviewed according to Cohen's Kappa (McHugh (2012)). The interpretation of this indicator reads as follows: if $\kappa \in [0.01; 0.2]$ (resp. $\kappa \in [0.21; 0.6]$), agreement between raters is very limited (resp. fair to moderate), but if $\kappa \in [0.61; 0.8]$ (resp. $\kappa \in [0.81; 1]$), agreement is substantial (resp. almost perfect). Note that earlier studies on those transformation topics, which also relied on experts opinions, recorded agreement scores around $\kappa \approx 0.7$ (see for instance Blinder (2007)).

Once analyzed, the tasks separability ratings display a high level of alignment between experts across all 3 occupations. Cohen's Kappa was worth $\kappa = 0.75$ on ratings pertaining to lawyers, $\kappa = 0.76$ for paralegals and $\kappa = 0.82$ for legal secretaries. Looking at the overall results, a task performed by a lawyer (resp. a paralegal or a legal secretaries) is linked (on average) to another 6 (resp. another 4 or 2). Interestingly, this aligns with the intuition that higher paid occupations have a more complex structure. Finally, raters' agreement was calculated for each task in each job. If task level agreement displayed small variations (for lawyers $\kappa \in [0.59; 0.95]$, $\kappa \in [0.66; 0.92]$ for paralegals, $\kappa \in [0.71; 1]$ for legal secretaries), there was no activity where expert's alignment was moderate or poor.

The data generated by the survey and experts' ratings was used to estimate (according to the methodology described in section 4.4) the extent to which the activities within legal occupations can be displaced off/near-shore and replaced by digital applications. Results are displayed on figure 4.1 and table ??.

The first finding of this study revolves around the impact of automation on those occupations. Once accounting for tasks separability, labor replacement opportunities are estimated to be significantly lower than previously

estimated (Frey and Osborne, 2017). The percentage of labor that could be replaced for lawyers (resp. paralegals) indeed goes down from 3.5% to 0% (resp. 95% to 0%). Note that this finding is robust against a change in methodology used to estimate workload (i.e. method 1 vs method 2). For those two occupations, it thus seems that digital tools should aim at complementing existing activities and developing new services rather than aiming at replacing existing activities. When it comes to legal secretaries, labor replacement opportunities also appear negligible, which drastically differ from the initial ideas shared by Frey and Osborne (2017) (i.e. 90-95% of legal secretaries work can be replaced).

The second finding of this chapter revolves around the potential for labor displacement off/near-shore of legal activities. Here again, accounting for task separability leads to much more conservative estimates than the ones previously highlighted in the literature (Jensen and Kletzer, 2010), where 95% of legal activities were assumed to be ripe for displacement. In this case, the volume of work that can be displaced for lawyers goes down to about 30% and about 5% for paralegals. This finding is also robust against a change in workload estimation methodology in the case of paralegals, but subject to small fluctuations (+/- 5%). Finally, if most of the legal secretaries' work cannot be replaced by digital tools, it can be displaced off/near-shore. Besides, depending on the estimation methodology, the amount of work that can be pushed in a cost friendly location represents between 60% and 70% of the overall workload currently assumed by local workers.

Employment wise, the transformation studied in this chapter is very likely to trigger quite a change in the legal industry's landscape. However, when task separability is factored in, results are much more conservative than previous estimates which predicted the entire industry to either move off/near-shore or to be replaced. Now, with the proposed methodology, 1/3 of lawyers' work activities and 1/20 of paralegal labor could be moved to another location. But depending on its pace, this change may very well be absorbed by the ongoing growth of the sector (i.e. this will have no repercussion employment wise), something that will be discussed in more details in the final section of this chapter. But this does not hold true for legal secretaries. This occupation, which employs 12% of the overall legal industry workforce, appears to be bound to experience a severe reduction in workforce locally as more than half of the associated activities can be displaced.

4.5.2 What are the effects of task separability labor substitutability?

Considering the results of the previous section, it appears that the transformation of the legal industry is less drastic than what was previously suggested by the literature. One key problem though is that if firms attempt to separate tasks that are interlinked, some tasks will have to be performed

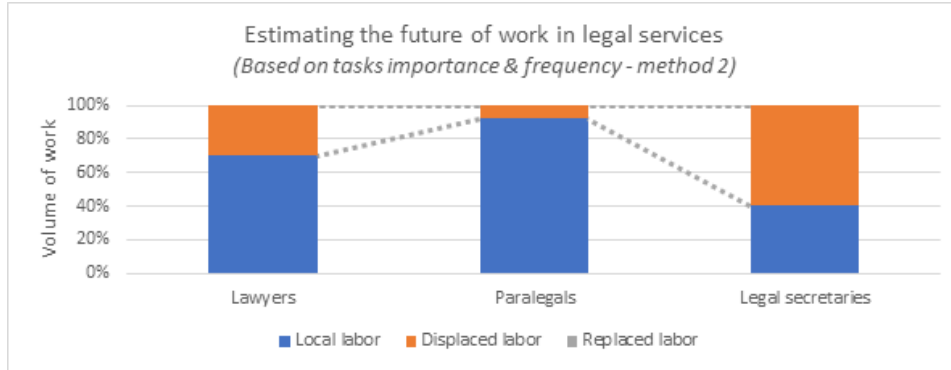


Figure 4.1: Scope of the transformation within legal occupations.

| % of labor that can be | displaced | displaced | replaced | replaced |
|----------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|
| Workload assessment method | Method 1 (based on importance) | Method 2 (based on frequency) | Method 1 (based on importance) | Method 2 (based on frequency) |
| Lawyers | 31.2% | 28.9% | 0% | 0% |
| Paralegals | 3.6% | 7.6% | 0% | 0% |
| Legal secretaries | 70.7% | 59.9% | 0% | 0% |

Table 4.2: Details behind the estimated scope of the transformation of legal occupations.

twice (i.e. work gets duplicated onshore and off/near-shore), which will lead to increased costs and a loss in productivity. This sub-section will therefore detail the effect of separability on labor displacement and replacement and provide a view in terms of the reduction in performance firms may face if they don't size their efforts properly (i.e. don't account for tasks separability). Additionally, this sub-section will be used to stress the potential overlap existing between labor replacement and displacement.

To understand what could go wrong if legal practices' transformation is not approached properly, let's start by reviewing the effect of tasks separability on the potential for labor displacement across legal occupations. Using the data generated by the survey, it is possible to calculate the proportion of work that could be potentially displaced assuming that no tasks are interlinked (i.e. $\frac{\sum_n d_j^n \cdot T_j^n}{\sum_n T_j^n}$ as per the conventions described in section 4.4) and compare it against the proportion of work that can be off/near-shore once linkages between work activities are taken into account (i.e. $\frac{\sum_n d_j^n \cdot 1 \cdot (\sum_k M_j(n,k) \cdot d_j^k = 1) \cdot T_j^n}{\sum_n T_j^n}$). Results, displayed in Figure 4.2 and table ??, show that outside of legal secretaries, tasks non-separability induces a very

important reduction in the amount of work that can be displaced. About 30% to 40% of the work done by lawyers and paralegals can be performed remotely but is linked to local activities and therefore must remain onshore. Note that if changing the workload estimation methodology leads to differences in the associated estimates, the main finding here holds true.

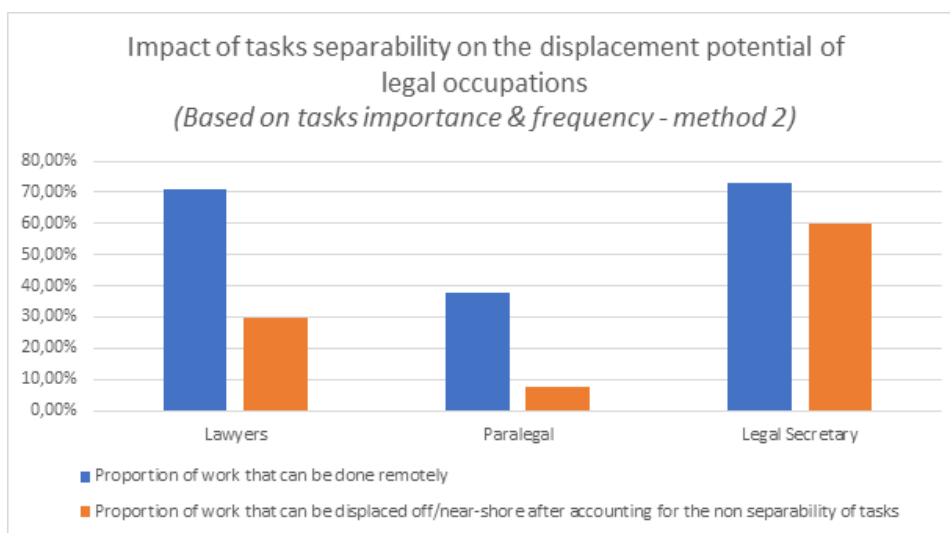


Figure 4.2: Tasks non separability effect on labor displacement potential in the legal industry.

| % of labor that can be | done remotely | done remotely | displaced displaced | displaced replaced |
|----------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|
| Workload assessment method | Method 1 (based on importance) | Method 2 (based on frequency) | Method 1 (based on importance) | Method 2 (based on frequency) |
| Lawyers | 80.77% | 71.2% | 32.15% | 29.89% |
| Paralegals | 44.61% | 37.83% | 3.59% | 7.64% |
| Legal secretaries | 77.06% | 72.92% | 70.72% | 59.90% |

Table 4.3: Effects of tasks non separability on labor displacement in legal occupations.

Now, according to the data provided by the US Bureau of Labor Statistics, US lawyers (resp. paralegals) come at a cost of 59.1 \$/h (resp 24.9\$/h) (see table 1). So, if 29.8% (resp. 7.6%) of the activities assumed by lawyers (resp. paralegal) are displaced to a location where labor is 50% cheaper, hourly costs fall to 50.3\$/h (i.e. cost reduction of 15%) for lawyers' labor and to 23.9\$/h (i.e. cost reduction of about 4%) for paralegals. On the other hand, if more work gets displaced, it must be redone. For example,

if a firm attempts to displace 71% of the work done by lawyers (resp. 37% of the work done by paralegals), the practice will end up having to assume a labor cost of 62.5\$/h for lawyers (i.e. a 5.7% cost increase) and a labor cost of 27.7\$/h for paralegals (i.e. a 11.2% cost increase). This small example shows that task separability matters as getting the wrong scope for the transformation leads to rework and extra costs.

The same holds for labor replacement. Using the data from the survey, it is possible to calculate the proportion of work that could be potentially assumed by digital tools assuming that no tasks are interlinked (i.e. $\frac{\sum_n r_j^n \cdot T_j^n}{\sum_n T_j^n}$ as per the conventions described in section 4.4) and compare it against the proportion of work that can be replaced once linkages between work activities are taken into account (i.e. $\frac{\sum_n r_j^n \cdot 1 \cdot \sum_k M_j(n,k) \cdot r_j^k = 1 \cdot T_j^n}{\sum_n T_j^n}$). Results, displayed in Figure 4.3 and table 4.4, show that the non-separability of certain legal activities means that digital tools cannot replace any of the work done by lawyers, paralegal or secretaries. Therefore, as mentioned earlier in the previous subsection, automation should be considered as a vehicle to complement the work done by lawyers and paralegals via new services rather than an instrument to replace work. Note that this result also appears robust against a change in the methodology used to estimate workload (see table 4). Besides, similarly to what's happening when displacing labor,

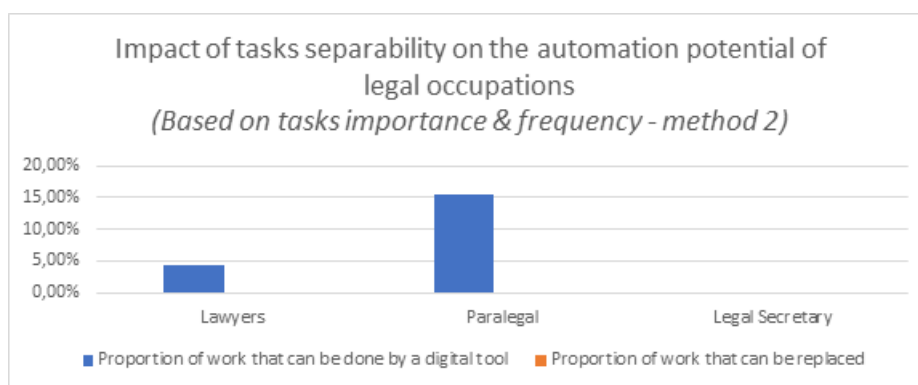


Figure 4.3: Tasks non separability effect on labor replacement potential in the legal industry

getting the wrong scope to the digital transformation of a legal practice results in extra costs. Assume for instance, that a digital tool costs 1M\$ to implement and come with the promise of replacing 4% of the work currently done by lawyers (e.g. to automate searching through public records to produce opinion and establish ownership). In this case a US practice would expect to save about 4.8k\$ per lawyer per year. First, this means that the practice would have to be big enough to yield some benefit of the change.

| % of labor that can be | digitalized | digitalized | replaced | replaced |
|----------------------------|--------------------------------|-------------------------------|--------------------------------|-------------------------------|
| Workload assessment method | Method 1 (based on importance) | Method 2 (based on frequency) | Method 1 (based on importance) | Method 2 (based on frequency) |
| Lawyers | 3.11% | 4.23% | 0% | 0% |
| Paralegals | 14.59% | 15.54% | 0% | 0% |
| Legal secretaries | 0% | 0% | 0% | 0% |

Table 4.4: Effects of tasks non separability on labor replacement in legal occupations.

In this case, if the practice wanted to yield a return after the first year of implement (resp. the second), it would need to employ about 200 (resp. 100) lawyers. But post implementation, the non-separability of tasks would imply that work would in practice not be replaced and that the firm would have paid 1M\$ for nothing. . . .

4.6 Discussion:

The results highlighted in section 4.5 have shown that a sizeable transformation is ongoing in the legal industry. Over the near future, 30% (resp. 8%) of the work done by lawyers (resp. paralegals) can be re-allocated off/near-shore whilst most all the activities (59%) done by legal secretaries will be assumed by off/near-shore workers. This change raises yet a few questions around the associated consequences first on legal practices performance and second on their employees. This section will therefore discuss those two topics and be used to propose potential avenues for future research.

When it comes to discussing the consequences of this transformation (either on firms or individuals), what matters is mainly the speed at which the change can occur. This was recently hinted at by [Eppinger \(2019\)](#) and appears like an area that would greatly benefit some further research. This could for instance mean investigating the key parameters that drive the change at pace within a firm or reviewing the speed at which trade is impacting the legal industry (macro level study). At firm level, a possible starting point here could be to leverage the success drivers identified by the literature around offshoring efforts ([Hutzschenreuter et al., 2011](#)) and see if those parameters are linked to the pace of the transformation.

To understand why speed is so important, let us consider a simple example: a legal firm which generates $y(0)=100\text{M}\$$ of revenue per year at time $t = 0$. Given the employment footprint highlighted in table 4.2, the service delivery model of this firm can be approximated as follows: for every lawyer, the firm employs 0.6 paralegal, 0.3 secretary and another 0.74 employee (e.g.

administrative staff). Assume that the transformation has not started. According to the data provided by the US bureau of labor statistics, a lawyer costs about 122k\$ per year or 59.1\$/h, it can therefore be inferred that a legal employee works on average 2060 hours per year. Additionally, benchmarks from the American Lawyer states that a legal firm generates about 1M\$ worth of revenue per lawyer it employs. This can be used on top of the data pertaining to the service delivery model in place in the industry to deduce that legal firms currently charge a price $p(0)=180\$/h$ per hour of work. The 100M\$ firm therefore currently employs 100 lawyers, 63 paralegals and 32 secretaries and given the costs reported in table 4.2, this firm currently yields a profitability (expressed in % of its revenue) of $0=79.2\%$. Now let us imagine that the firm plans to transform. Over the next couple of years, prices are likely to go down because of competitive pressure by 2% a year as all legal firms embark on the same competitiveness journey (i.e. $p(t+1) = p(t) * 0.98$) (see Ribes (2020) for example). Assume that, for the sake of simplicity, local salaries are fixed (at the levels displayed in table 1), that wages off/near-shore are 50% lower than local ones. Let us consider four scenarios. In the first instance, the firm can displace an extra 1% of labor per year off/near-shore, in the second 3%, in the third 5%. In the fourth scenario, the firm does not displace work (scenario 4 therefore serves as a reference point). Given that the firm does not currently displace labor, this would mean that for it to displace the 12% of lawyers' activities, it would take 12 years in the first scenario, 4 in the second, less than 3 in the third instance.

The transformation's consequences, highlighted in Figure 4.4, are interesting. The associated chart indeed shows that if the transformation is fast enough, it can yield a profitability increase over the short run (scenario 2 3), but that as soon as it stops, competition keeps driving a profitability erosion. Besides, the example also highlights that a slow change does not generate enough costs savings to prevent a decline in profitability (scenario 1). The example therefore illustrates that displacing labor appears more of an instrument used to ensure firms' long-term survival and that it can only result in some short-term performance boost in specific cases. Additionally, this potential performance boost is small (2 to 3% with the data leveraged in the example). Thus, off/near-shoring may only be an instrument of interest for firms above a certain size threshold as driving the change will require some resource and will come with some level of costs. For instance, if one employee is needed to drive the change, say with a cost of say 120k\$ per year, a firm can only start displacing work if it generates more than 4 to 6 M\$ of revenue per year (otherwise the costs associated to the transformation out weight its benefits). Note that this question of threshold could also benefit from some further research. Outside of consequences on legal practices' performance, the transformation highlighted in this chapter is also bound to lead to modifications in terms of how employees are compensated and

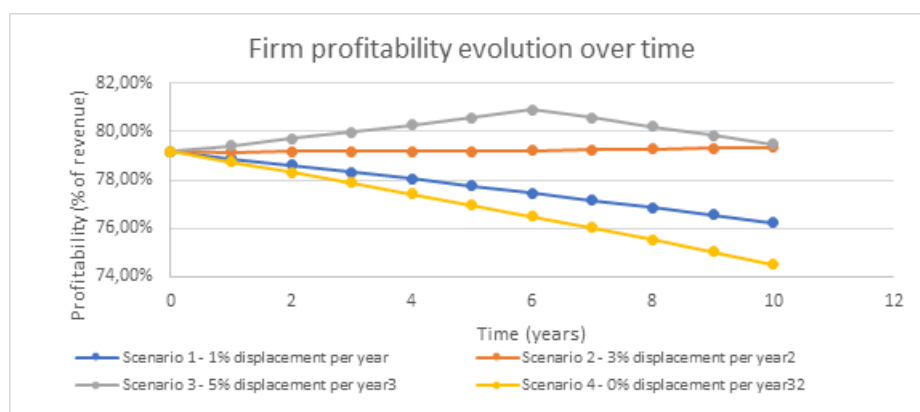


Figure 4.4: Profitability evolution of a legal practices under diverse transformation speeds

incentivized (micro-economic/firm level considerations) as well as to have an impact on the overall local employment in the sector (macro-economic level considerations).

From a micro-economic perspective, the transformation may have an impact on the standard hierarchical career in place in the legal industry (i.e. the “up or out” where junior employees strive to succeed an existing partner in a legal practice). First, the sustainability of the model would have to be verified (perhaps through a discussion like the one of [Ribes et al. \(2020\)](#)). Second, it would be interesting to have empirical data assessing whether such changes have an impact on local workers’ compensation. Recent theoretical discussions indeed pointed out that it may not lead to major change in salaries, but it could be worth verifying the order of magnitude here. Finally, it would worth further investigating the effect the change has at the beginning and the end stages of legal careers. For junior workers, it could be interesting to review to which extent entry screening mechanisms change or if there is change in competencies required to enter the labor market. Note that the need to further understand firm’s screening mechanism is a topic regularly highlighted by the literature revolving around personnel economics ([Lazear, 1999](#)). This could indeed be useful for junior workers as well as for the educational system. But it could be useful to understand how legal careers are initiated, it could also be of interest to understand what’s happening at the end of the legal professional journeys. Is becoming an equity partner at a law firm still the goal of such careers? Is there landing ranks appearing? Is even the partnership model still relevant ([Greenwood et al., 2017](#))? ...

But the usage of a multi local service delivery model and of digital tools also calls for a discussion beyond the one around the adaptation of standard firms’ managerial practices. Overall, displacing or replacing work reduces

the need for local labor. It would therefore be of interest to further understand the levers of growth in the legal industry and review how the speed of the transformation impacts employment. The growth (revenue wise) of the industry indeed implies that the need for labor increases. But on the other hand, the transformation is about reducing the reliance of firms on local employees. So will the transformation translate in a slower employment growth or will it even lead (temporarily if not over the long run) to a decline in employment?

4.7 Conclusion:

This chapter has shown that a large portion of activities in the legal industry could be done remotely and that if digital tools do not replace legal labor at scale, they could rather complement it. This means that if legal practices will undergo a transformation over the course of the following years, it is not going to be as drastic as previously highlighted by the literature. The activities done by lawyers, paralegals and legal secretaries are indeed interlinked and quite often not separable. As a result, only 30% (resp. 7.6%) of the tasks done by lawyers (resp. paralegals) could actually be off/near-shored. Finally, the chapter shows that getting the wrong scope when transforming a legal firm may result in a significant loss in terms of performance (up to 20% of cost increase). Caution is therefore required when transforming to improve competitiveness.

Chapter 5

Displacement and PSFs' performance.

5.1 Summary.

5.1.1 French version:

Ce chapitre propose une exploration empirique des effets de la délocalisation d'activités de production sur la performance d'entreprises de conseil aux US. Cette étude est faite via un ensemble de données propriétaires & uniques. Elle montre qu'en moyenne, pour chaque pourcent d'activités délocalisées, les coûts de production de service décroissent de 3.7\$/h. Cette dégrue des coûts est corrélée à un réduction de prix de l'ordre de 3.3\$/h, si bien que même si les revenus décroissent, la transformation est profitable. En outre, l'étude montre que ce type de transformation est seulement l'apanage d'entreprises larges (i.e. plus de 1000 employés)(ce qui suggère une importante barrière à l'entrée) et qu'elle nécessite environ 5 années pour atteindre son potentiel.

5.1.2 English version:

This chapter empirically investigates the effects of labor displacement on US management consulting firms. This is done via a unique and exclusive data set. In the context of US management consulting practices, the chapter shows that for every percent of work displaced, production costs are reduced by 3.7\$/h on average. It also highlights that since prices also go down by 3.3\$/h on average per percent of work displaced, off/near-shoring increases MC practices profitability. Displacing labor is yet a transformation that occurs mainly in very large firms (i.e. more than 1000+ employees) and which full potential takes more than 4 to 5 years to realize. This suggests that leveraging a multi local service delivery model presents adoption

barriers that only large management consulting firms can overcome.¹

5.2 Introduction.

The topic of displacing activities off/near-shore, in both manufacturing and services, has raised a lot of interest over the past two decades across academics, economists and professionals (Pisani and Ricart, 2016). Independently of their sector of activity, firms are indeed engaged in a race to improve their competitiveness to increase their survival chances (Hopenhayn, 1992). To do so, they must both standardize their activities to operate at a lower cost and invest continuously in technology to improve their productivity (Markides and Berg, 1988).

Lowering costs has two main benefits. First, it enables firms to enter new markets where they could not operate profitably. Second, it translates into an increase in profitability that can be used to fuel investments related to both market access and productivity improvement (Kotabe and Swan, 1994; Di Gregorio et al., 2009; Bertrand, 2011). Therefore off/near-shoring, with its inherent promise of cost reduction (Ellram et al., 2008; Erber and Sayed-Ahmed, 2005) has become such a massive strategic imperative for many firms.

Interestingly, the scope of activities that have been considered for displacement has increased over time. According to (Doh et al., 2009), if labor displacement was primarily considered for high frequency and repetitive tasks (e.g. reporting, payroll administration etc...), the current practices have evolved. Over time, technological advances have indeed made routine tasks highly likely to be automated. In parallel, firms have gained more knowledge around the way they can operate globally. This has made them realize that displacing labor could also encompass innovation related tasks (for instance engineering and software development) and real time information exchange tasks (e.g. call centers).

If the motivations and principles behind the topic of labor displacement are clear, the recent literature review of (Mihalache and Mihalache, 2016) has suggested that labor displacement may not necessarily result in the expected increase of performance. As a benchmark (Aron and Singh, 2005), only 1 out of 2 organizations that has displaced labor reaps some benefit out of the associated transformation. If there is a consensus that displacing labor increases the firm survival chances (Coucke and Sleuwaegen, 2008), it does not necessarily translate into an increase in profitability nor in productivity. This is due to two main factors. First, it is important to remark that all firms share the same strategic options (i.e. labor displacement is available to all firms). In manufacturing, this leads to a general price reduction (Kohler, 2004) as this practice gets more common in a given market. This also means

¹This chapter was originally published as (Ribes, 2020).

that if firms are not able to transform themselves rapidly enough to compensate for market pressure (Mol et al., 2005), their profitability will shrink (see Stephan et al. (2008)). Second, displacing labor incurs some hidden extra costs that may impact both profitability and productivity. Additional layers of control and coordination indeed need to be put in place (Mugele and Schnitzer, 2008; Dibbern et al., 2008) and some knowledge transfer needs to happen (Chua and Pan, 2008). That is why recent studies such as the one of (Bhalla et al., 2008) have focused on clustering activities that can be displaced based on their hidden cost profile. To my knowledge, empirical studies on the impact of labor displacement on firm performance are limited. The main examples focus on either the manufacturing space (Aron and Singh, 2005) or the IT industry (Bhalla et al., 2008). However macro level studies such as the one of (Andersen, 2006) have stressed that the impact of labor displacement is heavily dependent in the industrial sector. As of today, there is no trace in the literature of benchmarks for management consulting firms, let alone professional services (e.g. audit, law, engineering..) ones. The data-set presented in this chapter therefore provides a unique and meaningful addition to the existing body of knowledge on this topic. When it comes to discussing the impact of labor displacement on Management Consulting [referred to as MC in the rest of this chapter] firms, a few questions arise. First, considering the literature, one may wonder to which extent such a transformation may impact firm performance (i.e. does it really translate into a profitability increase?). Second, when it comes to the operationalization of such a change, a few questions appear: Is labor displacement fit for purpose for all firms? How long does it take to implement? What does it take to be sustainable?

Those queries will be addressed empirically in this chapter. To do so, I will first perform a succinct literature review. This will be used as a reference point in the following description of the present data-set, hypothesis setting and the associated quantitative tests (linear and logistic regressions), which will be used to assess the impact of labor displacement in the management consulting space. The results will finally get discussed with an operational lens. Practical implications, limitations as well as potential next steps will also be reviewed.

5.3 Theoretical framework:

This section summarizes the theoretical foundations of the chapter. This is done in two steps. First some definitions of MC firms' performance are provided. Then the existing literature on labor displacement and its consequences on firm performance is reviewed.

5.3.1 MC firm's performance:

In the management and economic literature, the performance of a firm is usually assessed along 3 dimensions: its growth, its productivity and its profitability (see [Bottazzi et al. \(2008\)](#) for example). The first pillar, growth, is usually evaluated either through the firm revenue or employment evolution ([Sutton, 1997](#); [Lotti et al., 2003](#)). Given that the revenue of a MC firm is highly correlated to the number of individuals it employs (i.e. consulting firms sell specific element of knowledge that are then tailored to clients by individuals ([Løwendahl, 2005](#)), both measures could be considered equivalent. However, the MC field is evolving rapidly as an increasing number of offerings start to encompass an element of technology. Technology indeed offers a medium to store and quickly share/produce knowledge (see [Sarvary \(1999\)](#) or [Kenney and Zysman \(2019\)](#) for recent discussions). This means that looking at growth nowadays may be best tackled through a revenue lens.

Given their business and operating model, the focus of MC firms performance has traditionally been on growth ([Maister, 2012](#)). However, with the consulting market maturing (especially in developed countries) looking at growth is no longer sufficient. Recent studies have indeed found that in the MC space, labor productivity (usually expressed in terms of revenue per employees ([Nachum, 1999](#)) and profitability can be pressured ([Sako and Tierney, 2005](#); [Sako, 2006](#)) for striking UK based examples [e.g. productivity decrease superior to 2% per year]). Thus, the question of performance has evolved from “how to grow?” to “how to do so in a profitable fashion?”, a concept, which, according to recent literature reviews focused on the MC sector ([Empson et al., 2015a](#); [Mosonyi et al., 2020](#)), appears worthwhile investigating.

The reason behind this phenomenon and the associated interest is well-known: over time knowledge gets commoditized ([Manning, 2013](#)). This leads to a natural decrease in consulting competitiveness and results in a drop in the associated prices. To grow profitably, MC firms have therefore to combine two types of activities. On one hand, they need to grow their client pool at a faster pace than price declines and/or develop new offerings that can extend the firm portfolio and offset the revenue decline due to price changes. On the other, they need to reduce their production costs. A popular option here consists in displacing geographically some service production activities ([Stephan et al., 2008](#)). But to my knowledge, there is no information available to the impact of such a transformation for MC firms despite the abundant literature on the topics of international trade and labor displacement off/near-shore (see next sub-section). This is therefore topic that this chapter will shed more light on.

5.3.2 Labor displacement and its impact on performance:

Over the past decades, the literature on labor displacement has mainly been dominated by two theoretical perspectives. On one hand, the resource-based view (Barney, 1991) has stressed that firms should seek resources based on their availability, whilst on the other hand, the transaction cost economics perspectives (Williamson, 1981) has highlighted that firms should seek resources where financially relevant. The two approaches although different are complementary and have recently led to more integrated frameworks where the decision in terms of the localization of an activity (either from a geographical standpoint or from a firm boundary perspective (i.e. outsourcing) is first assessed based on availability and feasibility considerations (RBV) and then confirmed/informed financially (TCE) (Peris Bonet et al., 2010). However, the literature has stressed in many occurrences that the financial success of such transformation is not certain and that more sectoral studies and analysis around labor displacement's success drivers are needed. This is something that this chapter contributes to when it comes to the management consulting space. This contribution will now be highlighted by reviewing the current body of knowledge that has stemmed from the TCE and RBV theory. This will be done by first summarizing what is known around labor displacement and then what is understood about its impact on firm performance.

Labor displacement:

Displacing labor is well-known as an instrument to improve competitiveness through the optimization of production costs (Ellram et al., 2008). It has been the subject of numerous discussions in the literature. Nonetheless, it has mainly been debated, for historical reasons, in the context in the manufacturing firms (McCarthy and Anagnostou, 2004; Ulrich and Ellison, 2005; Nordås et al., 2006). In this context, the idea has been to decompose the production chain of a good in intermediary inputs and localize the production of each input in the most competitive place possible (Miroudot et al., 2009). This idea has since then also gained the field of services (Leshner and Nordås, 2006) and has sprung the emergence of a new branch in the literature around trade (Manning et al., 2008; Dossani and Kenney, 2007; Lewin and Peeters, 2006).

In this case, the main methodology used to structure labor displacement is to decompose the service production chain into tasks (Baldwin and Robert-Nicoud, 2014) and then to sequentially reallocate them (Lewin and Peeters, 2006). Initially, the only tasks considered as in scope for this kind of transformation were the ones that had an administrative and/or routine nature. This means that about 20 to 50% of the activities associated to service production were susceptible to relocation (Jensen et al., 2005; Jensen and

Kletzer, 2010). But recently this thought process has evolved to encompass complex technical and innovation - related activities (Lewin et al., 2009). This has been associated to the rise of specialized hubs (Kenney et al., 2009), where an abundance/oversupply of skills is generating lower labor costs (e.g. In India, there is currently an excess of software development capabilities that is driving prices down). All those recent evidences stress that not only is labor displacement a trending topic, but also that its impact in services may potentially be underestimated.

Ideas about labor displacement have therefore reached the service sector over the past decade and scholars have converged to an initial consensus when it comes to amount of work that could potentially be reallocated. But this field of research is still evolving along two main directions. First, at a macro level, economists are still exploring the benefits and risks of trade for the overall economy (gains in terms of Gross Domestic Product (GDP) or innovation capabilities (number of patents) – see Costinot and Rodríguez-Clare (2014) for a review) and for domestic labor market (wages, unemployment rates ... - see Hummels et al. (2018) for a recent review). Yet, as stressed by Arkolakis et al. (2019), it is not clear at an aggregated level of who benefits from international trade. Second, at a micro level, the recent literature review of Pisani and Ricart (2016) shows that if scholars have mapped the motivations (including the areas of applications in terms of activities business processes (Stephan et al., 2008) and the success factors of such transformation programs for individual firms (Larsen et al., 2013), there is still much work to do when it comes to understanding the associated consequences, notably in terms of performance (Larsen et al., 2019). This is something this chapter will tackle in the context of MC firms.

Outcome of labor displacement on firm performance:

The general consensus is that displacing labor comes with an increase in productivity (e.g. more units of a good/service are produced for the same costs) (Amiti and Konings, 2007; Halpern et al., 2015). However, besides “volume” effects, the literature records mixed evidences with respect to the impact of labor displacement on firm growth and profitability (Tadelis, 2007; Mihalache and Mihalache, 2016; Gilley and Rasheed, 2000; Kroes and Ghosh, 2010). As stressed in the introduction, the benchmark from (Aron and Singh, 2005) indeed stress that only 1 out of 2 organizations that has displaced labor reaps some benefits out of the associated transformation. The main reason behind this heterogeneity appears to be the difference in competition strength across sectors. The price of a good or a service indeed moves opposite to a change in its world supply (Grossman and Rossi-Hansberg, 2008). Given that labor displacement increases services and good availability (through productivity effects), it therefore comes with price reductions (Kohler, 2004). If labor displacement is well engrained in the field, prices

should decrease quickly and if a firm's transformation is slower than the one of its market(s), its performance still erodes despite its current effort to remain competitive.

The consequences of such a transformation on firm performance are therefore more related to the timing of the transformation decision and the difference in speed between a firm production chain's changes and the associated market's evolution. Recent evidences (Eppinger, 2019) indeed stress that the firms that could benefit from labor displacement are the ones which transform first. Given that the phenomenon is fairly new in the context of professional services (Metters and Verma, 2008; Sharma and Loh, 2009; Sako, 2015), one could expect that displacing labor in the consulting industry currently still yields benefits relatively easily which is what this chapter will showcase.

In summary, section 2 shows that there is an abundance of literature on the topic of labor displacement. Its theoretical foundations are relatively simple though. In the context of services, reallocating labor near/off-shore consists in displacing activities and processes (Grossman and Rossi-Hansberg, 2008) in a sequential and opportunistic manner (Lewin and Peeters, 2006). This is therefore a long-term transformation program for many firms. There are two main reasons behind this effort from an individual firm. First, from a managerial point of view (e.g. a resource-based view), when firms struggle to find resources locally, it makes sense to look for them elsewhere (Stephan et al., 2008). This is why India for instance, with its pool of technology professionals, has become the primary IT hub of many firms. Second, from an economic standpoint (e.g. a transaction costs economics view), it makes sense to look for resources in an environment where they are available in large numbers as it drives costs down (Ellram et al., 2008). However, a recurring problem is that the financial outcomes of such transformation are sector dependent and need further investigations (Pisani and Ricart, 2016; Larsen et al., 2019). This chapter therefore contributes to the field by providing empirical evidences of what this transformation means for the performance of management consulting firms.

5.4 Method & Results:

Data description:

This study uses revenue, workload and workforce composition indicators from a firm providing operational planning services and benchmarks to the professional services industry in North America. Firms potentially in scope to the study were filtered based on their NAICS affiliation (firms in the management consulting industry are indeed classified under the NAICS code 54161). Out of that subset an anonymous partition of 40 practices was generated, based on the provider's ability to use its own databases to provide

the desired information.

The associated longitudinal data set upon which this chapter is built tracks the evolution of $I = 40$ individual firms $i[1, \dots, 40]$ in the management consulting space between 2015 and 2018 in the United States. Within the data set, for each time point t , practices monthly revenue ($R_i(t)$ expressed in US\$), total workload (expressed in hours) ($H_i(t)$), as well as their associated proportion of work displaced off or near-shore [i.e. not delivered from the US] ($O_i(t)$) (expressed in a percentage of total workload) was recorded. Note that for each practice i , the price of an hour of work ($P_i(t) = \frac{R_i(t)}{H_i(t)}$) was also calculated. The key statistics displayed in table 1 show that within the data set, 50% of the MC practices are generating more than 2.2M\$ of revenue per month, 50% of the MC practices are pricing one hour of service above 203 \$/h and that there was a significant usage of off/near-shore services (1 out of 2 practices had some level of their activities produced outside of the US

Moreover, as in [Maister \(2012\)](#), the number of workers in those practices was monitored and the associated population was divided in two categories: sellers (of which there was $n_i^s(t)$ in practice i at time t), who are senior resources dedicated the client acquisition and producers whose focus is purely on service delivery. Finally, practices' profitability ($\Pi_i(t)$) (expressed as the revenue minus the total workforce costs) was also recorded. As seen on table 5.1, if profitability was highly variable across months and practices, average workforce costs only represented about 50% - 40% of the average MC practice revenue.

| Parameter — Quantile | 25% | 50% | 75% |
|------------------------------------|--------|--------|--------|
| Monthly revenue $R_i(t)$ (M\$) | 0.90 | 2.22 | 5.98 |
| Hours worked $H_i(t)$ (kh) | 4.11 | 10.85 | 31.71 |
| Offshoring share $O_i(t)$ (%) | 0.00 | 1.55 | 14.11 |
| Hourly labor price $P_i(t)$ (\$/h) | 136.89 | 203.17 | 290.85 |
| Profit $\Pi_i(t)$ (M\$) | 0.32 | 1.17 | 3.40 |
| Number of sellers $n_i^s(t)$ | 6 | 14.8 | 31 |

Table 5.1: MC practice monthly financial indicators - data set distribution

For reference, the statistics displayed by the US census as part of its Statistics of US Businesses [SUBS] program show that MC firms (registered under the NAICS code 54161) had in 2012 a national average of 7.3 employees and generated on average 220.8 k\$ of revenue per employee on an annual basis. On the other hand, labor costs were recorded to be of 81 k\$ per employee per year. Assuming that across the US, MC employees work 1750h per year and dedicate 70% of their time on average to revenue generation activities, it turns out that, at a national level, a US MC employee

generates 180 \$/h and that MC labor yields a 63% profitability. The current data sample therefore appears on par with the main national statistics.

Note that the data presented in this study is also aligned with the yearly US surveys published by Accounting Today, which record the revenue, leverage and partnership size in the top 100 US accounting and MC firms. Even though this benchmark is directional in nature (the Accounting Today's survey indeed only encompasses large firms across both the accounting and MC industry), it can be used as a sanity check. For instance, in 2018, Accounting Today reported an average revenue per partner of 1.9M\$ per year and a leverage of 9 employees per partner. Given that an employee comes with yearly cost of 80k\$, this would lead to a labor profitability of about 60%. The present data-set therefore recoups public estimates in terms of both revenue per partner and profitability.

5.4.1 Hypothesis & results:

Labor displacement is primarily understood as a medium to reduce production costs, which generates the following hypothesis.

Hypothesis 1: *Production costs decrease in the management consulting sector when labor is displaced.*

In the case of MC services, there is however no benchmark available on the topic. The impact of labor displacement on the hourly production costs of the MC practices ($C_i(t) = \frac{R_i(t) - \Pi_i(t)}{H_i(t)}$) is therefore assessed through the calibration of the following regression to the present data-set:

$$C_i(t) = \alpha + \beta.O_i(t) + \gamma.O_i^2(t) + \delta.n_i^s(t) + \phi.t \quad (5.1)$$

In the proposed model, the parameter α represents the cost of one hour of local labor, while parameters β and γ represented the cost savings associated to labor displacement. As firms' production costs are also known to be subject to economies of scale (Krugman, 1980) and to labor market trends, two parameters δ and ϕ have been added to account for both (dis) economies of scale and time trends.

Calibration results (see table 5.2) show that the average hourly local production cost of MC services is worth $\alpha = 176\$$ and that for every percent of work displaced, production costs decrease linearly by $\beta = 3.7\$/h$. The calibration also highlights that MC firms are subject to certain economies of scale as for each new seller, production costs decrease by $\delta = 0.35\$/h$. Given that a seller leverages about 6.5 employees, large firms (i.e. 35+ sellers and 250+ employees) experience a reduction in local production costs of 12\$/h (i.e. 6%+). Note that nonlinear effects (γ) do not have enough magnitude to meaningfully impact production costs and that market trends (ϕ) do not appear to be significant. If labor displacement decreases production costs

| Parameter | Estimate | Standard Error | P Value |
|------------------------|----------|----------------|---------|
| α (\$/h) | 176.7 | 17.3 | <2e-16 |
| β (\$/h) | -373.4 | 7.1 | <2e-16 |
| γ (\$/h) | -4.61 | 0.14 | <2e-16 |
| δ (\$/h/seller) | -0.35 | 0.12 | 0.006 |
| ϕ (\$/h/month) | 0.57 | 0.57 | 0.31 |

Table 5.2: MC production costs parameter estimation

(i.e. hypothesis H1 appears valid), Kohler (2004) also stressed that it may also be associated to price reductions.

Hypothesis 2: *In the management consulting space, displacing labor is linked to price reductions.*

This was tested with the following regression:

$$P_i(t) = \alpha + \beta.O_i(t) + \gamma.O_i^2(t) + \delta.n_i^s(t) + \phi.t \quad (5.2)$$

In this model, the parameter α represents a baseline price, while parameters β and γ measure the impact of labor displacement on prices. Since Greenwood et al. (2005) stressed that reputation could impact prices, a control parameter δ was added to account for a potential price increase in practices that have a larger footprint and therefore reputation in the marketplace. Potential time effects (e.g. due to the standardization of the service offering) were controlled through parameters ϕ . The model explains $R^2 = 84\%$ of the data-set variations. Its calibration (see table 5.3) shows that MC services have a baseline price of $\alpha = 284\$/h$ in the US when delivered by local resources. If time has no significant impact on prices, displacing labor comes with major changes as prices lower by $3.3\$/h$ for every percent of work that gets displaced. This means that if, as specified in Jensen et al. (2005), labor displacement occurs for 20% (resp. 50%) of the overall service production activities, prices go down to $223\$/h$ (resp. $127\$/h$). Interestingly the size of a MC firm does not have a significant impact on prices. If

| Parameter | Estimate | Standard Error | P Value |
|------------------------|----------|----------------|---------|
| α (\$/h) | 283.7 | 9.59 | <2e-16 |
| β (\$/h) | -328.1 | 3.92 | <2e-16 |
| γ (\$/h) | 2.19 | 0.08 | <2e-16 |
| δ (\$/h/seller) | 0.09 | 0.07 | 0.179 |
| ϕ (\$/h/month) | 0.01 | 0.31 | 0.973 |

Table 5.3: MC prices parameters estimation

labor displacement leads to a cost saving of $3.7\$/h$ and a price reduction of $3.3\$/h$, it comes with an increase in profitability.

Hypothesis 3: *In the management consulting space, displacing labor improves practices profitability.*

Since recent studies such as the one of [Bhalla et al. \(2008\)](#) found mixed evidence that labor displacement translated into an increase in firm performance, the hypothesis 3 was reviewed through the following regression:

$$\frac{\Pi_i(t)}{H_i(t)} = \alpha + \beta.O_i(t) + \gamma.O_i^2(t) + \delta.n_i^s(t) + \phi.t \quad (5.3)$$

In this case, α represented the profitability of one hour of work delivered locally, β and γ the effect of labor displacement on profitability. δ and ϕ acted as control for efficiencies of scale and market trends. The calibration results are in line with the previous two models. The profitability of one hour of local work $\alpha = 106\$/h$ is improved by $\beta = 0.4\$/h$ for every % of work displaced. If market trends do not appear significant, for every new seller, profitability increases by $\delta = 0.4\$/h$ due to production efficiencies. If a distributed service delivery model increases firm performance despite

| Parameter | Estimate | Standard Error | P Value |
|------------------------|----------|----------------|---------|
| α (\$/h) | 106.8 | 18.1 | <2e-16 |
| β (\$/h) | 5.2 | 7.4 | <2e-16 |
| γ (\$/h) | 6.81 | 0.15 | <2e-16 |
| δ (\$/h/seller) | 0.45 | 0.14 | 0.0009 |
| ϕ (\$/h/month) | -0.56 | 0.59 | 0.341 |

Table 5.4: MC firm profitability parameters estimation

price reductions, previous studies such as the one of [Roza et al. \(2011\)](#) have noted that firm appetite for labor displacement was dependent in their size. As half of the present data-set was composed of firm which did not displace labor, the following hypothesis was investigated:

Hypothesis 4: *The probability of a firm to displace labor increases with its size.*

This was tested by calibration the following logistic regression:

$$\log(P(O_i(t) > 0)/(1 - P(O_i(t) > 0))) = \alpha + \beta.n_i^s(t) + \gamma.1_{O_i(t-1)>0} \quad (5.4)$$

This regression indeed helps assess to which extent the probability that a MC practice displaces labor $P(O_i(t) > 0)$ is impacted by its size, measured in terms of its number of sellers $n_i^s(t)$, through the parameter . Since displacing labor involves a firm wide transformation, this probability was also assumed to be dependent previous behavior (i.e. if a firm has already started displacing labor, chances are that it will keep doing so). This is represented

by parameter α . When calibrated, the regression yielded a very high accuracy (i.e. $>95\%$). Its results (displayed in table 5.5) show that if labor displacement is not in place, it takes a community of 150+ sellers (i.e. a firm of 1000+ employees) to get a 50% chance to start a labor displacement program. Additionally, once in place, labor displacement does not stop (i.e. there is no evidence of re-shoring). In the management consulting sector, la-

| Parameter | Estimate | Standard Error | P Value |
|-----------------|----------|----------------|----------|
| α (\$/h) | -3.13 | 0.18 | $<2e-16$ |
| β (\$/h) | 0.019 | 0.005 | $<1e-4$ |
| γ (\$/h) | 6.67 | 0.19 | $<2e-16$ |

Table 5.5: MC labor displacement probability - parameters estimation

bor displacement appears as a relevant option to increase firm performance. If prices go down by 3.3\$/h as the benefits of labor displacement are shared with clients, this type of transformation yields enough benefit to increase profitability by 0.4\$ per hour of work. This type of program appears yet restricted to very large firms (i.e. 1000+ employees).

5.4.2 Additional insights:

Displacing labor is a transformation for a management consulting practice. If the benefits of this change appear clear considering the results displayed in the previous section (i.e. profitability increases when MC firms are large enough to start such a program), the operational details behind it are worth discussing. There are notably two dimensions on which the literature appears, to my knowledge, shy: the time it takes to implement such a transformation and its implication for firms' career frameworks and employees' incentives structure.

The longitudinal structure of the data-set presents a unique opportunity to test the speed at which labor displacement can occur. This was assessed by calibrating the following regression:

$$(H_i.O_i)(t) = \alpha + \beta.n_i^s(t) + \gamma.(H_i.O_i)(t-1) + \delta.(H_i.O_i)(t-2) + \phi.(H_i.O_i)(t-3) + \psi.(H_i.O_i)(t-4) \quad (5.5)$$

The underlying idea is that the overall volume of work that a practice displaces ($H_i.O_i(t)$) is driven by sellers pushing work out (parameter β). As most MC practices are structured as partnerships (Maister, 2012), sellers, who are generally equity partners and gets compensated based on the profits generated by the practice, have a direct incentive to transform their service delivery model. Sellers' decisions therefore fuel the transformation. Additionally, the delivery of a service usually spans over a couple of months.

Some of the overall volume of displaced work thus results from prior engagements being carried over. When investigating the lagged correlation in the data-set, this carry-over structure was significant across 4 months' worth of activity. Those correlation are represented by the parameters $\gamma, \delta, \phi, \psi$, which each represents the percentage of work that gets carried over from previous periods.

The calibration of this regression yields a high explanatory power ($R^2 = 73\%$) and shows (see table 5.6) that, when the practice is large enough to have an off/near-shoring program in place, each seller displaces an extra =30h worth of work every month. Additionally, close to 90% ($\gamma + \delta + \phi + \psi$) of the current displaced labor results from carried over activities. Given that

| Parameter | Estimate | Standard Error | P Value |
|-------------------|----------|----------------|---------|
| $\alpha(h)$ | -9.78 | 1.6e-4 | 0.56 |
| $\beta(h/seller)$ | 30.2 | 4.1 | <2e-16 |
| $\gamma(\%)$ | 36 | 1.53 | <2e-16 |
| $\delta(\%)$ | 25.6 | 1.61 | <2e-16 |
| $\phi(\%)$ | 16.1 | 1.62 | <2e-16 |
| $\psi(\%)$ | 11.8 | 1.54 | <2e-16 |

Table 5.6: Labor displacement transformation speed - parameters estimation

a seller generates 1.6k hours of work per month on average, the previous regression can be used to assess how long it takes for labor displacement to reach its full potential. Results, displayed in Figure 5.1 to displace 15%+ of labor and that afterwards, the transformation speed slows drastically. This appears in line with past findings. [Hutzschenreuter et al. \(2011\)](#) has indeed shown that the time it takes to re-allocate a given activity off/near-shore is a matter of six months to a year. Therefore, the sequential process ([Lewin and Peeters, 2006](#)) of displacing multiple activities (i.e. up to about 20% of work) is usually taking several years.

If the average length of the transformation associated to labor displacement is clear, one may question its impact on MC practices sustainability. MC firms indeed operate according to an “up or out” model ([Tece, 2003](#)), where employees responsible for service production are screened and either trained to become business developers/sellers (the “up”) or incentivized to exit the organization (the “out”). This screening is highly selective as benchmarks ([Carvalho and Cabral-Cardoso, 2008](#)) state that 15% to 30% of employees leave the organization every year. If the selection process remains unchanged, while local workforce needs are reduced due to labor displacement, the overall pool of potential business developer will shrink. This may result in a loss of relationships in the firm portfolio which will translate in a loss in revenue. This risk to practices sustainability can potentially be solved by modifying the career structure of MC practices. This comes either in the

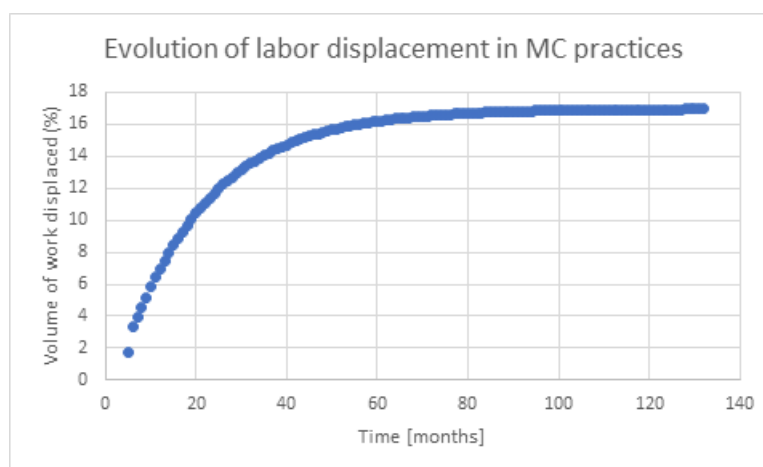


Figure 5.1: Labor displacement evolution

form of proposing alternatives to the “out” or in the form of career acceleration programs.

However, the organizational impact of displacing labor is unlikely to be limited only to career tracks. Wages will also have to shift to preserve workers’ incentives. Assuming the tournament structure and notably the deferred compensation mechanism described by (Lazear and Rosen, 1981) still holds, a compensation polarization may occur. Employee wages will have to decrease. If business development opportunities remain the same, displacing work means that there will be less candidates for the same number of open business developer/seller position. As promotion chances for minders will get higher while business developer compensation will increase (as a direct result of profitability improvements generated by labor displacement), compensation will be more deferred and local employee wage should decrease. This potential re-allocation is in line with some of the macro movements that have been observed at country level in most developed economies. (Mithas and Whitaker, 2007; Hakkala et al., 2014; Baumgarten et al., 2013) have indeed reported that displacing labor consistently lead to a wage increase (resp. decrease) for more skilled (resp. less skilled) workers.

5.5 Discussion & conclusion:

5.5.1 Robustness checks:

In order to assess the robustness of the previously described results, three types of analysis were performed. First, the proposed regressions were corrected (as illustrated below) by adding a practice dependent fixed effects α_i to correct for potential biases induced by the different nature of services provided between management consulting practices. For instance, a

MC practice specialized in technology consulting for financial services may have a different approach to offshoring than a MC practice providing HR consulting services to manufacturing actors.

$$\begin{cases} C_i(t) = \alpha_i + \beta.O_i(t) + \gamma.O_i^2(t) + \delta.n_i^s(t) + \phi.t \\ P_i(t) = \alpha_i + \beta.O_i(t) + \gamma.O_i^2(t) + \delta.n_i^s(t) + \phi.t \\ \frac{\Pi_i(t)}{H_i(t)} = \alpha_i + \beta.O_i(t) + \gamma.O_i^2(t) + \delta.n_i^s(t) + \phi.t \end{cases} \quad (5.6)$$

The calibration results of those augmented regressions are displayed in tables (5.7;5.8,5.9). The table shows that insights remain consistent independently of the practice inherent service offering. Prices [resp. production costs] are indeed negatively correlated with the use of off/near-shore resources (H1) (H2), whilst profitability is positively correlated to the use of labor displacement techniques (H3). Note that the magnitude of those correlation (i.e. β, γ) remain also unaltered by the introduction of practice specific fixed terms.

Second, the proposed regressions were also altered to verify if the use

| Parameter | β | γ | δ | ϕ |
|----------------|---------|----------|----------|--------|
| Estimate | -363.2 | -5.96 | 0.31 | 0.36 |
| Standard Error | 6.75 | 0.18 | 0.2 | 0.55 |
| P value | <2e-16 | <2e-16 | 0.12 | 0.3 |

Table 5.7: Calibration results of the cost related regression with practice level fixed effects.

| Parameter | β | γ | δ | ϕ |
|----------------|---------|----------|----------|--------|
| Estimate | -332.9 | 2.58 | 0.95 | 0.31 |
| Standard Error | 3.36 | 0.09 | 0.1 | 0.27 |
| P value | <2e-16 | <2e-16 | <2e-16 | 0.25 |

Table 5.8: Calibration results of the price related regression with practice level fixed terms

| Parameter | β | γ | δ | ϕ |
|----------------|---------|----------|----------|--------|
| Estimate | 30.2 | 8.5 | 0.63 | -0.03 |
| Standard Error | 6.9 | 0.19 | 0.21 | 0.57 |
| P value | <2e-16 | <2e-16 | 0.002 | 0.95 |

Table 5.9: Calibration results of the profitability related regression with practice level fixed terms

of a scaled variable (i.e. a percentage) representing the usage of off/near-shore resources into the production mix generated a bias. This was done by

replaying the calibration exercise with the following specifications:

$$\begin{cases} C_i(t) = \alpha + \beta.(O_i(t) * H_i(t)) + \gamma.(O_i(t) * H_i(t))^2 + \delta.n_i^s(t) + \phi.t \\ P_i(t) = \alpha + \beta.(O_i(t) * H_i(t)) + \gamma.(O_i(t) * H_i(t))^2 + \delta.n_i^s(t) + \phi.t \\ \frac{\Pi_i(t)}{H_i(t)} = \alpha + \beta.(O_i(t) * H_i(t)) + \gamma.(O_i(t) * H_i(t))^2 + \delta.n_i^s(t) + \phi.t \end{cases} \quad (5.7)$$

Results, shown in tables (5.10,5.11,5.12), also suggest that the insights of section 3 are robust. The hypothesis (H1) (H2) (H3) are indeed also verified with this type of formulation. The only difference appears to be that the relations between the volume of work displaced and financial performance appear curvi-linear rather than linear. Besides the updated profitability regression appears to indicate that unless there is a sufficient volume of work displaced, the transformation may not be efficient as prices go down faster than costs. This appears to echo the findings associated to (H4).

Finally, the regression associated to (H4) was also revised to stress-test the

| Parameter | β | γ | δ | ϕ |
|----------------|----------|----------|----------|--------|
| Estimate | -2.11e-3 | 8.5e-9 | -9e-3 | 4.6 |
| Standard Error | 7e-4 | 5e-9 | 0.19 | 0.26 |
| P value | 0.0046 | 0.095 | 0.95 | <2e-16 |

Table 5.10: Calibration results of the cost related regression with non scaled offshoring variables

| Parameter | β | γ | δ | ϕ |
|----------------|---------|----------|----------|--------|
| Estimate | -5.1e-3 | 2.1e-8 | 1.2 | 7.6 |
| Standard Error | 6.7e-4 | 4.6e-9 | 0.17 | 0.23 |
| P value | 1.9e-14 | 4.6e-6 | 7e-12 | <2e-16 |

Table 5.11: Calibration results of the price related regression with non scaled offshoring variables

| Parameter | β | γ | δ | ϕ |
|----------------|-----------|----------|----------|--------|
| Estimate | -3e-3 | 1.2e-8 | 1.23 | 2.98 |
| Standard Error | 0.23 7e-4 | 5e-9 | 0.19 | 0.26 |
| P value | 4e-5 | 0.01 | 4e-10 | <2e-16 |

Table 5.12: Calibration results of the profitability related regressions with non scaled offshoring variables

robustness of the relationship between practice size and practice likelihood of off/near-shoring labor. Two terms were added to notably tests whether financial performance, in line with the ideas of self-selection proposed by

Melitz (2003) (i.e. only high performing firms leverage trade), had an impact on MC practices behavior. This was done by tailoring the associated regression in the following fashion:

$$\log\left(\frac{P(O_i(t) > 0)}{1 - P(O_i(t) > 0)}\right) = \alpha + \beta.n_i^s(t) + \gamma.1_{O_i(t-1)>0} + \delta.P_i(t) + \phi.\frac{\Pi_i(t)}{R_i(t)} \quad (5.8)$$

Results, displayed in table 5.13, show that financial performance in terms of price (which is a direct indication of productivity in the MC industry) and profitability does not appear to impact firm likelihood to displace labor. It therefore appears that all firms exhibit the same appetite to leverage off/near-shore resources, but that they potentially face an implementation barrier that limit the transformation to the ones that are large enough to overcome the associated hurdle. This would suggest that labor displacement is approached differently in the MC industry than in other sectors (for instance the manufacturing one). In general, the decision to off/near-shore work is indeed positively impacted by the original performance of the firm (Wagner, 2011).

It would be interesting to test if this stance is simply linked to the maturity of the offshoring phenomenon in the MC industry. Compared to manufacturing industries, this type of transformation is indeed still new and offshoring MC firms are still in a position of early adopters, who learn and benefit from the change. It would therefore be useful to re run this analysis in a couple of years and see how/if results have changed.

| Parameter | α | β | γ | δ | ϕ |
|----------------|----------|---------|----------|----------|---------|
| Estimate | -3.06 | 1.82e-2 | 6.64 | 4.1e-7 | -1.5e-4 |
| Standard Error | 1.8e-1 | 4.7e-3 | 1.89e-1 | 1.9e-6 | 1.2e-4 |
| P value | <2e-16 | 7.8e-5 | <2e-16 | 0.83 | 0.22 |

Table 5.13: Calibration results of the revised regression associated to hypothesis (H4)

5.5.2 Practical Implications:

Three main practical implications are highlighted by this chapter. It first shows that if MC practices profitability can increase as a result of labor displacement, it may not be a “one-size-fits-all” instrument. The associated transformation indeed requires a size threshold of about 1000 employees to start. This threshold suggests that there are barriers to reallocating labor off/near-shore that small firm cannot easily overcome. A seller, who displaces 20 % of labor, indeed gains about 8\$/h of work through a distributed service delivery model. This means that he/she generates an extra

153k\$/year of profitability (a seller indeed generates an average of 1.6k worth of work per month) through labor displacement. Given the cost of an employee in the US, this should be more than enough to incentivize the transformation of every MC practices. However, labor displacement only appears to impact very large firms (with 150+ sellers and where the gain of a global service delivery model is superior to 25M\$). Thus, there appears to be barriers to labor reallocation. If the notion of trade barriers has been the subject of some early discussions (Larsen et al., 2013; Arkolakis et al., 2019), it would be worth further investigations.

The second major element stressed in the chapter pertains to the possible speed of this transformation. As discussed in section 2 (theoretical framework), a MC practice's performance only increases if it transforms faster than its peers. This chapters records that transforming a firm in a span of 4 to 5 years (which is equivalent to a CEO mandate) yields a profitable outcome. This means that for a newly appointed executive in a firm of 1k+ consultants, labor displacement could be one of the first tangible measures that emerge post her/his 100 first days in role. Interestingly this chapter also shows (see the discussion section) that 80% of the transformation can be achieved in 2 years, which positions labor displacement as a tool that yields "quick wins". This discussion on transformation speed and competitiveness although hinted at in the classical literature has not been, to my knowledge, capitalized on. This chapter therefore paves the way for further conversations around the pace of change of in the MC and broader professional services industry.

Finally, this study also shares some insights about the competitive pressure that exists in the MC space. This kind of transformation is again common in the field (Sako, 2015) and the tests deployed in the methodology section show that for every percent of work done off/near-shore, prices drop by about 3\$/h. This first benchmark brings the discussion to the next level as it not only shares some insights on what the consequences of labor displacement are for revenue (which was, to my knowledge, not previously available in the literature), but also it shows that time does not appear significantly correlated to price change. This of course opens the door to further conversations.

5.5.3 Limitations & future research:

Since the scope of this study is limited to a small number of US practices, it would be first interesting to see how its findings fare in different geographical context (both mature emerging ones) and of course, with a larger sample. Geographically, the performance (growth, productivity and profitability) of the MC sector is indeed known to vary across mature markets. For instance, in his latest report (Cerruti et al., 2019), the European federation of management consultancies associations [FEACO] displayed large MC pro-

ductivity variations across European countries. Revenue per employee was indeed worth 100k\$ per year in Italy but closer to 300k\$ in Switzerland, compared to the 200k\$ observed in the US. One option to further this research would therefore be to conduct the exercise on a bigger data-set (i.e. including more years and countries) and use it to review if market-related differences in performance triggers different behaviors and outcomes with respect to labor displacement. This could for example mean exploring if prices reductions (which were seen associated to off/near-shoring) are lower in high growth markets.

But besides looking at mature markets, it would probably be very insightful to also review the impact of labor displacement on the consulting sector in emerging geographies (e.g. Mexico, India, African countries etc...). As highlighted by [Sako \(2005\)](#) (resp. [Größler et al., 2013](#)), results (resp. motivations) are likely to be very different from the one highlighted in this study. An increase in labor displacement from mature to emerging locations could indeed be associated, in emerging countries, to raising labor costs (especially for activities where specialists' skills are short in supply) and depending in the fierceness of the competition to higher prices. Besides, it could be interesting to discuss the selection mechanism of off/near-shore geographies (for instance through taxation/tariffs ([Díez, 2014](#); [Hansen, 2010](#))).

Outside of additional empirical evidences and benchmarks, the findings of this study open the door to a more mechanistic and theoretical discussion with respect to MC firms' performance. The correlations highlighted in this paper (e.g. displacing labor is associated to price reductions) indeed do not equal causality. For example, at this stage, it is still unclear if MC firms offshore production activities because of price pressures or if prices decrease because firms transfer their production elsewhere. To get a full understanding of the motivations and outcomes behind labor displacement decisions, it would be beneficial to go back to a broader economic modeling.

Additionally, it would be interesting to pursue this study by reviewing how to incentivize / operate this transformation (see [Ribes et al. \(2020\)](#) for early discussions around the sustainability of this type of transformation). It is indeed known that in mature countries, trading activities generally benefits highly skilled workers while reducing the need for medium skills as well as the income of low skill individuals (see ([Goos et al., 2009](#); [Baumgarten et al., 2013](#))) for discussions on the polarization on jobs, skills and wages induced by trade). In the context of MC firms, it would be therefore interesting to understand how consultants are nudged to push some of their activities abroad and how they benefit from the transformation from an individual perspective.

5.5.4 Conclusion:

This analysis shows that if labor displacement yields cost savings in the management consulting space, most of the associated benefits are passed to clients in the form of a price reduction. Overall the associated transformation yields an increase in profitability (for every percent of work displaced, profitability increases by 0.4\$ per hour of work) but appears limited to large practices (i.e. 1000+ employees) due to trade barriers and requires a significant and continuous commitment to be successful (more than 4-5 years). To be sustainable, this transformation also implies a revision of the traditional career frameworks of those firms.

Considering the results provided in this paper, two additional questions appear which naturally further the proposed research. First, from a competition standpoint, if labor displacement is only available for large firms, one may wonder to which extent/ by when this transformation will lead to a consolidation of the consulting market into an oligopoly, at the expense of the smaller firms constituting in the competitive fringe. Second, one may wonder if displacing labor at scale, not only entails a change in local consulting career frameworks but also a move for MC practices from a partnership structure to a corporation. Such a change has indeed already been operated by Accenture in 2001.

Chapter 6

Displacement & sector's evolution:

6.1 Summary:

6.1.1 French version:

La délocalisation d'activités de production est un instrument attirant l'attention de nombreuses entreprises de services professionnels. Ce chapitre propose donc un modèle théorique permettant d'en estimer les conséquences dans le cadres spécifique des entreprises de conseil. Son potentiel est illustré dans le cas de l'industrie du conseil en Allemagne. Les résultats montrent que les bénéfices (i.e. accroissement de profitabilité) de ce type de transformation sont présents pendant quelques années, mais sont ensuite très rapidement transférés aux clients. Cela suggère que les entreprises de conseil sont engagées dans une course pour délocaliser aussi rapidement que possible.

6.1.2 English version:

Labor displacement off- or nearshore is a performance improvement instrument that currently sparks a lot of interest in the service sector. This chapter proposes a model to understand the consequences of such a decision on management consulting firms. Its calibration on the market of consulting services for the German transportation industry suggests that the benefits of labor displacement are almost instantaneously transferred to clients and that for MC firms to get a competitive edge (and increase their profitability) they have to engage in a race with respect to their transformation (i.e. offshore more quickly than their peers).

6.2 Introduction:

The management consulting sector (referred to as MC in the rest of this paper) has expanded tremendously over the past decades (see [Empson et al. \(2015b\)](#)). This growth has in turn sparked an increase in interest from the academic community across all social sciences. However, according to the recent literature review of [Skjølsvik et al. \(2017\)](#), several questions remain open with respect to MC firms. One of them pertain to the mechanisms at the disposal of those firms to improve their competitiveness. The sector indeed grows more quickly than the rest of the economy in mature countries and competition is intensifying.

A viable instrument to improve MC practices performance consists in displacing labor off/near-shore to lower the costs associated to the production of MC services. However, if this topic has been widely discussed in the context of manufacturing and goods, it has not been thoroughly discussed, so far, in the literature when it comes to services. In the specific context of consulting, researchers have merely started to scratch the surface of this type of transformation. If they have recently converged on the fact that these relocations may impact 20% to 50% of the activities associated to the production of consulting services ([Jensen and Kletzer, 2010](#)), little is known on the consequences of such an evolution for the prices, revenues and profitability of the firms in the MC sector.

To address this shortcoming, this paper builds on two strands of the economic and management literature. It first expands on the very large literature on trade and also offers a case study for the service industry. Displacing labor to improve firm performance is not a new phenomenon but it has mainly been discussed in the context of manufactured goods ([Baldwin and Robert-Nicoud, 2014](#)). If services, in opposition to goods, were initially considered as non-tradable, a number of economists (incl. for example [Gervais and Jensen \(2013\)](#)) have shown that services too are now being offshored. Recent benchmarks such as the one of [Breinlich and Criscuolo \(2011\)](#) show that the import of services is still small (for instance less than 5% of UK firms import services), but that this appears as a growing trend since firms now tend to import both goods and services from similar locations ([Ariu et al., 2019](#)). When it comes to firm performance, the impact of trade is thought to be similar across services and goods. If re-allocating labor off/near-shore obviously reduces costs, it is also known to hinder growth since it leads to a reduction in prices (and thus in revenue). The results on firm's profitability appear mixed ([Arkolakis et al., 2019](#)) and have triggered intense debates (i.e. revenue and costs both go down and sometimes margins go up, sometimes down...). This chapter therefore proposes a model to better understand the potential heterogeneity in performance that an offshoring transformation triggers in the MC sector. The model leverages the ideas of [Ellram et al. \(2008\)](#) and [Jensen and Kletzer \(2010\)](#) in terms of trade

in tasks and expands on the associated framework of [Grossman and Rossi-Hansberg \(2008\)](#) in a dynamic context (i.e. where both services consumers and providers evolve over time). The main finding generated by the model is that there are two possible dynamics resulting from the off/nearshore reallocation of labor. On one hand, if MC firms can train new consultant more rapidly than their client pool is growing, offshoring work becomes a race between firms which is dominated by large players. Performance wise, it results in price and profitability erosions as well as an industry consolidation (a finding that aligns with the recent paper from [Autor et al. \(2020\)](#)), while profitability is dependent in the structure of transformation and the competition dynamics. On the other hand, if training consultants is challenging, offshoring work becomes a mechanism to increase profitability as it yields no impact on prices.

This chapter is articulated around two elements. First, a competitive market where MC firms reallocate labor is modeled in section 6.3. This generates the previously described results around the price and profitability dynamics of the consulting sector. The viability of the model is then illustrated in section 6.3. The associated proof of concept is built on MC firms dedicated to the support of the German transportation industry and is enabled by public data curated by the OECD. This example, albeit arbitrary at first glance, has been chosen for two reasons. On one hand, globalization is mainly about displacing work from mature markets to emerging ones. Germany, as the third largest mature market for consulting services in the world (after the US and the UK), thus appears as an appropriate example. On the other hand, management consulting firms are very specialized ([Kipping and Engwall, 2002](#)). Given that they all aim at providing solutions to their client to improve their performance, they differentiate themselves by tailoring their offerings to industrial sectors. The transportation industry, with its specific challenges, is a representative instance of a typical market for consulting firms and considering its prominence in Germany (as well as other countries), it looks to be a relevant test case for this type of model.

6.3 A model of global competition:

6.3.1 Aligning services demand & supply through prices:

For a client firm, contracting a consulting service to improve its performance yields benefits. According to [Armbrüster \(2006\)](#), those benefits increase with clients' size. For the sake of simplicity, let us assume that this relationship is linear (i.e. consulting benefits are directly proportional (up to factor $v \geq 0$) to client's revenue r). A client will only use a service if its benefits ($v.r$) outweigh the associated cost, represented by the service price p (i.e. $v.r \geq p$). Thus, calling $f(t, r)$ the number of firms at time t with revenue r ,

the demand for consulting services $D(t, p)$ can be expressed as:

$$D(t, p) = \int_{r \geq \frac{p}{v}} f(t, r).dr \quad (6.1)$$

To meet this demand, MC providers do not rely on technology but on workers (Løwendahl, 2005). Given that consulting offerings are usually complex, their production for one client requires multiple consultants (say n) (Maister, 2012). A MC practice with a total of e workers can therefore service $\frac{e}{n}$ client firms. Considering this production structure, MC practices have a natural interest in lowering their labor cost to increase their competitiveness. This can be achieved by localizing resources in the right place (e.g. for the same type of competence, a consultant in New York - US will not bear the same cost as a consultant in Johannesburg – South Africa) . This resourcing choice is made considering that local resources come at a unit cost c and that, if offshoring a percent of labor off/near-shore yields a savings Δc , it also comes with a fixed cost θ (e.g. the cost of setting up and maintaining a new entity in a foreign country) and only affects a portion $\phi \in [0; 1]$ of the production activities of MC services (according to Jensen and Kletzer (2010), in MC services, $\phi \approx 20 - 30\%$).

From an operation standpoint, MC firms only choose to supply services at a price p if their production activities yield a profit. This therefore yields two conditions with respect to MC firms size.

Lemma 10: *MC firms only choose to set up an off/near-shore hub if they are large enough to absorb the associated set up costs (i.e. $e \geq \frac{\theta}{\phi \cdot \Delta c}$).*

Note that this echoes the finding of Gervais and Jensen (2013), who found a positive correlation between the size of import in service and the size of the firm as well as the findings of Ribes (2021) who found that reallocating labor off/near-shore was mainly a trait of large MC firms.

Lemma 11: *A MC firm can only operate without an off/near-shore hub if the revenue from an offering covers the cost of local resources (i.e. $p \geq n \cdot c$). The only firms that can operate in a more cost constrained environment (i.e. when $p \leq n \cdot c$) are the ones that are large enough to survive (i.e. $p - n(c - \Delta c \cdot \phi) - \frac{(C \cdot n)}{e} \geq 0 \leftrightarrow e \geq \max(\frac{\theta n}{(p - n \cdot (c - \phi \cdot \Delta c))}; \frac{\theta}{\phi \cdot \Delta c})$).*

Therefore, calling $g(t, e)$ the number of MC firms with e employees, the supply $S(t, p)$ of service that can be provided at price $p \geq n \cdot (c - \phi \cdot \Delta c)$ is

given by:

$$\begin{aligned}
 S(t, p) = & \frac{1}{n} \underbrace{\left(\int_{e \geq \max\left(\frac{\theta n}{(p-n)(c-\phi \Delta c)}; \frac{\theta}{\phi \Delta c}\right)} e.g(t, e).de \right)}_{\text{Firms which are large enough to offshore activities}} \\
 & + 1_{p \geq n.c} \cdot \underbrace{\int_n^{\frac{\theta}{\phi \Delta c}} e.g(t, e).de}_{\text{Firms which have chosen not to offshore}}
 \end{aligned} \tag{6.2}$$

In this market structure, at any point in time t , the equilibrium price $P(t)$ for MC services therefore adjusts itself so that the available supply of services matches its demand (i.e. $\forall t, D(t, P(t)) = S(t, P(t))$), which translates into:

$$\begin{aligned}
 \int_{r \geq \frac{P(t)}{v}} f(t, r).dr = & \frac{1}{n} \cdot \left(\int_{e \geq \max\left(\frac{\theta n}{(p-n)(c-\phi \Delta c)}; \frac{\theta}{\phi \Delta c}\right)} e.g(t, e).de \right. \\
 & \left. + 1_{P(t) \geq n.c} \cdot \int_n^{\frac{\theta}{\phi \Delta c}} e.g(t, e).de \right)
 \end{aligned} \tag{6.3}$$

6.3.2 What are the key dynamics that drive MC prices evolution?

To understand how the equilibrium price $P(t)$ of MC services evolves over time, the dynamics behind the demand and supply in consulting services must be specified. On the demand side, firms' dynamics can be simply¹ represented by Gibrat's law (Sutton, 1997) (i.e. clients grow their revenue over time at a constant rate ψ [i.e. $dr = \psi.r.dt$]). Considering that a proportion $b(t)$ (resp. $d(t)$) of new (resp. existing) firms enters (resp. exits) the market at time t with a revenue r_m (which is sufficient for them to be profitable), demand dynamics, which are exogenous to the consulting industry, are given by:

$$\forall r > r_m, \partial_t f + \partial_r(\psi.r.f) = -d(t).f(t, r) \tag{6.4}$$

The same type of model can also be used on the supply side of the market. As noted in Audretsch et al. (2004), consulting firms indeed grow their workforce at a constant pace μ (i.e. $de = \mu.e.dt$), which represents their ability to source and train young graduates into consultants (Maister and Lovelock, 1982). MC firms, which employ at least n workers locally, have therefore their dynamics depicted by:

$$\forall t, \forall e \geq n \partial_t g + \partial_e(\mu.e.g) = 0 \leftrightarrow g(t, e) = g\left(t - \frac{1}{\mu} \cdot \ln\left(\frac{e}{n}\right), n\right) \tag{6.5}$$

¹Note that it was shown in earlier chapters that this may not hold true for all PSFs, but this yet remains an asymptotic truth and a suitable approximation for the bulk of the sector.

In this type of set up, two types of markets appear (see Figure ??). An emerging consulting market is a market where the change in consulting demand between two periods of time is higher than the increase in supply due to consulting firm training capabilities (i.e. $\psi \cdot \frac{n.c}{v} \cdot f(t, \frac{n.c}{v}) \geq (d(t) + \mu) \cdot D(t, n.c)$). In this type of market, the price of consulting is $P(t) = n.c$ and the gap between supply and demand triggers the entry of $g(t, n)$ new firms, such that:

$$g(t, n) = \psi \cdot \frac{n.c}{v} \cdot f(t, \frac{n.c}{v}) - (d(t) + \mu) \cdot D(t, n.c) \quad (6.6)$$

A mature consulting market is characterized by an excess of supply over demand (i.e. $\psi \cdot (P(t)/v) \cdot f(t, (P(t)/v)) \leq (d(t) + \mu) \cdot D(t, P(t))$). This type of market only enables players that are large enough to have set up an off/near-shore hub (i.e. $p \leq n.c$ and $e \geq \frac{\theta}{\phi \cdot \Delta c}$). It regulates itself through price reductions ($\partial_t P < 0$). Entry is no longer an option and, at every point in time, the $k(t) = g(t, \theta n / (P(t) - n \cdot (c - \phi \cdot \Delta c))) \cdot (\theta^2 \cdot n) / (P(t) - n \cdot (c - \phi \cdot \Delta c))^3 \cdot \partial_t P$ least competitive MC practices are exiting the market. The price of consulting services then adjusts to ensure that the increase in the number of profitable providers meets the increase in clients:

$$\begin{aligned} \partial_t P \cdot g(t, \theta \cdot \frac{n}{P(t) - n \cdot (c - \phi \cdot \Delta c)}) \cdot \frac{\theta^2 \cdot n}{(P(t) - n \cdot (c - \phi \cdot \Delta c))^3} \\ = f(t, \frac{P(t)}{v}) \cdot (\psi \cdot (\frac{P(t)}{v}) - d(t)) \cdot D(t, P(t)) - \mu \cdot S(t, P(t)) \end{aligned} \quad (6.7)$$

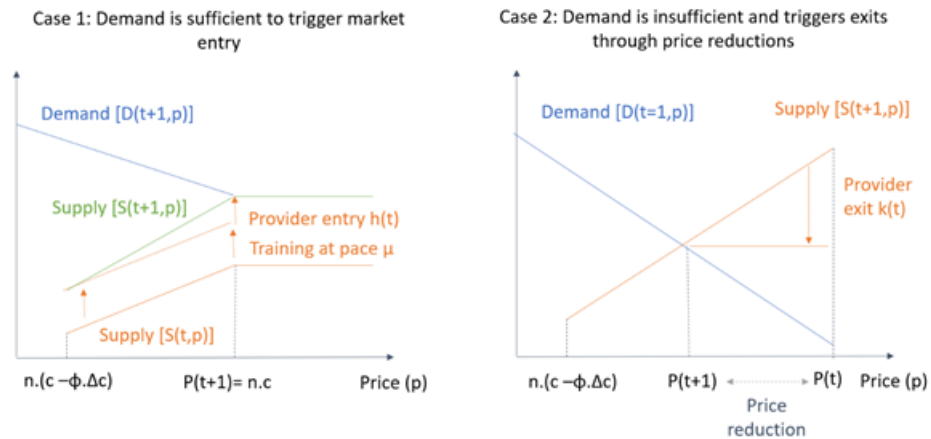


Figure 6.1: Equilibrium between demand and supply in emerging and mature consulting markets.

This competitive set up can yield two outcomes on MC firms' profitability. When demand increases to trigger entry, the profitability of an individual

MC firm of size e increases. Prices and revenues indeed stay flat while firms grow and transform their service delivery model (through labor displacement), therefore reducing their production costs. However, when demand dynamics are not sufficient to sustain the entry of new providers, MC firms profitability increases only if they are large enough for their growth and associated economies of scale to offset the prices decrease triggered by the market (i.e. $\frac{\theta \cdot n \cdot \mu}{e} \geq -\partial_t P(t)$).

Note that the proposed model is general and could also be applied to understand the impact that technology investments may have on MC firms. In this case, θ would represent the investments made by firms in technology and considering technology perfectly replaces labor (i.e. $\Delta c = c$) the same results in terms of market and competition dynamics would hold.

6.3.3 Model simplification in a stable ‘‘Zipf’’ market:

There has been numerous empirical evidences that the distribution of firms according to their size follows a Zipf law of exponent $\alpha \in [1; 2]$ (i.e. $f(t, r) \propto \frac{1}{r}^\alpha$) in various sectors of the economy (see [Axtell \(2001\)](#)). If the birth and death rates of clients’ firms are relatively stable over time (i.e. the market is stable), this structural assumption can be used to simplify the demand side of the framework to:

$$f(t, r) = f_0 \cdot e^{((\alpha-1) \cdot \psi - d) \cdot t} \cdot (r_m/r)^\alpha \quad (6.8)$$

$$D(t, p) = f_0 / (\alpha - 1) \cdot e^{((\alpha-1) \cdot \psi - d) \cdot t} \cdot (r_m)^\alpha \cdot (p/v)^{1-\alpha} \quad (6.9)$$

This can then be leveraged to provide additional insights to the propositions highlighted in the previous sub-section.

- **The emerging consulting market.** In an economy where the death and birth rates of client firms are stable, if the training speed of new consultants is strictly lower than the sum of the death and adjusted growth rates of client firms (i.e. $(\alpha - 1) \cdot \psi > d + \mu$), the number of consulting providers will expand exponentially and the consulting sector structure will be given by:

$$g(t, n) = f_0 \cdot e^{((\alpha-1) \cdot \psi - d) \cdot t} \cdot (r_m)^\alpha \cdot \left(\frac{n \cdot c}{v}\right)^{1-\alpha} \cdot \left(\psi - \frac{d + \mu}{\alpha - 1}\right) \quad (6.10)$$

$$\begin{aligned} \forall e \geq n; \quad g(t, e) \\ = f_0 \cdot e^{((\alpha-1) \cdot \psi - d) \cdot t} \cdot \left(\frac{n}{e}\right)^{\frac{((\alpha-1) \cdot \psi - d)}{\mu} + 1} \cdot (r_m)^\alpha \cdot \left(\frac{n \cdot c}{v}\right)^{1-\alpha} \cdot \left[\psi - \frac{d + \mu}{\alpha - 1}\right] \end{aligned} \quad (6.11)$$

Note that in this case, the framework results in Zipf type distribution for the consulting sector as well and that the supply evolves over time at the same pace as the demand (i.e. $\partial_t D = \partial_t S = D(t, n, c) \cdot ((\alpha - 1) \cdot \psi - d)$).

- **The mature consulting market.** In an economy where the death and birth rates of client firms are stable, if the pace at which consultants are trained is too important (i.e. $(\alpha - 1) \cdot \psi \leq d + \mu$ and assuming the consulting sector starts with a distribution of shape factor β (i.e. $g(0, e) = g_0 \cdot (n/e)^\beta$) such that $\beta > \frac{(\alpha - 1) \cdot \psi - d}{\mu} + 1$), the consulting space can no longer sustain the entry of new firms. The competition therefore leads to a consolidation and the sector's structure evolves according to:

$$\begin{aligned} \forall e \geq \frac{\theta \cdot n}{P(t) - n \cdot (c - \phi \cdot \Delta c)}; \quad g(t, e) & \quad (6.12) \\ & = g_0 \cdot \left(\frac{n}{e}\right)^\beta \cdot e^{\mu \cdot (\beta - 1) \cdot t} \end{aligned}$$

$$S(t, p) = \frac{g_0}{\beta - 1} \cdot e^{\mu \cdot (\beta - 1) \cdot t} \cdot \left(\frac{p - n \cdot (c - \Delta c \cdot \phi)}{\theta}\right)^{\beta - 1} \quad (6.13)$$

Finally, the market price $P(t)$ is given as a solution of:

$$\begin{aligned} P(t)^{\alpha - 1} \cdot (P(t) - n \cdot (c - \Delta c \cdot \phi))^{\beta - 1} & = \frac{f_0 \cdot (\beta - 1)}{g_0 \cdot (\alpha - 1)} \cdot e^{((-d + (\alpha - 1) \cdot \psi - \mu \cdot (\beta - 1)) \cdot t)} \cdot (\theta)^\beta \\ & \quad - 1) \cdot (r_m)^\alpha \cdot (\alpha - 1) \\ & = e^{(-d + \alpha - 1) \cdot \psi - \mu \cdot (\beta - 1) \cdot t} \cdot P(0)^\alpha \\ & \quad - 1) \cdot (P(0) - n \cdot (c - \Delta c \cdot \phi))^{\beta - 1} \end{aligned} \quad (6.14)$$

This model has a few interesting properties. First, prices increase with the benefits provided by the service (i.e. $\partial_v P \geq 0$). Second, prices also increase with the fixed costs associated to the setup of an off/near-shore production hub (i.e. $\partial_\theta P \geq 0$). Finally, it also shows that prices decrease exponentially over time at a pace that is purely dependent in the structural set up of the client and of the consulting sector.

6.4 Application: the transportation market:

To illustrate its properties, an application of the model to consulting services provided to the German transportation and storage industry is now proposed.

6.4.1 Data parameters estimation:

On the demand side, the calibration of the model can be achieved through the data provided by the Organization for Economic Cooperation Development - OECD . The organization's records (Structural and Business Demographic Statistics database – SBDS) show (see table 6.1) that, at an aggregated level, between 2008 and 2017, the transportation and storage sector in Germany (identified through the ISIC4 code 49 to 53) has increased its revenue by about 11.8 (+/- 12.3) B\$ a year and had an average annual birth (resp. death) rate of 7.3% (+/- 0.9%) (resp. 8.8% (+/- 0.9%)). In this set up, calling $R(t)$ the revenue of the sector, $d(t)$ (resp. $b(t)$) the death (resp. birth) rate of firms, r_d (resp. r_m) the average revenue of dying (resp. new) firms and $N(t)$ the number of enterprises in the sector, it is possible to assess the average growth rate of firm in the sector via the following regression:

$$R(t+1) = (1 + \psi).R(t) - d(t).N(t).r_d + b(t).N(t).r_m \quad (6.15)$$

Leveraging the information from table 6.1 yields that on average each new (resp. exiting) firm can be estimated to generate about $r_m \approx 4.4M\$$ (+/- 9.6) (resp. $r_d \approx 1.1M\$$ (+/- 7.9)) of yearly revenue and that the growth of the sector is purely reliant on the entry of new competitors as the growth of firms estimated through the regression is not statistically significant (i.e. $\psi \approx -0.03$ (+/- 0.09) cannot be differentiated from 1).

On the supply side, if it is not possible to isolate the consulting firms that only service the transportation industry in Germany, the characteristics of the sector can be estimated through the aggregated OECD summarized in table 6.2. The organization's records show that, at an aggregated level, between 2008 and 2017, the consulting sector in Germany (identified through the ISIC4 code 702) has increased its employment by about 11.8 (+/- 12.7) thousands of worker per year and had an average annual birth (resp. death) rate of 13.7% (+/- 2.7%) (resp. 12.2% (+/- 0.8%)). Since the consulting sector described through table 6.1 services the whole economy (and not only the transportation sector), the fact that it has both a non-neglectable birth and death rate can be interpreted (in the context of the model proposed in section 6.3) in the following fashion: in the consulting sector, some sub-segments (e.g. consulting services dedicated to the government etc...) are subject to an intense competition which drives firms out, whilst some others experience an excess in demand which drives the entry of new competitors. In this set up, calling $E(t)$ the employment of the sector, $d(t)$ (resp. $b(t)$) the death (resp. birth) rate of firms, e_d (resp. n) the average number of employees of dying (resp. new) firms and $N(t)$ the number of enterprises in the sector, it is possible to assess the average growth rate of firm in the sector via the following regression:

$$E(t+1) = (1 + \mu).E(t) - d(t).N(t).e_d + b(t).N(t).n \quad (6.16)$$

Leveraging the information from table 6.2 yields that on average each new (resp. exiting) consulting firm can be estimated to employ about $n \approx 2.5$ (+/- 5.4) (resp. $e_d \approx 25.5$ (+/- 17.7)) workers (which is on par with existing benchmarks such as the one of [Kubr \(2002\)](#) for instance) and that the growth of the firm in the sector is important as they tend, on average, to double in size every year (i.e. $\mu \approx 0.91$ (+/- 0.52)). Finally, the OECD data highlighted in table 6.2 provide a first order estimate of the compensation of a consultant in Germany $c = 36.7$ (+/- 1.2)k\$/year.

6.4.2 Model inputs subject to a sensitivity analysis:

If the model proposed in the previous section of this paper can partially be calibrated through the data available in the OECD database, a few inputs still need to be estimated. Those inputs pertain to the nature of the consulting landscape (i.e. the shape of the distribution of firms α, β), the benefits ν of the service and the nature of the off/near-shoring mechanism (i.e. its intensity ϕ , its costs θ and its benefits Δc).

If, to my knowledge, there is no data source that can specifically be used to assess them, some benchmarks are available in the literature and can be fed to model. First, the distribution of firms in an industrial sector generally obeys a power law of exponent $\in [-2; -1[$ ([Axtell, 2001](#)). Second, when it comes to clients' appetite for MC services, one must recall that consulting practices mainly help firms optimize their selling, general and administrative costs, which are worth about 25 to 30% of their revenue (see [Chen et al. \(2012\)](#) or [Anderson et al. \(2007\)](#) for benchmarks). So, in the case of a consulting solution that can help firms decrease their general costs by 10%, clients generate savings worth around $v \approx 2,5\%$ of their revenue. Finally, with respect of off/near-shoring, as stressed in [Jensen and Kletzer \(2010\)](#), a portion $\phi 20\%$ of consulting activities can potentially be reallocated to be delivered in a remote hub, say for example in Poland, where salaries are about $\frac{\Delta c}{c} = 50\%$ lower. Since recent empirical studies (see [Metters \(2008\)](#) for instance) have shown that this peak is only achieved in very large firms (i.e. more than $\frac{\theta}{\phi \cdot \Delta c} = 1000$ employees), the fixed costs associated to this hub structure can be estimated around $\theta 5M\$$.

However, if those estimates can be fed to the model to yield preliminary results, a sensitivity analysis will be in order given their rough nature.

6.4.3 Model results & sensitivity analysis:

OECD data shows that both birth and death rates of transportation firms in Germany is relatively stable over time. Considering that the consulting sector displays a high training speed in general (see the estimates developed in the previous section) and that the shape of the associated industrial sector usually obeys a power law of exponent $\in [-2; -1[$ ([Axtell, 2001](#)), the

results of section 6.3 suggest that the consulting practices dedicated to the transportation industry are ongoing a consolidation. In this context, no firm enters the market, every existing firm is leveraging offshore resources and “small” MC incumbents exit the market every year.

The model can be used to yield two types of prediction. First, it can help assess the speed at which prices are decreasing over time in a consolidation context. Second, it can help assess the minimum size at which the firm can potentially generates an excess in profitability.

When it comes to prices, assuming that the consulting sector is at the beginning of a consolidation (i.e. the price of an offering is on average of $P(t = 0) = n.c = 110k\$$), the model can be used to understand the speed at which prices will decrease over time depending on either the consulting (resp. client) sector structure (β) (resp. (α)). The results displayed in Figure 6.2 show that the evolution of prices is highly dependent on the shape of the clients’ sector and exhibits relatively little sensitivity to the state of the consulting space. If prices converge extremely rapidly (i.e. in less than 2 to 3 years) in an environment with a large proportion of large clients (i.e. α is high) to a point where $P = n.(c - \Delta c.\phi)$ (i.e. when there is no excess in profit for an offshore model), the more the client sector hosts a small proportion large firms the longer it takes for prices to converge. When it

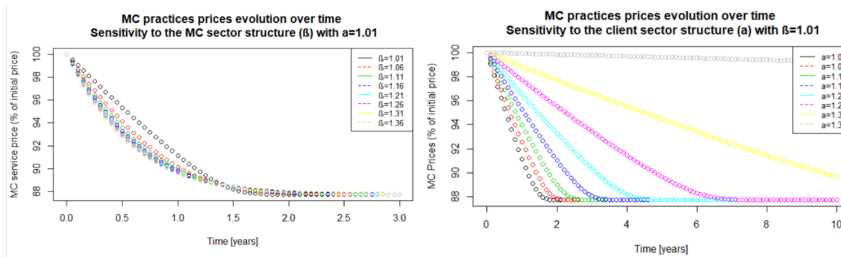


Figure 6.2: Sensitivity analysis of the MC sector prices evolution in a consolidation context

comes to the profitability of a consulting practice of size e , the proposed model yields that at time t , the only firms which generate an excess in profit (i.e. $\Pi(t, e) > 0$) are the ones leveraging a multi local service delivery model. Given that MC firms train consultants at a speed μ , calling e_0 their size at time $t = 0$, this profitability excess π can be quantified as the proportion of the service revenue that goes directly to MC partners:

$$\pi(t, e_0) = 1 - n. \frac{(c - \Delta c.\phi) - \frac{\theta}{e_0}.e^{-\mu.t}}{P(t)} \quad (6.17)$$

MC practices operating in a market ongoing a consolidation will experience different dynamics. This heterogeneity in the behavior of their profitability

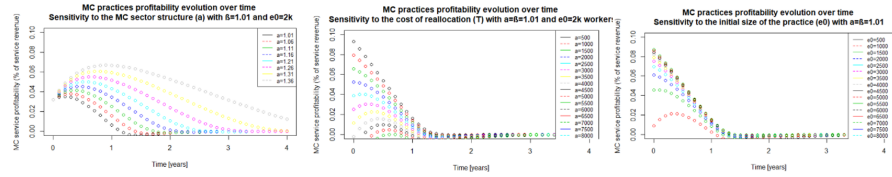


Figure 6.3: Sensitivity analysis of the MC practices profitability evolution in a consolidation context

is driven by 3 parameters. First, their profitability will be impacted by the size of their client pool (parameter α). It is indeed the main driver when it comes to the evolution of prices as seen on the previous paragraph. Second, it will be impacted by their initial size (i.e. e_0). Finally, their financials will be impacted by the fixed costs incurred through the transformation (i.e. θ). When markets consolidation begins at $t = 0$, prices are such $P(0) < n.c = 110k\$$. So assuming that $\phi = 20\%$ of labor can be reallocated offshore to yield a cost savings of $\frac{\Delta c}{c} = 50\%$ and that the maintenance of the offshore hubs costs a fixed fee of $\theta = 5M\$$, the only firms that are able to leverage a multi local model are the ones with more than $e_0 \geq 139$ workers. The excess in profitability that is generated by this multi local delivery model is then below $\Delta c \cdot \phi / c = 10\%$ (i.e. $\pi(0, e_0)[0; 10\%]$) of the revenue associated to the service. The model developed in section 6.3 can then be used to assess the dynamics of a practice profitability for say an initial size of $e_0 = 2000$ workers. The results, displayed on Figure 6.3, show that the excess in profitability generated in the process of the market consolidation quickly disappears (i.e. in less than 3 years) and that the pace of its disappearance is mainly impacted by the shape of client sector (α). Meanwhile the key factor with respect to the profitability patterns (i.e. straight decrease or an inverted U shape pattern) appears to be the initial unit cost of reallocating labor (i.e. $\frac{\theta}{e_0}$). In summary, the model can be used to assess two aspects of the performance dynamics of MC firms. First, it quantifies the lifespan of an offering by providing the evolution of the associated price and revenue. Second, it provides a view of the profitability patterns of an offering over time. All things considered, the numerical experiments displayed in this paper show that MC firms must continuously reinvent their portfolio of services since the market converges to a place where reallocating labor offshore does not yield any excess in profitability. Interestingly, the limiting factor in the adoption of labor reallocation does not seem to be the market, but rather the MC practices themselves. Recent empirical evidences indeed have shown (Ribes, 2021) that transforming a firm service delivery model so that a portion ϕ of work gets done off/near-shore takes around 5 to 10 years. Therefore, the current model suggests that as firms transform themselves,

they yield no extra profit from the transformation in a consolidated market and that the main instrument to yield economies of scale would be for them to merge.

6.5 Conclusion:

This chapter develops a model showcasing the effects of off/near-shoring on the management consulting sector. In the case of the German market and the consulting services dedicated to the transportation industry, it shows some consolidation is already ongoing. From a dynamic standpoint, it shows that prices almost instantaneously adjust to reflect the ongoing labor reallocation results (i.e. in less than a year in most cases) but that some exceptions may arise in the case of markets with a limited number of large clients. This numerical experiment therefore suggests that if reallocating labor off/near-shore does yield an excess in profit for a MC firm, the reason does not lie within the market, but more within the characteristic of the firm itself (e.g. its ability to offshore labor compared to its peers).

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Sector turnover [B\$] [R(t)] | 224.1 | 241.8 | 217.0 | 236.5 | 256.0 | 262.6 | 268.4 | 284.4 | 298.5 | 315.1 | 330.6 |
| Number of firms in sector (000s) [N(t)] | 90.7 | 89.7 | 87.5 | 87.5 | 89.7 | 87.8 | 90.9 | 103.3 | 101.4 | 106.6 | 109.6 |
| Firm birth rate (%) [b(t)] | - | 9.2 | 8.2 | - | - | 7.6 | 7.0 | 6.8 | 6.9 | 6.6 | - |
| Firm death rate (%) [d(t)] | - | - | 9.7 | - | 9.6 | 9.4 | 9.3 | - | 8.0 | 7.9 | 7.7 |

Table 6.1: Key statistics on the German transportation sector [source - OECD]

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|------|-------|-------|-------|-------|-------|-------|-------|-------|-------|-------|
| Sector Employment (000s) [E(t)] | - | 158.6 | 166.1 | 161.1 | 188.8 | 187.3 | 200.6 | 235.7 | 242.4 | 253.8 | 264.9 |
| Wages & salaries of employees (B\$) | - | 5.93 | 5.96 | 6.08 | 6.96 | 6.93 | 7.42 | 8.23 | 8.41 | 9.50 | 10.2 |
| Number of firms in sector (000s) [N(t)] | - | 43.9 | 43.8 | 46.3 | 53.9 | 56.2 | 60.8 | 76.6 | 80.9 | 81.3 | 85.5 |
| Firm birth rate (%) [b(t)] | - | 16.3 | 14.5 | - | 15.7 | 14.5 | 12.0 | 16.0 | 11.2 | 11.4 | 12.0 |
| Firm death rate (%) [d(t)] | - | - | 14.3 | - | 14.0 | 12.1 | 11.7 | 12.3 | 11.5 | 11.2 | 11.0 |

Table 6.2: Key statistics on the German management consulting sector [source - OECD]

Chapter 7

Technology & performance:

7.1 Summary:

7.1.1 French version:

L'automatisation est l'une des clés de voutes de l'amélioration de la compétitivité d'une entreprise. Son utilisation et impact sur la performance d'une firme ont déjà fait l'objet de nombreuses discussions dans le domaine de la manufacture. Cela reste toutefois un sujet ouvert pour les entreprises de services et notamment de services professionnels (légaux, comptables, de conseils...). Ces entreprises ont en effet la réputation d'avoir une production spécifique à chaque client, et, de ce fait, n'apparaissent pas sujette à un standard et donc à une automatisation potentielle.

Ce chapitre montre (via une étude empirique) que dans le contexte des entreprises de conseil en Europe, les investissements sur des technologies d'automatisation vont bon train (i.e. à hauteur d'environ 1.5% de leurs revenus). Les résultats de ces efforts sont toutefois variables entre pratiques de conseils. Les entreprises à forte productivité (i.e. plus de 200\$/h) ne semble en effet pas bénéficier de ces efforts. D'un autre côté, pour les firmes à faible productivité, l'automatisation se traduit par un regain de productivité mais reste neutre d'un point de vue profitabilité car se corrèle à une hausse des coûts de production couplée à une hausse du revenu.

7.1.2 English version:

Technology is one of the key instruments to improve firm's competitiveness. Its usage and impact on firm performance, although thoroughly described in the context of manufacturing sector, remains a topic of conversation for services firms. This notably holds true for professional services practices (accounting, law, consulting engineering...). Those firms indeed have a reputation of offering bespoke services to clients and therefore do not appear, at first glance, prone to technological changes.

This chapter empirically shows that, in the context of European management consulting (MC) firms, practices invest in technology at a constant rate (about 1.5% of MC firms' revenue is invested in technology). However, the outcome of those investments differs between high low productivity practices (a threshold set a 200\$/h based on the data available in this study). In low productivity practices, technology investments are positively correlated to revenue and labor costs growth as well as associated to a workload decrease. However, in highly productive practices, technology investments do appear to lead to both small workload and revenue reductions. As a result, technology only improves the productivity of low performing practices and is neutral when it comes to profitability.

7.2 Introduction:

Technology has always been a medium to make firms' and individuals' activities more efficient. It is a core ingredient to the recipe for competitiveness. But, in the context of a firm, competition has also made it a time-sensitive topic. Technology indeed has been and still is the subject of a race where early adopters bloom while late ones decline. A good historical example of that phenomena lies in the manufacturing field. For certain actors to keep growing at a pace that exceed the one of the overall economy, investments in technology had been made so that more could be produced for the same costs. Those who were able to do so quickly gained clients from their competitors, which, ultimately, resulted in today's consolidated marketplace. Looking at the economic landscape of the early 21st century of any developed country, if technology still is a prominent discussion element, its applications have shifted. The new focus area is directed towards the field of services, whose activities make up to 80% of the current wealth of mature markets. An interesting trend though is that for technology to be of use, some standardization must have occurred. This means that industries that have been around for some time are more likely to gain from those investments than new ones. On that front, there are several examples making the headlines of the newspapers today: the banking industry with the promises of new fintech start/scale-ups (e.g. Revolut), the healthcare space with its medtech contenders (e.g. Babylon health) etc. . . .

But what if the business model of a sector was to produce tailored services to clients? Would technology be at all relevant? That's the current challenge of the management consulting industry [referred to as MC in the rest of this paper]. The associated industry is old and well-established. As such, it is very likely subject to standard, which is only re-emphasized by the size of some of its contenders (e.g. Accenture employs more than 300k individuals worldwide and its "Big 4" counterparts are about of the same magnitude). But at the same time, MC services comes with a promise of bespoke services.

This chapter will therefore shed some light on the use of technology in this specific context and the associated outcomes.

By doing so, this chapter builds on two stands of the existing socio-economic literature: the one related to innovation related investments as well as the one related to the services firm's performance. When it comes to innovation, firms are known to invest in technology for two primary reasons ([Thatcher and Oliver, 2001](#)). On one hand, technology can be used to replace labor, which translates in costs reductions. On the other hand, technology can be used to grow the revenue generated by a product/service. The associated impact on firms' performance is however still debated. If such investments appear positively associated with growth ([Coad et al., 2016](#)), there seems to be mixed evidences of their impact on productivity ([Grover et al. \(1998\)](#), [Coad and Vezzani \(2019\)](#)) and profitability ([Morbey and Reithner \(1990\)](#), [Hanel and St-Pierre \(2002\)](#)).

This heterogeneity appears to stem from differences inherent to the various industrial sectors that make today's economy ([Stiroh, 2002](#)). First, the potential usage of technology is sector & industry dependent. For instance, in the manufacturing space, the potential for automation in assembly chains is well known and has been capitalized on over the past decades. But the same solution cannot be applied in services. Second the competitiveness of each industrial sector differs. Going back to the canonical framework proposed by [Hopenhayn \(1992\)](#), this means that the survival incentive associated to technology investments is not the same across industries. As a result, the research field centered on innovation has evolved towards sector specific studies.

When it comes to services and more specifically to management consulting, the discussions around innovation seem to be in their infancy. The latest developments in the literature indeed highlight that the potential for technology in MC services is quite sizeable: according to [Frey and Osborne \(2017\)](#) 15 to 20% of the current activities required to deliver MC services could be automated. But, to my knowledge, there is nothing in the current literature describing the progresses already made on this transformation, nor is there any evidences of the associated impact. This is a gap that this chapter starts to address.

This question of transformation is of course inherently linked to the one of services' firm performance (notably in the context of professional services). The question of performance is usually approached in the literature with 3 layers (see for instance [Bottazzi et al. \(2008\)](#)). Its first element revolves around growth. The only certainties here are that growth rates decrease with firms size and age to converge to a stable level ([Evans, 1987](#)) and that growth is uncertain even though it becomes a little bit more predictable as firms become bigger ([Sutton, 2002](#)). In the context of professional services and notably management consulting, growing is primarily linked to sourcing individuals that can perform business development activities ([Maister,](#)

2012). The ongoing question now is about whether the primary lever of growth is still those business developers or if it is starting to shift toward technology investments. This is something that this paper will address by analyzing a unique longitudinal dataset composed of US practices. The second (resp. third) aspects of firm performance revolves around profitability (resp. productivity). If it has been observed that larger firms are generally both more profitable and productive than their small counterparts (Lee, 2009), it is also known that neither profitability nor productivity are a static topic. Firms indeed compete and their survival depends on their ability to transform themselves. In the professional services space, transformation is about two things. It is first about displacing work to decrease production costs (cite previous work). But it is also about investing in technology to replacing labor at scale through technology (Mason, 1992). If some work has already been done on labor displacement, little is known on the characteristics of a technology enabled transformation for MC practices. This is something this paper will tackle by investigating when those investments occur in the lifecycle of a MC firms and whether it has an impact on costs (and ultimately profitability) and productivity.

This chapter addresses the highlighted gaps empirically. This is done by first describing the dataset at hand as well as the associated hypothesis (both in terms of the characteristics and consequences of technology investments in MC firms). In the second section of this chapter, the results of those tests are discussed and interpreted. Finally, additional considerations in terms of the speed of this transformation and the potential interactions between technology investments, labor displacement and growth mechanisms are discussed.

7.3 Methods & results:

7.3.1 Data:

The dataset presented in this study is composed of yearly financial information from $N = 407$ individual MC practices between 2014 to 2019 across 5 "European" countries: the UK, Germany, Sweden, Norway & Denmark. For each practice $n \in [1 \dots N]$, 3 types of indicators were collected (see table 7.1). First, 3 main financial metrics were gathered: revenue ($R_n(t)$ expressed in \$), labor costs ($C_n(t)$ expressed in \$) as well as technology investments ($I_n(t)$ also expressed in \$). Second, two operational indicators were captured: the total workload associated to the delivery of the MC services ($H_n(t)$ expressed in h) as well as the percentage of work that was displaced off/near-shore ($O_n(t)$). Finally, given that the workforce of MC practices is divided in two groups: sellers who are responsible for revenue generation and producers who ensure the delivery of services (Maister, 2012), and that information around the production mechanisms of those practices was al-

ready captured, the number of sellers in those practices was also recorded. In this dataset, the average profile a MC practice consists of a revenue of 10M\$ which is generated by about 3 to 4 sellers. The associated production of services requires a workload close to 50kh, which is equivalent to a pool of 40 employees who work 1750h each and dedicate 70% of their time to revenue generation activities. When it comes to the production of MC services, delivery is mainly done locally (less than 1% of labor was displaced off/near-shore) and exhibits a profitability around 53%. Finally, investments in technology amounts for 1.5% of the overall revenue. Note that the or-

| | 25% quantile | 50% quantile | 75% quantile |
|----------------------------|--------------|--------------|--------------|
| Revenue $R_n(t)$ (M\$) | 1.01 | 10.4 | 29.9 |
| Labor $H_n(t)$ (kh) | 5.6 | 49.9 | 159.4 |
| Displacement $O_n(t)$ (%) | 0% | 0.7% | 5.3% |
| Investments $I_n(t)$ (k\$) | 6 | 158.6 | 655.7 |
| Labor costs $C_n(t)$ (M\$) | 0.74 | 5.46 | 14.3 |
| Number of sellers $S_n(t)$ | 0.5 | 3.5 | 9 |

Table 7.1: Dataset overview

ders of magnitude in the present dataset are aligned with available public benchmarks such as the one from the European federation of management consultancies associations (Feaco, 2018). This reference point indeed states that an average of 305k\$ (resp. 220k\$) worth of revenue gets generated for an employee in Germany (resp. the UK), while the productivity of the average worker in the MC practices of the dataset is closer to 255k\$ per year (assuming that they dedicate 70% of their 1750 working hours to revenue generating activities).

7.3.2 Hypothesis & methodology :

The pace at which resources can be trained to supply consulting service is often greater than the speed at which the associated client pool expands ¹. The production of consulting services indeed relies on young professionals, who are sourced right after their graduation in a business or engineering field and who need a couple of months/years of training before reaching full proficiency. The pace at which the supply of MC services can ramp-up is therefore important. On the other hand, MC services are tailored to address the specific problems of a given industry and, in most sectors, the number of firms that can potentially benefit from those services does not grow quickly. As a result, most industrial sectors experience an excess in consulting supply, which naturally triggers a form of regulation through price pressures. For MC practices to survive in such a context, they must either develop new

¹See previous chapter for a discussion and an example on the German consulting market

businesses and/or lower their production costs to remain competitive. From what is described in the literature pertaining to other industrial sectors, both outcomes can potentially be achieved through technological investments. Technology can indeed first be leveraged to replace labor. In this case, some of the activities which compose the production chain of the service get automated. This results in lower production costs. On the other hand, technology can also be used to extend a given service offering. This then creates more work and adds revenue.

If lessons can be learned from other sectors, little is known about technology in the specific context of MC. This raises two main questions. The first one pertains the outcomes of such investments and the second to their applicability (e.g. is there a size threshold or a form of entry barrier?). When it comes to outcome, the key lessons from studies on the manufacturing sector is that investing in technology spurs growth. This generates the following hypothesis for the MC sector:

Hypothesis 5: *Technology investments are positively associated to revenue growth.*

MC practices traditionally increase their revenue $R_n(t)$ by adding business developers $S_n(t)$. So, if the cumulated technology investments are expected to influence revenue, the return of those investments may not be on par with the one associated to extending a firm salesforce. The correlation highlighted by 5 was therefore tested through the following simple linear regression:

$$\underbrace{R_n(t+1) - R_n(t)}_{\text{Change in revenue}} = \alpha + \beta \cdot \overbrace{(S_n(t+1) - S_n(t))}^{\text{Change in the number of business developers}} + \gamma \cdot \underbrace{\sum_k I_n(t-k)}_{\text{Cumulated technology investments}} + \epsilon \quad (7.1)$$

Assuming that technology is a source of revenue, the associated investments must trigger additional work. But at the same time if technology is used as an instrument to replace labor at scale, the workload associated to the delivery of MC services must decrease. Given that the existing literature suggest that technology is more used as a growth engine than a cost optimization one, the following hypothesis emerges:

Hypothesis 6: *Technology investments are positively associated to workload growth.*

Since growth is traditionally spurred in the MC space by adding business developers, changes in this category of workers are likely to explain most of

the annual workload variations of those practices. The sum of technological investments could then explain another part of those variations, which motivated the following regression as a test of hypothesis 6.

$$\begin{aligned}
 \underbrace{H_n(t+1) - H_n(t)}_{\text{Change in workload}} &= \alpha + \beta \cdot \underbrace{(S_n(t+1) - S_n(t))}_{\text{Change in the number of business developers}} \\
 &+ \gamma \cdot \underbrace{\sum_k I_n(t-k)}_{\text{Cumulated technology investments}} + \epsilon
 \end{aligned} \tag{7.2}$$

Note that even if the previous hypothesis (i.e. 6) holds true, it does not mean that technology is not used to replace labor, but merely that the increase in workload due to new activities outweigh the changes linked to automation. Assuming that technology reduces MC practices workload thus motivated the following hypothesis:

Hypothesis 7: *Technology investments are also negatively associated to labor costs growth.*

Given that the growth in labor costs is primarily linked to an increase in activity and that labor replacement and labor displacement are the two keys instruments identified in the literature to lower the delivery costs of services, the following regression was used to test hypothesis (7):

$$\begin{aligned}
 \underbrace{C_n(t+1) - C_n(t)}_{\text{Change in labor costs}} &= \alpha + \beta \cdot \underbrace{H_n(t+1) - H_n(t)}_{\text{Change in total consulting workload}} \\
 &+ \gamma \cdot \underbrace{(O_n(t+1) - O_n(t))}_{\text{Change in offshored workload}} \\
 &+ \nu \cdot \underbrace{\sum_k I_n(t-k)}_{\text{Cumulated technology investments}} + \epsilon
 \end{aligned} \tag{7.3}$$

If the previous hypothesis (5 – 7) enable a discussion on what to expect from technology in the MC space, the applicability of technology as a competitiveness medium has also to be reviewed. First, questions of barriers to entry and size dependency can quickly be assessed. If there is no such thing in the manufacturing space (i.e. firms are known to invest a fixed percentage of their revenue in technology [Coad and Rao \(2010\)](#)), this may not hold true for services. This motivated the following hypothesis:

Hypothesis 8: *The percentage of their revenue that MC firms dedicate to technology investments is independent of the size or the labor costs of the practice.*

Leveraging the previous argument that revenue may be best proxy for size in the context of MC firms, this assumption was simply tested through the following regression:

$$\frac{I_n(t)}{R_n(t)} = \alpha + \beta.R_n(t) + \gamma.C_n(t) + \epsilon \quad (7.4)$$

Finally, one must recall that technology has traditionally been considered as a medium to improve productivity throughout the economic literature (Hopenhayn, 1992). As a result, investments may not have the same effect on firms that have high levels of productivity versus less efficient ones. This was tested by estimating the parameters of the regressions supporting hypothesis (5 – 8) not only on the full dataset but also on the subset of firms that exhibited a high [resp. low] level of productivity (i.e. the top 50% which had a productivity above [resp. below] 200\$/h). Those two data cuts will be referred to as “HP” [resp. “LP”] in the rest of this paper.

7.3.3 Results :

Estimating the parameters associated to the regressions detailed in the previous section yields the impact matrix displayed in Figure 7.1. This matrix has two striking features. First, it shows that highly productive MC practice do only benefit from small workload reduction through technology investments. Second, it shows that if low productivity practices benefit from technology through a revenue (resp. workload) increase (resp. decrease), technology is also associated to an increase in labor costs. Those results will be further unpicked in this section through a detailed discussion of the calibration results. When it comes to revenue growth, the regression associated

| | Impact of technology on revenue growth | Impact of technology on labor cost growth | Impact of technology on workload growth |
|-----------------------------|--|---|---|
| All practices | + | + | -- |
| High productivity practices | - | Not significant | - |
| Low productivity practices | + | + | - |

Figure 7.1: Impact of technology on MC practices

to hypothesis (5) exhibit a very high explanatory power ($R^2 > 90\%$) in each cut of the dataset. Interestingly, it shows that main way in spur growth in a MC practice is to increase its salesforce. As seen on table 7.2, for every new seller revenue increase by about 3M\$ (+/-200k\$) a year. If technology appears to be positively associated to revenue growth in general, its effects is highly dependent in the practice productivity.

In highly productive practice, technology investments are negatively associated to growth. This correlation yet does not equal causality. Revenue may indeed erode because of competition and technology investments are made to improve competitiveness during challenging times.

In low productivity environment (i.e. productivity below 200\$/h), investing 1M\$ in technology yield a return of 14% (+/-7%) every year. If this appears appealing at first glance, it appears unlikely for those firms to leverage technology as a scalable instrument for growth. Such a firm would indeed need to invest about 20M\$+ to yield a yearly revenue increase on par with the one of an extra seller. With respect to workload, the regressions associated to hypothesis (6) also yield a high explanatory power, although differences occur across the various cuts of the dataset (R^2 [All practices] =73%, R^2 [HP practices] = 87%, R^2 [LP practices] =86%). The calibration shows that in a high (resp. low) productivity environment the 3M\$ revenue growth generated by an extra seller is associated to an increase of 9.5kh (resp. 25kh) in labor. On the other hand, for every 1M\$ invested in technology, the workload necessary to produce MC services gets reduced. Across both high and low productivity practices, the yearly workload decreases by 1kh (0.5) per year (or an equivalent of roughly 0.5 workers). The cost decomposition associated to hypothesis (7) leads to several interesting findings (see table ??). First, for each additional hour of work, labor costs increase by 73\$/h (resp. 90\$/h) in low (resp. high) productivity practices. This intuitively aligns with the fact that resources that are more productive are also more expensive. Second, labor displacement and replacement via technology have different effects depending in the productivity of the practice. In highly productive environments, neither labor displacement nor replacement via technology seem to be associated to labor cost changes. However, in low productivity practices, displacing labor off/nearshore yields benefits in the form a saving of 24\$/h and technology investment comes with a labor cost increase. The case of technology is interesting, on one hand it replaces work, but on the other it also creates new activities. This chapter shows that, for practices with a productivity below (resp. above) 200\$/h, every 1M\$ of investment in technology decreases workload by 1kh, which saves about 72k\$ (resp. 90k\$), while generating an extra 240k\$ cost and an extra 142k\$ of revenue (resp. a decrease in 110k\$ in revenue). Therefore, if technology is an instrument to improve productivity, it appears to be neutral as far as profitability is concerned. Finally, the investment patterns of MC practices were found to be independent of their size and cost structure. The tests associated to hypothesis 8 (results can be found in table 7.5) indeed did not yield any significant correlation in any of the cuts of the dataset. Additionally, practices characteristics did not yield any explanatory power with respect to the heterogeneity in technology investments in the dataset ($R^2 < 1\%$).

| Parameter | Estimate | HP | LP | Standard Error | HP | LP | P Value | HP | LP |
|----------------------|----------|-------|------|----------------|------|------|---------|--------|--------|
| α (M\$) | 0.73 | 1.4 | 0.02 | 0.36 | 0.5 | 0.5 | 0.04 | 0.005 | 0.66 |
| β (M\$/seller) | 2.8 | 2.8 | 3.1 | 0.05 | 0.06 | 0.09 | <2e-16 | <2e-16 | <2e-16 |
| γ (%) | 2.0 | -11.3 | 14.2 | 5.8 | 11.2 | 7.4 | 0.1 | 0.3 | 0.05 |

Table 7.2: Technology impact on revenue evolution 5 - parameters estimation

| Parameter | Estimate | | Standard Error | | P Value | |
|---------------------|----------|-------|----------------|------|---------|--------|
| | All | HP | LP | All | LP | HP |
| α (kh) | 7.2 | 2.9 | 10.7 | 3.9 | 5.6 | 0.06 |
| β (kh/seller) | 15.0 | 9.5 | 24.9 | 0.05 | 0.85 | <2e-16 |
| γ (kh/M\$) | -4.3 | -0.73 | -1.0 | 0.6 | 0.77 | 0.11 |
| | | | | | | 0.05 |
| | | | | | | <2e-16 |
| | | | | | | 0.18 |

Table 7.3: Technology impact on workload evolution (6) - parameters estimation

| Parameter | Estimate | Standard Error | | P Value | | | |
|-----------------|----------|----------------|-------|---------|------|-------|-------|
| | | All | All | All | All | | |
| α (M\$) | -0.2 | 0.09 | -0.4 | 0.13 | 0.2 | 0.5 | 0.06 |
| β (\$/h) | 74.2 | 90.1 | 72.5 | 2.0 | 1.8 | <0.01 | <0.01 |
| γ (\$/h) | -70.1 | 0.5 | -96.2 | 23.1 | 16.1 | <0.01 | 0.9 |
| ν (%) | 17.8 | -1.7 | 23.9 | 2.9 | 3.9 | <0.01 | 0.6 |

Table 7.4: Technology impact on labor costs evolution 7 - parameters estimation

| Parameter | Estimate | Standard Error | | P Value | | |
|------------------|----------|----------------|--------|---------|-------|------|
| | All | HP | LP | All | HP | LP |
| α (%) | 21.6 | 14.5 | 27 | 0.06 | 0.002 | 0.25 |
| β (%/M\$) | -0.22 | 0.25 | -0.025 | 0.75 | 0.37 | 0.9 |
| γ (%/M\$) | 0.18 | -1.2 | -0.16 | 0.8 | 0.19 | 0.9 |

Table 7.5: Technology investments and firm characteristics (8) - parameters estimation

7.4 Discussion & conclusion:

7.4.1 Practical implications:

This study not only shows the practical outcomes of technology investments in MC practices, but it can also help technology providers size the opportunity associated to servicing MC firms. The results displayed in this chapter highlight that technology mainly benefits low productivity MC practices (i.e. below 200\$/h). For this kind of firm, for every 1M\$ invested in technology, workload reduces by 3.5kh (0.2) on a yearly basis while yearly revenue grows by 58.7k\$ (17.5). So, in the case of a practice that generates 100M\$ of revenue annually (which can be covered through an average of 35 sellers), if its initial productivity is of 140\$/h, it needs to deliver on 715kh of work per year to meet its revenue. This practice will invest 2% of its turnover in technology programs every year. Therefore, after 5 years of investments (i.e. about 10M\$ of cumulated investments), the firm should experience a reduction in its original yearly workload by 35kh (i.e. 5%) and, if the size of its salesforce does not change, a slight increase in revenue by 0.6M\$ (i.e. by 0.6%). As a result, productivity will improve to 148\$/h (or by 6%).

Those estimates bring to life the benchmarks of [Frey and Osborne \(2017\)](#). First, they show that, in the MC field, technology is not associated to large changes in revenue but is about replacing/optimizing current activities. Additionally, it shows that transforming a MC firm service delivery model by replacing 15% or more of its “production” activities is likely to take 10 to 20 years.

Given that technology related activities are not core to MC practices and given the time span of such transformations, this could represent a very interesting opportunity for technology providers. Going back to a potential business case, this chapter shows that a 1M\$ investment translates in a decrease of 3.5kh of work per year. Since MC labor comes at a cost of 74.3\$/h (5.2), 1M\$ of investment generates a 250+ k\$ of savings every year. Thus, after 4 to 5 years, the investment is fully recovered and in the time span of a decade, this 1M\$ spent in tech has helped a potential MC firm save 2M\$ in labor.

If there is a business rationale for technology providers to potentially support the MC sector, several questions yet arise with respect to the size of such a market. A rough estimate can be devised from looking at the OECD database (see [Yamano and Ahmad \(2006\)](#) for a description). The OECD indeed records for each country the revenue of the MC sector and its number of employees. Assuming that each employee works about 50 weeks per year, 40 hours a week and dedicate 85% of his/her time to revenue generating activities (i.e. 1 employee = 1700h of revenue generating work per year), the average productivity of the sector can be estimated. Since most technology opportunities lie with MC practices whose productivity is under 200h/h, an

initial low bound estimate for the technology market associated to the MC sector can be devised.

Estimates displayed in table 7.6 show that the 3 largest European countries (the UK, Germany, France) represent a market potentially worth more than 2B\$ a year. If this is sizeable, the associated market is also heavily fragmented. As MC firms do only allocate 2% of their revenue towards technology, providers will only be able to generate less than 10k\$ of revenue per client per year. This means that the associated technology solutions in the marketplace will have to be flexible and that their number will ultimately be limited.

| | United Kingdom | Germany | France |
|-----------------------------|----------------|---------|----------|
| Revenue - 2017 | 79.4B\$ | 39.2B\$ | 32.53B\$ |
| Number of employees - 2017 | 489k | 177k | 163k |
| Number of firms - 2017 | 176k | 85.5 | 144k |
| Average productivity | 95.5\$/h | 129\$/h | 117\$/h |
| Est. market size (M\$/year) | >794 | >392 | >325 |
| (k\$/year/firm) | <10 | <9 | <4 |

Table 7.6: Estimating the size of the technology market associated to the MC sector

7.4.2 Limitation & future research:

There are two main limits to this study. First, it only covers mature European markets. Although it provides a first reference point with respect to the investment patterns (incl. their outcomes) of MC firms on technology, it would be interesting to see how the associated findings fare in other mature market context (e.g. US/Canada, Australia, Japan) as well as in emerging ones. Technology may indeed not have the same appeal when local consulting resources have a low-cost footprint (e.g. eastern European block, India, Malaysia etc. . . .). Finally, depending in the market, the threshold of 200\$/h that came out of the dataset, may be variable. For instance, in the case of Switzerland, given that labor consulting productivity is about twice as high as in Germany (Feaco 2018), the threshold of 200\$/h may be pushed up.

The second limitation of this study pertains to the way cumulative investments have been accounted for. The time coverage of the dataset is indeed limited, which means that cumulated investments are assumed to be 0 prior to 2014. If the proposed methodology proves useful to estimate the return of those investments, those figures must be taken as directional. Note that as an alternative, the parameters of the regressions used in this chapter were also estimated when cumulative investments ($\sum_k I_n(t-k)$) are replaced by the investments made during the year (i.e. $I_n(t)$). In this case, results were directionally similar (i.e. across the overall dataset yearly technology invest-

ments were associated to a revenue and labor cost increase and a reduction in workload), which illustrates the robustness of the conclusions drawn from this study.

When it comes to potential avenues for future research, two main options arise. First, it would of interest to further understand the impact of technology on MC firms' performance. At that stage, this could mean exploring three sub-topics. MC firms have indeed two main strategic levers to improve their competitiveness: displacing labor off/near-shore and replacing labor. So, it would be informative to understand if and how those two instruments overlap ² (e.g. if labor displacement revolves around routine activities, what's happening for off/near-shore hubs when automation kicks in?). Moreover, one element that has not been discussed here and that would merit some attention revolves around the limits of technology. The results of this chapter indeed assume constant return to scale (e.g. 1M\$ invested in technology yields a 140k\$ revenue increase). But the return of those investments should intuitively decrease as the potential for labor replacement in the MC space is not infinite (see [Frey and Osborne \(2017\)](#)). Of course, all those elements should be considered in a broader competitive landscape and it could also prove useful to quickly model how firms' investments decisions are the result of a competitive landscape.

Besides firm level considerations, a second potential avenue for future research would revolve around understanding the implications of labor replacement for individual consultants. Two ideas could be potentially worth some extra discussions here. First, it would be interesting to understand what the effect of those continuous investments on the role of a consultant could/should be. As technology becomes an increasingly important component of services production, one could wonder to which extent traditional consulting roles and IT ones are likely to merge. A potential example of this phenomenon in today's world is the increasing number of job openings in the MC space for product owners and data scientists / engineers. If roles are changing, the standard "up-or-out" career model in place in the MC space may also be subject to a revision ([Ribes et al., 2020](#)). If production activities get automated, MC practices will no longer have a large internal pool of resources upon which to draw the workers that plan the delivery and sell their services. The consulting career paradigm (i.e. get in as a graduate and either progress through the hierarchy or leave the firm) and its incentives (i.e. deferred compensation) will therefore shift which may trigger changes in consultants wage structure.

²Note that some of this was done in the case of the legal industry in an early chapter of this work.

7.4.3 Conclusion:

This chapter empirically explores the outcomes of technology investments on MC firms' performance across a panel of mature European markets. It shows that technology yields different effects depending in practices' initial productivity. In highly productive environments (e.g. practices that generate more than 200\$ of revenue per hour of work), technology replaces labor but is also associated to a revenue decline, while in low productivity spaces, technology replaces labor, increases revenue but also comes with an increase in labor costs. As a result, in low productivity environment, investments in technology trigger some revenue growth, boost productivity but appear neutral profitability wise; while in highly productive practices, technology is associated to a revenue decline and appears to be an instrument to stabilize productivity and profitability.

Chapter 8

Adjusting PSFs' career frameworks.

8.1 Summary:

8.1.1 French version:

Ce chapitre propose un modèle théorique et financier de l'organisation des entreprises de services professionnels. Le modèle inclut une variété de contraintes pouvant représenter les pratiques de management du secteur. Son analyse dans le cadre d'une organisation *up or out* montre qu'il existe de limites en termes de structure hiérarchiques et de délégation afin d'avoir une organisation viable. En outre, son optimisation montre que les entreprises de services professionnelles peuvent bénéficier financièrement d'une accélération des carrières des individus et de la création de rôles d'expertises (économies à hauteur de 5% de la masse salariale).

8.1.2 English version:

This chapter proposes a resourcing model that can be used to optimize the costs of large professional services firms [PSFs]. Its outcome is based on trade-offs between promotions and external hires under a variety of firm-specific constraints. It is enabled by continuous coupled age structured equations that take into account the workforce evolution at each level of the hierarchy. The model first explicitly provides conditions on the leverage structure of a PSF to design a pure "up or out" organization. Second, it shows that a professional services organization can benefit from creating alternate career tracks such as pools of specialists with different compensation schemes. The type of cost optimization is shown to achieve about 5% savings.¹

¹This chapter was originally published in *Economics Bulletin* as (Ribes et al., 2020) and was since then amended to account for the comments of Pierre Fleckinger, Raphael

8.2 Introduction:

The professional services sector is a specific industrial segment for which interest has grown sharply in the academic community over the past two decades (see Skjølsvik et al. (2017)). According to (Empson et al., 2015b), the sector is centered on accountancy, management consulting, legal, architectural and engineering firms². Although those firms provide different services (e.g. delivering an audit is not the same thing as designing a building), their business and delivery model has proven to obey a shared standard (see Løwendahl (2005)). As such, one of the trending research topic pertaining to professional services firms [referred to as PSFs in the rest of this paper] has to do with they way they manage their resources in order to increase their performance.

As discussed in Bottazzi et al. (2008), firm performance is made of three components: growth, profitability and productivity. When it comes to improving on PSFs' productivity (see Nachum (1999) for a definition), the academic community converges in saying that it mainly comes through services standardization (see Schmenner (2004)), the consequence of which is to change the resources mix necessary to deliver services (e.g. more junior and less expensive resources can be used)(see Greenwood et al. (2005)). However, if firm profitability and growth are well covered topics in the economic literature (see Hopenhayn (1992) for a seminal reference), especially for manufacturing firms, there is, to my knowledge, no discussion around profitable growth in the specific context of professional services firms. This paper will therefore start to bridge this gap, by exploring how resource management (in the form of the design of multiple career tracks) can help PSFs lower their production costs (and therefore increase their profitability) while remaining sustainable.

This work adds to three main streams in the academic literature. First, it adds to the current discussions pertaining to resource management in the field of personnel economics. According to Ulrich and Brockbank (2005), those conversations have mainly revolved around firm employment decisions and promotion rules over the past decades and ultimately aim at improving firms' financial performance (see Bidwell (2011) or Colombo et al. (2012)). As of late, as the field has recognized that those policies are varying on a firm by firm basis, they have branched out and evolved toward discussions around individuals selection and screening (see Lazear and Shaw (2007)) as well as career tracks design (see Ferguson and Hasan (2013)). This paper

Levy & Angelo Secchi.

²Note that, although less prominent from a revenue and employment standpoint, the professional sector also encompasses a host of other firms which provides services such as advertising ones; photographic services; translation and interpretation services; veterinary services; and other professional, scientific, and technical services. Please refer to the north american industrial classification system [NAICS] for further details.

contributes to this last topic by proposing a model that can easily be operationalized to find a cost optimal career proposition based on a PSF service delivery model.

Second, this work adds to the literature in operational research around workforce planning. As highlighted by [Alavi and Leidner \(1999\)](#), professional services have much more agile practices than capital intensive industries. This calls for a constant review of PSFs' human capital model and of its sustainability, especially as PSFs set an emphasis on growing people from within and rarely leverage external hires (see [Rider and Tan \(2014\)](#) for an illustration in the case of law firms). As most workforce planning studies have revolved around manufacturing environments (see [den Bergh et al. \(2013\)](#) for a review), the literature presents a gap with respect to PSFs that this paper addresses. Additionally, from a technical standpoint, the topic of workforce planning has been dominated, in operational research, by either deterministic (see [Stewman \(1986\)](#) for a review) or stochastic (see [Chattopadhyay and Gupta \(2007\)](#) for an example) discrete models. However, this paper takes a different stance by leveraging a continuous dynamic population approach. Although unusual in the workforce planning literature (see [Doumic et al. \(2017\)](#) for a discussion), this type of techniques is common to describe labor markets (see [Gomes et al. \(2013\)](#) or [Perthame et al. \(2018b\)](#)) and understand their equilibrium properties. As the subject of this study is to assess large organization sustainability (the "Big 4" accounting firms have for instance each more than 250k employees each worldwide), tools suited for population studies appear relevant and provide an original addition to the field.

Third, this work adds to the small academic niche revolving around PSFs. As noted by [Maister \(2012\)](#), PSFs have historically proposed a strict "up or out" career track because of their partnerships structure and as well as their screening imperatives to deliver quality work (see [Empson and Chapman \(2006\)](#) for a discussion). However, as PSFs grow and expand their service offerings, their model tends to shift (recent examples include Capgemini or Accenture), which enables them to potentially have dual career tracks. Accounts of those changes are already present in the literature ([Malhotra et al. \(2010\)](#), [Smets et al. \(2012\)](#)). Reasons highlighted in the community appear for now varied. For instance, [Stumpf \(2002\)](#) documented that an increasing share of individuals do not potentially understand and aspire to become partner (the pinnacle of the "up"). [Gilson and Mnookin \(1989\)](#) on the other hand stressed that the volume of new hires required in the professional services sector is now such that PSFs have been forced to lower their recruitment standard and the quality of the individuals they on-board. As a result, side career tracks have been created to manage the expectations of individuals who, by design, are unlikely to access the partner status. Others, such as [Bar-Isaac and Lévy \(2019\)](#), have highlighted that PSFs face difficulties in managing the "out" (i.e. they do not have the means to out-

place individuals who are not promoted). In this case adjoining an extra "non-partner" career track to their organizational model appears a suitable option to manage individuals who are "denied" the partner status. In any case, if the topic is not new, it has not been, to my knowledge, approached in an operational sense, a gap this paper aims to bridge.

The two main questions underlying this paper will be addressed sequentially. First, PSFs organization will be modeled based on simple, observable considerations such as firm's population size, seniority and turnover in section 8.3. This model will then be used to understand when the hierarchical structure and associated management aspirations of such a firm break depending in its business model in section 8.4. Finally, the production costs of professional services is analyzed in section 8.5 to see if relaxing the up or out culture can help reduce service delivery costs.

8.3 PSFs organization: a model.

Professional services firms are hierarchical organizations. According to [Maister \(2012\)](#), PSFs' workforce is usually structured around three main positions: "finders", "minders", "grinders". "Finders" sell services and establish client relationships based on their reputation and expertise. "Finders" delegate delivery planning and service quality reviews to the "minders", while "grinders" are in charge of the actual service production. The number of positions can somewhat vary depending on the service nature. For example, law firms are usually structured around two levels: partners and associates (see [Oyer and Schaefer \(2012\)](#)), while consulting firms exhibit more granular levels. But ultimately a PSF can be summarized to a set of L positions ordered in terms of level of responsibility from $j = 1$ to L .

From a resource point of view, three types of organizational dynamics have to be taken into account to describe PSFs "up or out" evolution over time. First, workers in position j can leave the firm at a rate μ_j because of retirements and resignations. Second, they can get promoted from position j to position $j + 1$ at a rate $P_j(t)$ if they have accumulated enough experience in their position (i.e. if their seniority s in their position is superior to a threshold of $\tau_j \geq 0$). Finally, a proportion $h_j(t)$ of the total $N_j(t)$ workers in position j can be hired externally at a rate $h_j(t)$.

The resources needs of PSFs are driven by clients acquisition and revenue management. According to [Maister \(2012\)](#), their business model is indeed based on charging hours at a given rate until the service has been tailored and delivered to clients. The allocation of those hours across the "finders" / "minders" / "grinders" may somewhat fluctuate depending on the client but it obeys, on average, to a well defined standard. So does the total amount of hours that is required to service the client portfolio of a PSF. Therefore a firm knows the overall amount of workers $N(t)$ it will need based on the

amount of clients it expects to service. It can then decompose the associated work in activities and forecast its workers needs $N_j(t) > 0$ across each of its positions $j \in \{1, \dots, L\}$. Note that, as the firm and its services mature, its needs in terms of "finders", "minders" and "grinders" evolve, which entails a change in the firm leverage ratio $\frac{N_j(t)}{N(t)}$ over time (see Ribes (2018b) for a discussion). To operate, a firm therefore needs to understand first its present and future needs $N_j(t)$ for each position and dynamically adjust its promotion rules τ_j , promotion actions $P_j(t)$ and external hiring activities $h_j(t)$ to meet them.

This dynamic adjustment can be achieved by assessing how the pool of workers $\rho_j(t, s) > 0$ that at time t , have seniority s in a position $j \in \{1, \dots, L\}$ (s.t $N_j(t) = \int_0^{+\infty} \rho_j(t, s) ds$) is evolving:

$$\partial_t \rho_j + \partial_s \rho_j + \mu_j \rho_j + I_{s \geq \tau_j} P_j(t) \rho_j(t, s) = 0, \quad s \geq 0, t \geq 0, \quad (8.1)$$

Calling $A_j(t) = \int_{s=\tau_j}^{+\infty} \rho_j(t, s) ds$ the number of workers that can potential be promoted from position j to position $j + 1$ and integrating equation (8.1), it comes that the new workers in position j are given by:

$$\rho_j(t, s = 0) = \underbrace{h_j \cdot N_j(t)}_{\text{External Hires}} + \underbrace{P_{j-1}(t) A_{j-1}(t)}_{\text{Promotions}} = \partial_t N_j(t) + \mu_j \cdot N_j(t) + P_j A_j(t) \quad (8.2)$$

Note that for the first position (e.g. $j = 1$), only external hiring is possible (which means that $P_0 = 0$) and that it is not possible to promote workers out of the last position (e.g. $j = L$) (which means that $P_L = 0$). This type of system, called renewal equation or McKendrick equation, is standard and well understood (see Gurtin and MacCamy (1974), Farkas (2002) and Perthame (2007) for methodological references).

8.4 Is a no external hiring policy sustainable for a PSF?

To deliver professional services (e.g. an audit), PSFs (e.g. an accounting firm) leverage a service blueprint that they tailor to their client (see ? for a reference). As blueprints and delivery models are often firm specific, it is possible to hire "grinders" externally, but it is extremely challenging to hire "minders". Finally "finders" are only brought in externally to develop new services and/or markets.³ For example, an audit firm focused on the utilities sector could bring in a new "finder" to start expanding its client portfolio

³Studies focusing on the legal environment (Rider and Tan, 2015) have indeed shown that a significant amount of movement exist at "finders" level between firms. External hiring at that level is indeed beneficial as it translates into an increase in reputation (and therefore revenue growth) (McEvily et al., 2012). As such, the "up or out" scheme is

to mining firms if it is unable to do so organically. Therefore external hires are mainly concentrated at the lowest level of the hierarchy.

Assume that all of the external hiring takes place at the lowest level of the firm (i.e. $j=1$). The condition (8.2) therefore entails that the promotion rates P_j must compensate both the turnover and the workforce needs fluctuations in the higher level of the firm:

$$P_j(t) = \frac{C_{j+1}^{no}(t)}{A_j(t)}, \quad C_j^{no}(t) := \underbrace{\sum_{l=j}^L \partial_t N_l(t)}_{\text{Business needs fluctuations}} + \underbrace{\sum_{l=j}^L \mu_l \cdot N_l(t)}_{\text{Turnover}} \quad (8.3)$$

This also means that the total number of hired workers at position $j = 1$ must balance the total number of workers leaving the firm (i.e. $h_1 N_1(t) = \sum_{l=1}^L (\partial_t N_l(t) + \mu_l \cdot N_l(t))$). For the organization to avoid hiring externally outside of its lowest level position, it must ensure that there is always enough workers that can be promoted (i.e. $A_j(t) > 0$). This leads to the following proposition. Assume that the population in position j is initially distributed as $\rho_j^0(s) \in L^1(+)$, for a PSF to be able to maintain a strict no hiring policy, its business needs must obey the following conditions:

$$\forall t \leq \tau_j, \quad N_j(t) > e^{-t\mu_j} \int_t^{\tau_j} \rho_j^0(s-t) ds + \sum_{l=j}^L \int_0^t (\partial_t N_l(t-s) + \mu_l N_l(t-s)) e^{-\mu_j s} ds, \quad (8.4)$$

$$\forall t \geq \tau_j, \quad N_j(t) > \sum_{l=j}^L \int_0^{\tau_j} (\partial_t N_l(t-s) + \mu_l N_l(t-s)) e^{-\mu_j s} ds. \quad (8.5)$$

When it comes to the sustainability of PSF's "up or out" model, proposition (8.4) shows that two cases appears. On one hand, if the firm is young (i.e. has not gone through a round of promotion across all its positions ($t < \max_j(\tau_j)$)) and its delivery model remains unchanged (i.e. $\partial_t N_l \approx 0$), its sustainability is dictated by its initial workforce composition. As young PSFs are very likely to die (for instance, in the US, the census data shows that 20% of PSFs between 0 and 3 years close every year) and sustainability appears as one of the determinant for survival (see Storey (2016) for a broader discussion), proposition (8.4) stresses that founders should pay a attention to their initial staffing model (i.e. ρ_j^0) as it can become a show stopper for their firm. On the other hand, if the firm has survived long enough to go through at least a cycle of promotions across all its positions (i.e. $t \geq \max_j(\tau_j)$), the sustainability of a level j is dictated by the evolution of the firm service delivery model in the upper-levels (i.e. $\partial_t N_k$ for $k > l$).

currently under scrutiny (Hillman, 2002) as it may only apply to the "production" oriented roles of PSFs. Cross organizational careers indeed require a certain level of reputation to start (Bidwell and Briscoe, 2010).

Now, assuming the conditions of proposition (8.4) are met, it becomes possible to fully characterize the workforce evolution of a PSF which services have fully matured, especially as, according to [Audretsch et al. \(2004\)](#), the assumption that PSFs grow according to Gibrat's law holds (i.e. their growth rate ν is constant). [Steady state behavior] Assume that a PSF grows at a rate ν and keeps its leverage structure constant (i.e. its workforce needs at each level j are such that $N_j = \bar{N}_j e^{\nu t}$). If:

$$\forall j > 1, \quad 1 > \sum_{l=j}^L \frac{\bar{N}_l}{\bar{N}_j} \frac{\nu + \mu_l}{\nu + \mu_j} (1 - e^{-(\nu + \mu_j)\tau_j}).$$

then there is a unique state with growth $\rho_j(s, t) = \bar{\rho}_j(s) e^{\nu t}$ and it is given by $A_j(t) = \bar{A}_j e^{\nu t}$, $C_{j+1}^{no}(t) = \bar{C}_{j+1}^{no} e^{\nu t}$ and

$$\begin{aligned} \bar{\rho}_L(s) &= (\nu + \mu_L) N_L e^{-(\nu + \mu_L)s}, \\ \forall j < L \quad \bar{\rho}_j(s) &= e^{-\nu s - \frac{C_{j+1}^{no}}{A_j} (s - \tau_j)_+} \sum_{l=j}^L (\nu + \mu_l) N_l. \end{aligned}$$

Interestingly, proposition (8.4) nuances the statements of [Maister \(2012\)](#) that make growth (in revenue and employment) a necessary condition for the sustainability of PSFs as it drives the firm incentive structure in terms of promotions opportunity. It indeed shows that, as long as PSFs' service delivery model (i.e. \bar{N}_j for $j \in \{1..L\}$) is set and viable, they can operate in a sustainable fashion whether or not they face favorable ($\nu > 0$) or adverse ($\nu \leq 0$) market conditions. Promotions rates for employees in position j (i.e. P_j) are indeed independent from firm growth (i.e. ν) and remain constant as long as the service delivery model of the firms is unchanged.

8.5 How to minimize the production costs of a PSF?

Section (8.4) has shown that for the "up or out" model of a PSF to be viable, its delivery model (i.e. the number of positions N_j required across the $j \in \{1..L\}$ levels of the firm) obeys specific constraints. The career model of a PSF can yet be optimized, notably to lower its production costs. To deliver services, the firm indeed relies on workers in each position j , who comes with a base cost ω_j that increases at a rate r_j with experience (i.e. the cost of worker with experience s is given by $\omega_j(s) = \Omega_j \cdot e^{r_j \cdot s}$). As technology only assumes a negligible part of the delivery of professional services (even though this may change in the future as stressed by [Frey and Osborne \(2017\)](#)), the production costs of a PSF organization (which has a no external hiring policy and is at equilibrium ($\nu = 0$)) are driven by its workforce and therefore

defined as the aggregate wage bill given by: $C = \sum_{j \leq J} \Omega_j \int e^{r_j \cdot s} \cdot \bar{\rho}_j(s) ds$. Note that, to ensure that costs are finite, the yearly wage increases must be such that $r_j < \mu_j \cdot (1 + f(\tau_j))$ with $f(\tau_j) = \frac{\sum_{l \geq j+1} \mu_l \cdot N_l}{\mu_j \cdot N_j \cdot e^{-\mu_j \cdot \tau_j} + [\sum_{l \geq j+1} \mu_l \cdot N_l] \cdot [e^{-\mu_j \cdot \tau_j}]}$ as:

$$C_j = \Omega_j \cdot \left(\sum_{l \geq j} \mu_l \cdot N_l \right) \cdot \left(\frac{e^{(r_j - \mu_j) \tau_j} - 1}{r_j - \mu_j} + \left(\frac{e^{(r_j - \mu_j) \cdot \tau_j}}{\mu_j (1 + f(\tau_j)) - r_j} \right) \right) \quad (8.6)$$

Two types of activities can then be initiated to decrease the cost of service. First, it can reduce the pool of workers that are waiting for a promotion (i.e. A_j) by promoting people earlier if ready. This will translate in savings if wage increase r_j are important. To reduce its production costs, a PSF can speed up its career track (i.e. decrease τ_j) on positions j if their yearly wage increase is such that:

$$r_j < \mu_j \cdot \left(1 + \frac{f'(\tau_j) \cdot [(r_j - \mu_j)(r_j - \mu_j \cdot f(\tau_j))]}{f(\tau_j) \cdot [2 \cdot r_j - \mu_j \cdot (1 + f(\tau_j))]} \right)$$

If a PSF can change its traditional up or out career track to manage costs, it can also have an interest in proposing alternative careers scheme by carving out a pool of specialists in position j that are not eligible to promotion above j and are sourced from the prior position $j - 1$. As generalists and specialists have a different wage structure (see Prasad (2009)), the following condition must therefore be respected, for this scheme to benefit a PSF. A PSF can optimize its production costs by setting up a pool of P_j specialists at position j that have a wage scheme $\theta_j(s)$ defined by a base salary Θ_j with a yearly increase at a rate $h_j < \mu_j$ (i.e. $\theta_j(s) = \Theta_j \cdot e^{h_j \cdot s}$) if:

$$\left(\sum_{l \geq j} \mu_l \cdot N_l \right) \cdot \left(\frac{e^{(r_j - \mu_j) \cdot \tau_j} \cdot [f(N_j - P_j, \tau_j) - f(N_j, \tau_j)]}{[\mu_j (1 + f(N_j, \tau_j)) - r_j][\mu_j (1 + f(N_j - P_j, \tau_j)) - r_j]} \right) > P_j \cdot \left[\frac{\Theta_j}{\Omega_j \cdot (\mu_j - h_j)} - \mu_j \cdot \left(\frac{e^{(r_j - \mu_j) \tau_j} - 1}{r_j - \mu_j} + \frac{e^{(r_j - \mu_j) \cdot \tau_j}}{\mu_j (1 + f(N_j - P_j, \tau_j)) - r_j} \right) \right]$$

Example. Those two policies were tested in a PSF whose characteristics are similar to the one described in table (8.1) (and with 1000 workers). The firm meets the conditions described in proposition (8.4) and is therefore able to grow its own employees. Normalizing the firm growth ν to 0%, its initial structure bears a long run operating cost of 71.53M\$ per year. Its career track features a 12 years period for an employee to grow from a "grinder" to a "finder". Without changing the overall track length, proposition (8.5) shows that remodeling the firm career track to allow promotion from grinder to minder after 3 years and from minder to finder after 9 leads to cost savings worth 572k\$ per year (i.e. 0.8% of total costs). Additionally creating specialist tracks for both minders and grinders with a wage scheme

of 77k\$/year for specialist minders (resp. 38k\$/year for specialist grinders) with a 2% year on year salary adjustment so that 7% (resp 20%) of the firm workforce is made of specialist minders (resp. grinders) preserves the firm ability to be self sustained while generating an additional 3.9% of cost savings (i.e. about 3M\$ per year).

| j | \bar{N}_j | Ω_j [k\$/year] | r_j^g [%/year] | τ_j (years) | μ_j [%/year] |
|----------|-------------|-----------------------|------------------|------------------|------------------|
| Finders | 5% | 150 | 2% | - | 5% |
| Minders | 20% | 70 | 5% | 6 | 15% |
| Grinders | 75% | 35 | 5% | 6 | 20% |

Table 8.1: Example of professional services organization set up.

8.6 Conclusion and perspectives.

This chapter models the labor organization of PSFs. It first shows that the viability of their classical organizational paradigm (i.e. the so called "up or out" model) is linked to the evolution of their service delivery model rather than its revenue growth as stressed in most of the PSFs related literature. Second it shows that, when PSFs are sustainable, they have the opportunity to reduce their costs of service production by redesigning the firm's career track. This optimization is shown to be mainly dependent in the exogenous competitive pressure that exists for workers in the market as this drives the number of individuals who leaves the organization.

The implementation of those new policies yet raises questions of workers appetite for the various career menus that a PSF can propose. This could indeed have some impact on the firm's position turnover and therefore its sustainability. This could represent an interesting avenue of future research.

Chapter 9

Evolving PSF's workers compensation.

This chapter discusses the topic of compensation evolution when labor gets displaced through a model applied to the management consulting industry. It was originally published as (Ribes, 2021). The focus of this chapter is illustrative. The associated insights and methods indeed apply to the overall professional services industry and can also be used when discussing the topic of labor replacement.

9.1 Summary:

9.1.1 French version:

La délocalisation d'activité est un sujet bien connu dans le domaine de la manufacture. Son utilisation dans le domaine des services et notamment dans le domaine des services professionnels est néanmoins récente.

Ce type de transformation est toutefois risquée (i.e. 1 entreprise sur 2 n'en tire pas les bénéfices escomptés). Une des principales difficultés rencontrée a trait à la résistance au changement des employés. Cela pose donc la question des techniques d'incentives disponibles pour rendre l'évolution attrayante.

Ce chapitre modélise donc l'impact de ce type de transformation sur la carrière de consultants et notamment sur l'incentive principal des entreprises de conseil : l'accession au rang d'associé. Le modèle montre, une fois calibré à des données issues des états unis, que la délocalisation conduit à une polarisation locale des salaires. Les rémunérations des associés croissent, tandis que le salaires des consultants diminuent de 200 à 500\$ par an pour chaque pourcent d'activités délocalisés.

Le modèle montre que les consultants bénéficient toutefois au long terme de ce changement dans la mesure où leur chance d'accéder au rang d'accéder au rang d'associé augmentent. En outre le modèle montre que la salaire

d'un consultant est beaucoup impacté par les chances d'accès inhérentes à la structure de l'entreprise qu'il souhaite rejoindre que par le phénomène de délocalisation.

9.1.2 English version:

Displacing labor off/near-shore has historically been the subject of many debates in the context of manufacturing firms. But recently it has also started to be used as an instrument to improve competitiveness in the realm of services. The management consulting industry is one of the many places where such transformation is underway.

It is however common knowledge that off/near-shoring activities is difficult. Available benchmarks indeed state that only one out of two firms get some benefits of the associated changes and it is known that one of the major derailleurs for this kind of evolution revolves around the willingness of their workers to embrace the change. For management consulting practices, the topic is very much on the table as they potentially can standardize and displace labor massively to reduce production costs (up to 50% of production activities can be done remotely). This therefore raises questions on the ability of such firms to provide incentives for their workers (i.e. what does it mean for one's career? For one's earnings? etc. . .).

This paper therefore offers a career model that can be used by such firms to assess what off/near-shoring entails for local consultants. Once calibrated to US data, it notably shows that displacing labor simply delays consultants' earnings until the final stage of their career (i.e. when they make it to partner) and also reduces the risk they bear when entering the industry (i.e. they become more likely to be promoted and therefore can yield higher revenue over time). The trade off is of course that if partners compensation increases up to 20%, consultants' wages decrease by 200 to 500 US\$ per year for every percent of work displaced.

If the model shows how consultants can benefit from off/near-shoring, it also stresses that their compensation and career are primarily linked to the partnership structure of the firm they join. Consultants' career are indeed mainly about becoming the successor of an existing partner. Such that, for every percent of increase in succession chances, consultants' wages decrease by 2 to 3 k\$ per year. As a result, consultants' career compensation are much more impacted by the shape of the partnership one may join than by the partnership choices when it comes to off/near-shoring work. To the point, that under certain circumstances (i.e. firms where succession is very likely), the partnership structure even rules out the competitive advantages (in terms of labor costs) presented by other geographies.

9.2 Introduction:

Displacing labor off/near-shore to reduce production costs has been a major and heavily mediatized topic for manufacturing firms over the past decades ([Harrison and McMillan \(2011\)](#), [Ellram et al. \(2013\)](#)). But the focus of those discussions has recently started to shift towards services ([Jensen et al. \(2005\)](#), [Wagner \(2012\)](#)). Given that displacing labor to developing countries (e.g. India, Argentina, China) can come with savings as high as 50 to 75% per unit of labor (e.g. an auditor in the US costs about 80k\$ per year while an auditor in India costs 20 to 40k\$), services firms have naturally started to revamp their service delivery model to benefit from geographical disparities and boost their performance, especially in sub-sectors where growth has started to become slower and overall financial performance has been under scrutiny. But besides financial considerations, this topic is nowadays the source of several conversations because of the potential impact of the associated transformation. Existing benchmarks, such as the one of [Jensen et al. \(2005\)](#), indeed state that between 20% and 50% of the activities necessary to produce a service can be delivered remotely. Since the service industry employs more than two third of the active population in developed countries (see OECD statistics), one can easily understand the consequences that such a change could have on mature markets .

Within the services realm, the management consulting industry [referred to as MC in the rest of this paper] is no stranger to this type of optimization. This type of instrument has indeed been used to offset declining profitability in a number of markets, which are experiencing competitive pressures (e.g. the UK, the US ([Sako, 2015](#))). Results, however, have been mixed. In the case of the UK, [Sako \(2006\)](#) has indeed reported that labor displacement has led to a decrease in productivity (expressed in \$ of revenue generated by hour of work) for MC firms. On the other hand, other evidences ([Ribes, 2020](#)) have reported that labor displacement was seen to improve US MC practices performance. Interesting, this heterogeneity does not come as a surprise as succeeding such a transformation has been always been notoriously difficult ([Youngdahl and Ramaswamy \(2008\)](#), [Ellram et al. \(2013\)](#)). This yet raises a few questions about how to get it right. One of the key elements that scholars have started to recently unearth revolves around the creation of incentives for individual workers (i.e. how to make workers embrace a shift of some activities off/near-shore?). But as stressed in the recent reviews of [Sako \(2015\)](#) and [Skjølsvik et al. \(2017\)](#), this later part is not yet well (if at all) understood in the context of MC firms. There is indeed, to my knowledge, no discussion available on the impact of labor displacement on consultants' career paths and wages. This appears as a gap that this paper will bridge.

To understand how labor displacement impacts local management consultants, this chapter develops and calibrates an original model explaining how

MC careers and wages are interlinked. This is done in four steps. First, the current literature pertaining to professional services firms (and their career models) as well as the one pertaining to labor displacement are reviewed. Those theoretical foundations are then used to model the succession mechanism (from employee to partner) that underpins MC careers and wages. Third, the impact of labor displacement on employee's succession chances is reviewed. This provides an equilibrium condition that can be used to assess the sensitivity of MC wages to labor displacement. Finally, the competition for employees between partnership is quantified and the resulting condition is used to fully characterize MC wages in a context where firms displace labor. This paper then concludes by discussing the implications of the proposed model for consulting partners and remote workers.

9.3 Theoretical foundations:

The ideas presented in this paper sit at the intersection of two distinct fields of research. On one hand, they build upon the managerial literature dedicated to the organization of professional services firms (PSFs) and knowledge intensive business services (KIBS) . On the other, they expand on the current body of economic literature dedicated to labor displacement (e.g. off/near-shoring). This section will therefore propose a brief review of those two topics and illustrate the contributions of this chapter.

9.3.1 What do we know about PSFs/KIBS as organizations?

According to the recent review of [Skjølvik et al. \(2017\)](#), the academic interest for PSFs has been rising steeply over the past 20 years. This curiosity has been motivated by the sector specificities and its prominence in today economy . Its value chain is indeed atypical in the sense that professional services are first sold before being produced and that the quality of the purchased service cannot be assessed ex-ante since the deliverable is co-created with the client ([Løwendahl, 2005](#)). This differs from most services and goods as the product/deliverable can generally be seen or tested upfront of the purchase.

Given the up-front intangibility of professional services, the first historical focus of the literature has been to find which signal potential clients could rely on when making a procurement decision. On that front, the consensus that the academic community reached was that clients actually hedge their decisions through the reputation of the individuals offering their expertise ([Starbuck \(1992\)](#), [Podolny \(1993\)](#), [Rao et al. \(2001\)](#), [Greenwood et al. \(2005\)](#)). Naturally , this generated a follow up question around how to industrialize the sales and delivery of such services (i.e. how to make the most of an individual's brand by setting up a firm), something that has been addressed through both managerial narratives (i.e. what is the organizational

blueprint that would help those individuals maximize their potential) and economic quantification exercises (i.e. what is the performance (growth, profitability, productivity) of such firms).

Looking back at the work done over the past decade, it appears that the standard organizational solution has been for reputed individual experts to establish privately held partnerships (Greenwood et al. (1990), Greenwood and Empson (2003)), where they would focus on building and maintaining their brand to generate revenue (i.e. focus on sales activities), whilst delegating service production tasks (Maister, 2012). But if the incentives of such a structure are clear for partners, scholar's attention quickly turned towards how to motivate and incentivize workers focusing on service production. The main approach highlighted by the literature consists in layering production activities to structure a step by step hierarchical career that could ultimately lead to succeeding to an existing partner when he/she retires (Galanter and Palay (1994), Sherer (1995), Malos and Campion (2000), Briscoe and Von Nordenflycht (2014)). This career scheme was dubbed the "up or out".

If the managerial tenets of PSFs organizations were covered in the 90s, questions of economic performance only started to gain traction recently. The main reason for this lag was probably that the 90s were a golden age for PSFs since competitive pressure only started to be felt at the onset of the new century. In most mature countries, the number of professional services firms has indeed grown much more rapidly than the pace at which the overall economy has developed. As a result, the past ten years (Skjølsvik et al., 2017) have seen the academic community starting to look at questions of competitiveness and performance through the lens of internationalization (Sako, 2005) as well as technology and innovation (see Armour and Sako (2020) for example).

Those classical competitiveness themes have however generated a host of new interrogations summarized in the recent literature review of Smets et al. (2017). One of those pertains to whether service quality is still unobservable and if individual reputation still bears the same weight in services purchase decision (Kronblad, 2020). Competitive pressure and the resulting technology investments have indeed initiated a commoditization/standardization of professional services and this may lead professional services firms to shift away from the partnership model as the reliance on human capital appears to erode.

But the implications of the transformation induced by the market competitive pressure is not limited to individual partners. Both labor replacement (via technology/ innovation) and displacement (off/near-shore) have indeed led the academic community to wonder to which extent the career structure of production-dedicated workers should change (Kuruville and Noronha, 2016). This has notably led to recent discussions around whether the classical "up or out" scheme is still valid. One of the emerging devia-

tion documented recently in the literature revolves around the introduction of “landing ranks” (see for instance the concept of “up and going nowhere” highlighted by [Malhotra et al. \(2010\)](#)). In this set up, PSFs have indeed been shown to offer career layers that are outside the standard partners succession career track, which serves both innovation ([Malhotra et al., 2016](#)) and costs savings ([Ribes et al., 2020](#)) purposes. However, there has not been, to my knowledge, anything done to address the question of compensation and incentives adjustments triggered by those changes in PSFs, something that is at the core of the generic “up or out scheme” and that this paper addresses in detail in the specific context of management consulting practices.

9.3.2 What do we know of the globalization of services delivery chains?

This contribution of this paper however goes beyond the research field dedicated to PSFs. At its core, this chapter indeed acknowledges that PSFs are ongoing a profound transformation articulated around labor replacement as well as labor displacement and it explores the shift in incentives associated to the use of this later transformation instrument (i.e. off/near-shoring). But if re-allocating labor across the globe is a new topic for PSFs (and in services in general), it is a mechanism that has already been used extensively across more mature industrial sectors (e.g. manufacturing) and which has generated a stream of academic research on its own.

Looking back at the work done by scholars over the past 30 to 40 years, it appears that the main reasons for displacing labor are well known. On one hand, a firm can use it to access certain competencies to innovate more quickly and spur growth (e.g. set up innovation hubs). This idea is generally referred to as the resource-based view of a firm (RBV) ([Wernerfelt, 1984](#)) ([Penrose and Penrose, 2009](#)). On the other hand, a firm can displace labor to reduce its costs (e.g. production/sales) with the aim of improving its profitability. This approach is nowadays clubbed into transaction costs economic frameworks (TCE) ([Williamson, 1998](#)).

Interestingly, the methodology used to assess the potential for labor displacement is the same whether a firm choose to do it for profitability and/or growth reasons. It starts by analyzing the value chain of a good / service / process ([Porter, 2001](#)) and breaking it down into sets of non-separable tasks ([Grossman and Rossi-Hansberg, 2008](#)) referred to as activities. Each of those activities are then reviewed and a re-allocation is proposed based on resources viability and costs constraints. Current benchmarks drawn from this framework in the field of services shows that between 20% and 50% of the work ([Jensen et al., 2005](#)) currently done locally (e.g. in New York, NY, USA) could potentially be reallocated somewhere else (e.g. Bangalore, India). But of course, this magnitude of this change depends in the service nature and some professional services may be more prone to be delivered

remotely than others. Looking back at the professional services classification offered by [Maister \(2012\)](#), complex and interaction heavy services (referred to as “brain”) are indeed likely to remain fully local (e.g. merger and acquisition consulting), while other which are process oriented (e.g. tax compliance) may actually be fully displaced.

But if, at first glance, displacing labor seems relatively simple, this type of transformation is not without challenges. Only 50% of the firms which attempt this type of change indeed reap benefits from it ([Aron and Singh, 2005](#)). Assuming that the transformation has been planned and executed properly (i.e. that non separable tasks have not been planned for dismantlement and that the possibility of off/nearshoring labor has been reviewed against potential automation opportunities [notably for routine activities]), the literature has reckoned that for the change to be successful, it must more than anything else occur at pace ([Eppinger, 2019](#)). As all firms virtually share the same options, sectors indeed see their prices revenue going down (for a given unit of service) (see [Ribes \(2020\)](#) for a specific example on management consulting). Therefore, firms transforming faster than the average on their sector gain from it, whilst others experience a decrease in their performance.

On that vein, the recent literature review of [Pisani and Ricart \(2016\)](#) has identified a couple of avenues of future research that could help firms transform successfully. If, of course, there are still intense debates about what should be displaced (the issue of dismantling non separable tasks and/or losing key capabilities locally has indeed given birth to an entire stream of discussions around reshoring activities ([Tate and Bals, 2017](#))), one key topic scholars are currently focusing on revolves around understanding the impact at individual level of such changes (e.g. career, compensation) and around making sure that individual incentives are aligned to navigate the change successfully and at speed. A number of evidences have indeed pointed out that labor displacement may lead to a decrease in compensation for some workers ([Baumgarten et al. \(2013\)](#) [Geishecker and Görg \(2013\)](#)), which in turn raises the question of the incentive they would have in supporting the firm transformation. This is something that this chapter will explore to in the context of management consulting firms.

In lieu of quick summary, section 9.3 has offered a high-level review on what’s currently known on the impact of labor displacement off/near-shore and professional services firms. It has notably shown that, as of today, there is gap in our understanding with respect to the impact of that type of transformation on local careers across all sectors. This paper therefore aims to bridge this gap in the context of management consulting practices. This will be done from both a managerial narrative and an economic standpoint. The associated analysis will be carried in a theoretical fashion and is decomposed in a couple of steps. First, section 9.4 will propose a baseline model of the traditional career of consultants to explain how their compensation

is driven. Section 9.5 will do a deep dive on the succession mechanism that underpins the proposed model and discuss how MC firms' transformations impact consultants' succession chances. Section 9.6 will then finally show how to solve the model and assess the realistic consequences of labor displacement. This will be done by integrating conditions representing the fact that all MC firms must compete to attract consultants. This will be followed by a general discussion in section 9.7. This discussion will highlight the practical implications of that transformation and future potential avenue of research. Section 9.8 will then offer a quick wrap-up.

9.4 The consulting career model:

In order to understand the impact of labor displacement on consulting careers, one must first understand their blueprint. This is something this section will explain both from a narrative standpoint and from a quantitative standpoint. The managerial narrative will be based on the existing literature and will be used to propose a simple and original personnel economic model.

Most management consulting firms are structured as privately held partnerships (Levin and Tadelis (2005), Maister (2012)). In those firms, a strict labor division exists between sales and production tasks. Business development activities are performed by the partners, who possess a portfolio of relationships big enough to generate revenue in a sustainable fashion. To maximize revenue generation, partners solely focus on sales and delegate¹ service production to employees (of which there is a total of L per partner – see Greenwood et al. (2005)).

To increase the practice profitability, partners can displace some of the service delivery off/nearshore. Local employees indeed come at a cost c , while off-nearshore ones are less expensive and come at a cost $\bar{c} < c$. According to benchmarks (Jensen et al., 2005), between 20% and 50% of the overall consulting activities could be delivered remotely. Note, however, that the amount of work that can be displaced is highly dependent in the type of service consultants provide and that they are limits to what can be done off/near-shore (for example see Doh et al. (2009) for a discussion around tasks separability).

In a partnership scheme, partners are compensated based on the practice profitability (Hitt et al., 2001). They consequently have a direct incentive to displace labor. Assume that every partner generates a revenue R and that when labor displacement occurs this revenue decreases by δ as some of the associated benefits get passed to clients in the form of price rebates Kohler

¹Delegation makes sense from an economic standpoint as client acquisition requires a market acknowledged expertise which is only possessed by partners, while the production process is very much a learning one that can be performed with limited initial knowledge.

(2004)². The compensation ω of a partner in a firm where a fraction θ of MC firms' employees is displaced off and/or near-shore is therefore given by:

$$\omega(\theta) = R.(1 - \delta.\theta) - L.c.(1 - \theta) - L.\bar{c}.\theta \quad (9.1)$$

However, labor displacement is also known to influence³ the wages of local workers (see Oldenski (2014)) [$c(\theta)$]. In the management consulting space, this influence must be understood in the context of the deferred compensation scheme that structures the wages of local workers (Malos and Campion, 1995). Most new partners indeed inherit a portfolio of relationships from an existing senior partner who retires (Briscoe and Von Nordenflycht, 2014)⁴. Employees have thus a chance $\phi(\theta)$ of becoming partners after a given period time⁵. This chance is affected by the amount of work that is being displaced. Therefore, the overall incentive for an employee (i.e. his/her prospective earnings) is given by:

$$I(\theta) = c(\theta).(1 - \phi(\theta)) + \phi(\theta).\omega(\theta) \quad (9.2)$$

If MC firms want to preserve employee's incentive while transforming (i.e. $\partial_\theta I = 0$) and ensure his/her participation in the associated efforts, local workers compensation must obey the following condition:

$$\begin{aligned} \partial_\theta c - c(\theta). \frac{((\partial_\theta \phi.(1 + L(1 - \theta)) - \phi.L))}{((1 - \phi) - \phi.L.(1 - \theta))} \\ = -((R.(\partial_\theta \phi.(1 - \theta) + \phi.\delta) + \frac{\partial_\theta \phi.\theta - \phi).L.\bar{c}}{((1 - \phi) - \phi.L.(1 - \theta))}) \end{aligned} \quad (9.3)$$

This blueprint therefore shows that employees' compensation is derived from the structural elements that make partners compensation (i.e. delivery (L, \bar{c}) and revenue (R, δ) parameters) as well as promotion chances (ϕ).

²This is a generic pattern that has been found across a number of industry. The underlying idea is that leveraging trade increases the service/product supply for a local market, which gets balanced by a reduction in prices

³Leveraging non local resources for production purposes indeed yields an increase in supply on the labor market which gets balanced by a decrease in wages for local workers.

⁴The literature around professional services firms has indeed traditionally highlighted that partners are either built via a succession mechanism or are self-starters (what's referred to as "rain makers") [see Maister (2012)]. But despite the attention paid to "rain makers", self-starting individuals appears to be rare in the overall sector, especially now that the field is maturing.

⁵Access to the partnership is first and foremost a question of recognition from the external market, a topic that has been well covered in the labor economics literature. As such, given the imperfection of the current structure (i.e. inability to assess ex ante the productive ability of an individual), time is required to creates a track record providing empirical evidences of an individual capabilities (see the theory of (Akerlof, 1978))

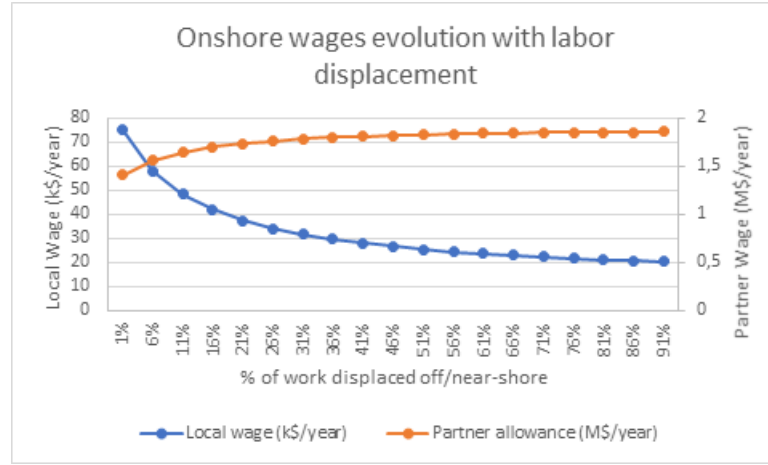


Figure 9.1: Local wage evolution with labor displacement

Example. To illustrate what this theory entails, let us assume that the chances of getting access to the partnership are independent from the level of transformation that occurs in a firm because of labor displacement (i.e. $\partial_\theta \phi(\theta) = 0$). Note that this is of course purely illustrative and will be discussed more in details in the next section. In this case, MC employees' wage can be analytically expressed from equation 9.3 up to a constant C as:

$$c(\theta) = \frac{C}{((1 - \phi) - \phi.L.(1 - \theta))} - (R.\delta/L - \bar{c}) \quad (9.4)$$

To get a sense of what the transformation associated to labor displacement could mean for employees, assume that, as in [Kipping and Kirkpatrick \(2013\)](#), every partner leverages a total of $L=8$ employees to deliver MC services. Those employees each support the generation of $\frac{R}{L}=250\text{k}\$/\text{year}$ (see for instance the benchmarks provided by the Accounting Today who audit on a yearly basis the performance of large US Audit and management consulting firms) and have a chance $\phi=10\%$ of accessing the partnership after a given tenure (see [Phillips \(2001\)](#) for a benchmark coming from the legal industry). When labor displacement occurs, a new type of employee with a compensation $\bar{c}=15\text{k}\$$ are brought in the delivery mix. A portion of the benefits of this change is passed to MC clients in a form of a price discount worth $\delta=1.2\%$ (see [Ribes, 2020](#)). Assuming as per the US census data that the base salary in the MC industry is worth $c(\theta = 0)=80 \text{ k}\$/\text{year}$, the impact of labor displacement on local workers can be quantified as seen in Figure 9.1. The results of this calibration show that, if succession chances are not impacted by labor displacement, by the time 20% of MC work will have been displaced, local wages will have been halved. Interestingly, most of the changes in local compensation are realized at the onset of the transformation (i.e. before 20% of the work gets displaced).

In summary, this section has proposed a career model that can be used to quantify the impact of labor displacement for consultants and MC partners. It has shown that labor displacement entails a transformation in the management consulting space that improves (resp. decreases) partners (resp. consultants) earnings since their consulting careers are structured around a deferred compensation mechanism. It has also highlighted that a few more elements need to be discussed to address the core question of this paper. One of them revolves around understanding what drives the probability for employees to make it to partner. This calls for a discussion on the career options that MC firms offers both to their local and remote workers, something that will be at the heart of the following section.

9.5 Succession pipelines and MC firms' transformation:

The previous section has highlighted that for someone to estimate employees' wages in MC firms in a context of transformation, it was necessary to understand the chances those workers have of becoming a partner (i.e. ϕ). So, naturally, quantifying the local impact of labor displacement requires a review of how such a change may impact employees' opportunities (i.e. what is the mechanism behind $\phi(\theta)$?). This will therefore be this section's area of focus.

As reported in [Adams and Zanzi \(2005\)](#), making it to partner is a long journey which takes between one and two decades⁶. Given that MC firms mainly operate with a given portfolio of relationships, employees generally become partners by inheriting an existing portfolio ([Briscoe and Von Nordenflycht, 2014](#)). It has also to be noted that given the local nature of relationships, this succession scheme is only open to individuals sitting in the same location as a partner and not to the located in specialized off/near-shore production hubs. To ensure the success of the succession, local MC careers are structured in sub-phases where incumbents get exposed. This also ensures a standard in quality with respect to the deliverable. Given that production activities are staged, the risk of errors at the end of the chain is statistically low. to all the aspects of the sale and production activities of a professional service ([Stumpf, 1999](#)). Note that those sub-phases will not be discussed in this paper as it concentrates on the overall succession mechanism (i.e. how does one move from employee to partner?).

In such a scheme, a local employee, who is joining a given a MC firm at a moment t , has his chances determined by the current shape of the partnership. Partners are indeed mainly leaving because of mandatory retirement after a tenure τ in the firm (an endogenous parameter which is set by the

⁶Please refer to the prior section for more details on the underlying economic mechanism.

partners themselves as a collective ⁷). So, if there are $n(a, t)$ partners at a moment t that have a tenure a , the overall size of the partnership $N(t)$ follows: $N(t) = \sum_{a\tau} n(a, t)$ and the number of successions for the next period is set as $n(\tau, t)$.

Since promotion is only possible after a period T ⁸, out of a local cohort of $L.(1 - \theta).N(t)$ new joiners, if we assume that succession chances to the $n(\tau, t + T)$ retiring partners are equal across all employees, the promotion chances of an individual joining the firm at time t are given by:

$$\phi(t, \theta) = \frac{n(\tau, t + T)}{L.(1 - \theta).N(t)} = \frac{n(\tau - T, t)}{L.(1 - \theta).N(t)} \quad (9.5)$$

Leveraging the compensation model built in the previous section (i.e. equation 9.3) and calling $S_t = \frac{n(\tau-T, t)}{N(t)}$ the number of partners that require a successor to be onboarded at time t , the impact of labor displacement on local salaries is therefore governed by:

$$\partial_{\theta} c - c. \frac{\frac{-S_t}{1-\theta} - 2.S_t.L}{(L.(1 - \theta)(1 - S_t) - S_t)} = - \frac{(R.(\delta - \frac{S_t}{L}) - L.\bar{c}.\frac{S_t}{(1-\theta)})}{((L(1 - \theta).(1 - S_t) - S_t)} \quad (9.6)$$

The framework proposed through equation 9.6 has a couple of interesting features. First, it aligns with the general intuition that the more labor gets displaced, the lower local workers' compensation is (i.e. $\partial_{\theta} c < 0$). Second, it can also be used by any individual to understand how differences in compensation across practices can be explained by differences in service delivery model (i.e. θ). Third, it also shows that the rewards individuals can enjoy from a consulting careers become more certain because of labor displacement ($\partial_{\theta} \phi > 0$).

Example. To illustrate the impact of a transformation on local wages, a sensitivity analysis is thereby performed. This is done with three sets of assumptions. First, the benchmarks (stemming from the literature) used in the previous section ($\bar{c}=15\text{k}\$/\text{year}$, $L=8$; $\frac{R}{L}=250\text{k}\$/\text{year}$; $\delta=1.2\%$) are re-used. Second, firms are not assumed to have any other constraints when offering wages other than having the same level of incentive independently of their labor displacement levels. Third, all MC firms are assumed to offer the same wages in the absence of labor displacement ($\forall S, c(S, \theta = 0)=80\text{k}\$/\text{year}$). The results of this quick calibration exercise are displayed in Figures 9.2 9.3. They interestingly show that the higher the succession chances, the higher the impact on impact of labor displacement. For instance, Figure 9.2 shows

⁷Mandatory retirement is indeed a way for a PSF to ensure that partnership promotion opportunities arise. This is in turn helpful to compete for workers on the labor market.

⁸This again represents the ability of the firm/clients to judge the productive abilities of an individual who are not known ex ante. Capacities are assessed through a series of signals/trials (see Spence (1978) for the associated labor economics theory)

that an individual having a 30% chance of succeeding an existing partner when joining a firm would have his entry wage halved if he joined a firm that displaces 50% of labor compared to a firm that does no displace any work. On the other hand, when succession chances are low, labor displacement has

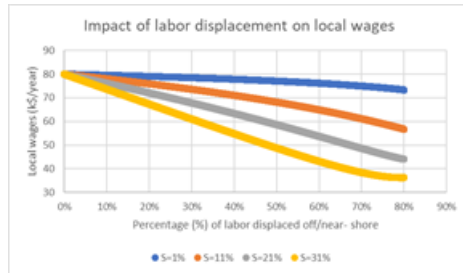


Figure 9.2: Local wages sensitivity to labor displacement

no impact on local employee salaries. Figure 9.3 indeed highlights that for every percent of labor displaced, local wages are reduced by 100\$ per year on average in partnerships with less than 5% of succession chances, whilst local wages get lower by 500\$ a year in partnership with 20+% succession chances. In short, accessing the status of partner in a MC firm is mainly

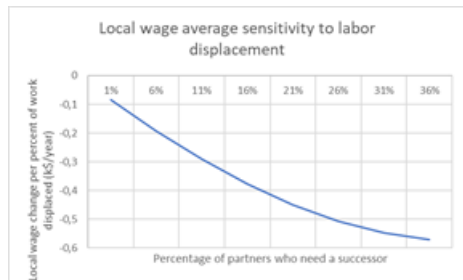


Figure 9.3: Local wages sensitivity to succession chances

a question of succession (Briscoe and Von Nordenflycht, 2014). Given that displacing labor increases local employees' chances to become partners, their wages face a downward adjustment, something that gets accentuated by the fact that partners earnings increase through this kind of transformation. However, if MC firms seeks to preserve a given incentive level as they transform themselves, they must also compete with other to attract employees. This will be discussed in the next section of this chapter.

9.6 Local employees' wages and competition across MC firms:

Through its previous sections, this paper has not only reviewed the linkages between partners' compensation and the wages of their employees but also modeled how transforming MC firms by leveraging off/near-shore resources would affect everyone's earnings. It then appeared through this exercise that employees' salaries (i.e. c) were driven by both the amount of labor a firm displaces (θ) as well as the succession opportunities offered by its partnership structure (i.e. S). Now to fully understand how wages are set and assess the economic impact of any kind of transformation, it is important account for how MC firms compete to attract employees.

If this competition element has already discussed in section 9.5 when it comes to potential heterogeneities of firms with respect to their service delivery model (i.e. θ), it now remains to review to which extent their succession pipeline impacts the overall mix. The key argument is that all firms must provide the same level (on average) of future earnings (i.e. I) to be attractive towards potential employees. When accounting for potential variation in partnerships structure and succession opportunities (i.e. S), this translates into the following condition :

$$\begin{aligned} \partial_S I &= 0 \\ \Leftrightarrow \partial_S c - c \cdot \frac{(1 + L \cdot (1 - \theta))}{(L \cdot (1 - \theta) \cdot (1 - S) - S)} & \quad (9.7) \\ &= - \frac{(R \cdot (1 - \delta \cdot \theta) - L \cdot \bar{c} \cdot \theta)}{((L \cdot (1 - \theta) \cdot (1 - S) - S))} \end{aligned}$$

This condition comes with a first natural consequence: if local employees have an incentive to become partner because it leads to a higher compensation ($\omega(\theta, c)c$), their wages decrease with their chance of accessing the partnership ($\partial_S c < 0$). But beyond this intuitive result, this also means that employees' wages in a partnership are subject to variations over time as partners come and go (e.g. retire). For instance, let us imagine that it takes $T=10$ years for an employee to hone/prove his/her skills to be eligible for succession. Assume that an employee, called Alice, just got hired. Additionally, let's consider that Alice's partnership is made of 2 partners who started the practice together 10 years ago and where the set retirement tenure is of $\tau=20$ years. In this case, Alice gets hired at a compensation level that reflects her promotion chances (i.e. in this case $S=1$). Now, ten years later, the 2 original partners retire. Let us envisage that Alice did not inherit a partner position. In this set up, if a new employee is hired, he/she will get a wage that reflects his/her promotion chances as well (i.e. right after the succession $S=0$) and get a compensation which is currently higher than the one of Alice. This small example shows that consultants wages are dynamic

in nature and that the associated fluctuations can be important.

Interestingly, those variations have also an additional property: they trigger employee's turnover (both voluntary and involuntary), a result similar to the empirical findings of Ribes et al. (2017) (i.e. turnover is mainly triggered by a lack of promotion opportunities). Going back to the example of Alice, her situation (i.e. not being the successor) has only one logical outcome: the deferred compensation mechanism means that her salary is unlikely to be readjusted as it reflected her promotion opportunity. Given the state of the promotion pipeline it is much more interesting for her to voluntarily leave the practice to find a more competitive alternative. In this case, the deferred compensation mechanism drives people to resign.

However, the situation could also play in the other direction. Imagine that Alice's practice has hired Bob right after the succession. Another 10 years later, succession chances are very high again (i.e. $S=1$) and this time, if a new employee arrives, he/she will get a salary that's lower than Bob's. At that stage, for Bob to be on the payroll of the firm comes at an extra cost and therefore, it would be in the partners' interest to force him to exit the practice.

Example. If the properties of the career model offered by MC firms are clear for their employees (i.e. their salaries c decreases with the amount of work a practice displaced and with succession chances [$\partial_{\theta}c \leq 0$; $\partial_{Sc} \leq 0$]), it can be useful to go a step further and to understand which parameter is actually the most important. This could indeed be useful for potential employees as they will only observe (for instance via Glassdoor) the potential compensation they can pretend to and can use this signal to deduce some properties around the partnership they are interested in joining.

Leveraging the same realistic assumptions used in the examples of previous sections, it is numerically possible to use equation 9.6 and 9.7 to infer how wages are evolving across partnerships. This is summarized in Figure 9.4. The key learning here is that if MC firms compensate their employees through a deferred earnings scheme and preserve the same level of incentive as they displace labor, the primary factor which impacts local MC wages are succession chances (i.e. S). In terms of orders of magnitude, for every percent of increase in succession chances, local wages go down by 2 to 3k\$ per year on average. In comparison, for every percent of labor displaced off-/nearshore, local wages go down by 0.2 k\$ per year. This is interesting because differs from the usual findings stemming from manufacturing studies. The main body of the literature has indeed traditionally recorded that displacing labor did create significant wage changes. According to Hummels et al. (2014), workers compensation (in a manufacturing environment) indeed decreases by 1 to 2% per percent of work displaced. However, in the case of MC firms, the proposed model shows that the deferred compensa-



Figure 9.4: Impact of labor displacement and incentives on local MC wages

tion mechanism acts as shield towards a globalization of labor. For a given succession rate, displacing 50% of labor barely decreases workers salaries, whilst according to the previous literature such a transformation could result in halving their compensation if they were operating in another sector. Note that those findings are robust across different delivery models (and therefore other professional services sub sectors). Running a sensitivity analysis of local wages C evolution with the leverage structure L of partnerships indeed yields the results displayed in Figure 9.5. The analysis shows that as soon as partners use more than $L = 4$ resources to deliver their services, there is no difference in the evolution of MC workers compensation when offshore resources are introduced. The only differences that are material are for partnerships who leverage few workers per partner (typically the legal partnerships where the number of associated is usually around 2 to 3 individuals), for which the jump in salary can be important especially when the number of partner is reduced.

9.7 Discussion.

The previous sections have shown that the succession scheme in place in the MC space primarily drives local employees' compensation and that an increase in 1% in succession chances to an existing partner has 10 times the impact of displacing 1% of labor off/near-shore on local employees' salaries. However, the associated partners compensation structure has not been reviewed, nor have the career options for remote workers. This section will therefore build upon those two points to ensure that this paper discusses the impact of labor displacement on wages for all the workers involved in the sale and delivery of MC services.

When leveraging the model built in the previous sections, partners compensation sensitivity to the shape of the partnership (i.e. employees' succession chances) and labor displacement can easily be calculated. The results, displayed in Figure 9.6, generate three main remarks. First the model shows that displacing labor yields benefits for partners. When succession chances are small (i.e. below 5%), pushing 20% (resp. 50%) of labor off/near-shore

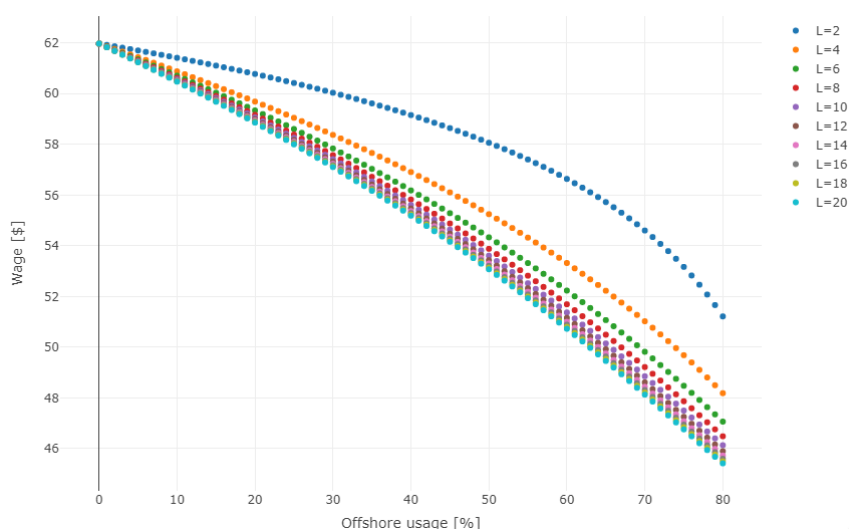


Figure 9.5: Impact of leverage on local MC wages evolution due to labor displacement.

indeed results in an increase of about 100k\$/year (resp. 250k\$/year) with respect to partners' income (i.e. a 7% (resp. 18%) increase). If this is in line with the usual ideas (see [Grossman and Rossi-Hansberg \(2008\)](#)) that labor displacement improves firm performance, the second feature of this model is that it shows that this may not be an interesting transformation for all MC firms. If previous research ([Yeaple, 2006](#)) has stressed that labor displacement is a tool for large firms, the model proposed in this paper also stresses that this is not a useful tool if succession chances are high (i.e. above 20 – 25%). In this case, local wages are indeed sufficiently low (because of the deferred compensation mechanism) to compete directly with the ones of off/near-shore workers. In light of this finding, further investigating the links between the shape of the partnership (i.e. S) and its size (i.e. N) may therefore constitute a valid avenue for future research. For example, this may improve our understanding of employee turnover and could therefore be useful to MC practices (e.g. control turnover to avoid knowledge spillover). Another interesting way to complement the model would be the link succession chance S with individual productive ability or quality, which is not known ex ante (a classical agency problem - see [Shapiro \(2005\)](#) for a reference). If partners are forced to recruit individuals without been sure they can succeed them, wages may be further adjusted. For instance, setting lower wages may actually act as a deterrent for low quality individuals who will not invest their time in such a system.

Finally, if labor displacement can be interesting, the structural differences between partnerships creates a competitive environment in which partners

can evolve to maximize their own earnings. Partners who are in a small firm with little labor displacement and which partnership does not offer a lot of succession opportunities can indeed jump ship and move to a larger firm with a labor displacement program to increase their income (see [Perthame et al. \(2019\)](#) for a generic framework). This flux to bigger firms would simply increase the speed of the ongoing consolidation of the sector (see [Arnold \(2005\)](#) for a related discussion). But if the incentives a MC firm can of-

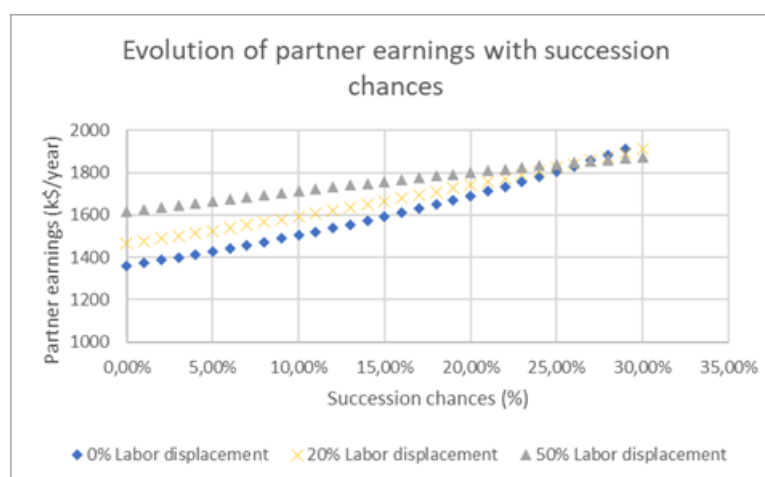


Figure 9.6: MC partners' earnings evolution

fer its local workers (both employees and partners) are clear, one may also wonder what those firms offer to their employees in off/near-shore hubs. When looking at similar knowledge intensive industries (e.g. software development), production activities in remote hubs are usually managed through a standard hierarchical structure (see [Upadhy \(2009\)](#), [Liu et al. \(2016\)](#) for discussions). In those cases, the general pattern is for remote workers to enter the industry after some initial training in the academia and to then progress through the managerial layers ([Safavi et al., 2018](#)). In this type of set up (i.e. production specialist), two types of career dynamics and incentives structures generally appear. In the first instance, as in [Jovanovic \(1979\)](#), workers move between employers to ripe the benefits of their production abilities and accelerate their ascension to managerial roles. In the second case, workers adopt side projects on top of their current employments (i.e. founding a startup) to increase their earnings. If this subject has already been evoked in certain sector specific discussions, there is however, to my knowledge, nothing available whether those generic patterns apply to MC practices off/near-shore production hubs. This could therefore constitute an interesting future avenue of research.

Another interesting element pertains to the potential transformation of those hubs. If local workers activities appear to mainly shift because of labor dis-

placement, the standardization of delivery activities also subjects remote workers to a change in the form of labor replacement via new/emerging technologies. According to the recent work of [Frey and Osborne \(2017\)](#), more than 20% of the production activities associated to the delivery of consulting services could indeed be automated. Similarly to what was done in this paper for local workers in the context of a transformation via labor displacement, it could therefore prove useful to see how off/near-shore hubs workers careers have to adapt when technology gets embedded to improve their productivity.

9.8 Conclusion.

To improve their performance in a context of competitive pressures, management consulting practices push work off/near-shore to benefit from labor cost differences across locations. This however raises the question of the consequences of such a transformation on local employees and their careers. A topic that has usually been at the center of many debates.

This chapter shows that in the end, those careers, which can be viewed as a succession pipeline to an existing partner, are not so sensitive to labor displacement. The benchmarks developed in this paper indeed show that for every percent of increase in succession rates, local wages go down by 2 to 3k\$ per year on average, whilst that for every percent of increase in labor done off/near-shore local wages go down by 0.2k\$. So, in essence, what matters is the composition of the partnership an individual chooses to join, not its delivery model. This has also demonstrated that even in global context with large disparities in labor costs, displacing activities may also not even be interesting for every MC firm. Some of those firms indeed offer high succession rates and therefore low entry wages. In those cases, labor displacement is not suitable tool to improve business performance and has therefore no impact on the consultants employed on those type of structures. Finally, this paper also highlights that even though employees' wages may get lower as MC practices shift work abroad, they should still be interested in pursuing such careers. The transformation indeed comes with higher potential pay offs (i.e. partners earn more) and lower risks (i.e. promotion chances into the partnership increase). The globalization of labor simply delays the rewards of such careers (i.e. it is a long game).

Chapter 10

Concluding remarks.

10.1 Personal considerations:

I have now spent more than a decade addressing questions of transformation for multi-national enterprises across multiple sectors of the economy. But being at the center of collective transformation efforts made me realize that I too had to evolve. So rather than occupying a pure corporate function, I have also invested some of my own time to further my understanding of our current world. This has taken the form of an academic journey, first through research partnerships and later through this PhD.

Looking back, those ten plus years of both research and application have been rich in encounters and travels. They notably have opened my eyes on the concepts of firms and labor. I indeed came candidly into the workforce thinking that firms were set in stone and that labor was a collection of relatively well scripted tasks. But I quickly realized that firms are closer to an assemblage of individuals aimed at generating value (in a socio-economic sense) and that both this collective and the associated deliverables are ever changing. As a result, labor is much more of an ongoing, far from being linear, project-based expedition.

Over the past couple of years, I have helped optimize the efficiency of the firms I joined both from a functional/managerial sense and/or in a more technical/economic fashion. As I wrap this PhD, I am closing a chapter of my professional life. So, it feels like the right time to reflect on what I have learned through all the projects I have orchestrated or delivered. Life being rich ([learning] opportunity-wise), I could have probably focused my research efforts on many things, but it felt that what could prove valuable to someone else (professional speaking) is to learn more around the relations between firm performance and their transformation programs in the context of professional services firms. This sector is indeed very important in our matures countries as it represents the epitome of “professionalism” (and therefore attracts many young graduates) and has a very large market

footprint (from both an employment and revenue standpoint). Surprisingly, it is also known to be relatively understudied.

I will therefore start those concluding remarks with a quick summary of the key facts and findings I have collected throughout this PhD. But I must admit that they are still several open questions that trigger my personal curiosity. So, as a final address, I will propose a brief discussion around what the future may look like for professional services firms and what are, in my view, the key questions to tackle for those firms to confidently approach the near future.

10.2 Lessons learned from the professional services sector:

Professional services firms [PSFs] compete on two fronts. First, they compete for both clients and professionals. This naturally tend to drive services prices and revenue down whilst driving labor costs up. Those two trends negatively impact a firm profitability, which, over the long run, translates in poor survival chances.

Remediation actions are, at a high level, straight forward. When it comes to the competition for clients and the ability of PSFs to generate revenue, the general answer is to grow either in volume (to offset a decline in revenue) and/or to offer new value-added services (i.e. innovate) (which increases prices and revenue). On the other hand, when it comes to competing for labor, the idea is to either invest in technology to replace labor at scale and/or to displace labor in locations where the supply of workers is important.

This later topic (i.e. transforming the labor structure of a PSF) has been the bread and butter of my PhD and the sum of all the work described in the previous chapters ultimately boils down to three high level facts:

- As of today, more than 20% of the activities associated to the delivery of professional services could either be replaced by technology or displaced in an off/near-shore hub. So the transformation potential of those firms is massive.
- Successfully transforming a firm by replacing or displacing labor is difficult. From a pure economic standpoint, the transformation has indeed to occur quickly. Since all firms have the same instruments available, for a firm to rip any benefits of this change, it must operate it at a faster pace than the competition.
- From a managerial point of view, the transformation needs to come with proper incentives for employees, which means that both the career and compensation structure of PSFs must be adjusted.

Looking at the transformation with a more granular lens, a couple of interesting features appear. First labor replacement and displacement are complementary. Looking at the activities that are necessary to ensure the delivery of professional services, there is indeed very little overlap between the 20% of activities that are prone to replacement versus the 20 to 50% of activities that are subject to a re allocation across the globe. Second, this transformation is sequential and if technological investments appear to be continuous over time and focus on low productivity activities independently of firm size (2 to 3% of PSFs revenue appear to be dedicated to innovation purposes for activities that generate less than 200\$ per hour of work), labor displacement appears mainly as trait of large firms (1000+ workers). Interestingly, if labor replacement is a marathon that spans over decades, labor displacement is more of a short sprint that occurs in a couple of years.

When it comes to the success of such transformation, they are also a few mechanisms that are worth mentioning. First technology usually comes with an increase in revenue and if it helps reduce workload as tasks are getting automated, it also requires highly specialized labor to be set up and maintained. As a result, technology support growth and workers productivity improvement but appears neutral from a profitability standpoint. Second displacing labor appears beneficial in the current context where most firms have merely started their transformation. But if this will enable them to survive over the short term, the benefits will completely disappear over the long run.

Finally, as the labor structure of PSFs evolves, their career and compensation model will have to be modified to make sure that individuals are ripping the benefits of joining such firms. There are two emerging trends here. First, the classical PSFs career model where workers start by learning about service production before evolving towards business development activities may no longer be sustainable given the amount of transformation their delivery model is going through. Instead a dual career track could appear: one dedicated to service production, one to business development. Second, the transformation will likely strengthen the ties between workers and their firms. The more firms transform, the more the distribution of the wealth they generate is going to be skewed towards individuals that have progressed with the firm. Basically, the transformation is going to accentuate the deferral of compensation. This will likely increase individual tenure and mean that PSFs managerial policies (who are currently dedicated to managing a highly volatile workforce (about one third of their employee leave every year)) will have to be revised.

10.3 Discussion:

Given the speed at which labor displacement can occur (20 to 50% of a PSFs labor could be displaced in the next 3 to 6 years) and the magnitude of the ongoing investments associated to technology, one can but wonder how the professional services landscape is going to look like in the next decade. If up to now, the scene was relatively homogeneous when it comes to the allocation and incentivization of service production activities, I personally think that over the next ten years, PSFs are going to differentiate themselves based on their own competitiveness imperatives. In this set up, three scenarios jump to mind:

- **The technology-enabled firm.** This model could represent the next generation of what [Maister \(2012\)](#) qualified as “process oriented” PSFs. In this case, since workers productivity is already low, the delivery of professional services would be mainly reliant on digital applications and tools. Here, business development activities would still occur locally, while technology design would be ensured through innovation hubs located either on or nearshore. The operation and maintenance of the technology would then either be passed to the client or be done by the service provider in an offshore managed services fashion. Each activity segment (sales, technology design and technology operation) would then have its own career model and incentive scheme. Considering the actual PSFs landscape, this could very well be the model for the next generation of audit and accounting firms.
- **The remote firm.** This model could represent the next generation of what [Maister \(2012\)](#) qualified as “gray hair” PSFs. Here, if technology plays a role in service production, the lack of standardization across offerings and the absence of flexibility in technology do not enable labor replacement at scale. Business development activities will still be executed locally but production tasks would be fully done near/offshore (the degree of distance between workers and clients would then be dependent on the complexity of the service). This could potentially be a suitable model for several management consulting practices, for instance the ones that help client navigate the implementation of a new piece of technology (say an ERP like Workday or Successfactor etc. . .). Here again, the geographical division of labor would suggest two career models (one model for sales, one for production) and incentive schemes.
- **The “brain” firm.** Amongst all the firms described by [Maister \(2012\)](#), this is, in my opinion, the only ones that will remain virtually unchanged. The degree of human interactions within both sales and production activities as well as the complexity of the associated challenges would not make them suitable for either labor replacement or

displacement. But interestingly, the difficulty for those firms is likely to be about operating a change in their model as they grow. Any offering indeed comes to birth with a high degree of customization but then is subject to standardization over time as it gets repeated. So, the question for “brain” firms is going to be to manage their transition to a “gray hair” type of practices when they are large enough.

Now, if the economics of this transformation are understood (with perhaps the exception of its consequences on emerging regions), the magnitude of the change as well as its imminence suggest that future research should aim at better framing what it takes to succeed at it from a managerial standpoint (i.e. to walk to talk). With that respect, several avenues appear, in my perspective, promising.

First, I believe it would be highly valuable to document practical examples detailing how, in an industry, the sales, production and innovation value chains have been decomposed and how this has translated into either technological investment(s) and/or the re-allocation of activities. This could potentially be achieved by leveraging standard off the shelf, well recognized and well-maintained frameworks (such as O*Net) and could pave the way to a standardization of transformation-related discussions. If they are already a few individuals and firms that have recently started to think along those lines when it comes to the impact of technology (for instance Faethm), there is, to my knowledge, no solution nor body of knowledge available around the impact of labor displacement. Given the predominance of geographical effects and the acceleration of remote working in a “post” Covid 19 crisis era, there is most definitely something to explore here.

This type of framework could then be leveraged to explain to workers the dynamics of their industrial sector, help them understand the benefits of the transformation (i.e. what’s in it for them) and ultimately help them better navigate their career. In my perspective, current managerial practices have indeed become clotted with static notions of jobs and skills that do not suit the changing nature of our eco system. Jobs are indeed a collection of activities and skills, in my view, reflect the knowledge it takes to operate a technology. Given that activities get displaced and that technology is subject to evolution, jobs and skills do not appear to be the best way to articulate the benefit of a change to any worker. Instead, I think that it would be worth exploring the question of roles, conceived as clusters of non-separable activities and to articulate careers as a puzzle of roles, where individuals construct their profile by creating relationships in the market place and picking up more complex role while delegating lower complexity ones.

In summary, the discussions around the transformation of services firms are far from being over and the associated sectors are on the verge of a massive change. So let’s see what the future hold . . .

Bibliography

- Acemoglu, D. and P. Restrepo (2018). The race between man and machine: Implications of technology for growth, factor shares, and employment. *American Economic Review* 108(6), 1488–1542.
- Acemoglu, D. and P. Restrepo (2020). Robots and jobs: Evidence from us labor markets. *Journal of Political Economy* 128(6), 2188–2244.
- Adams, S. M. and A. Zanzi (2005). The consulting career in transition: from partnership to corporate. *Career Development International*.
- Agarwal, R. (1998). Small firm survival and technological activity. *Small Business Economics* 11(3), 215–224.
- Akçura, M. T. and K. Srinivasan (2005). Research note: customer intimacy and cross-selling strategy. *Management Science* 51(6), 1007–1012.
- Akerlof, G. A. (1978). The market for “lemons”: Quality uncertainty and the market mechanism. In *Uncertainty in economics*, pp. 235–251. Elsevier.
- Akerman, A., I. Gaarder, and M. Mogstad (2015). The skill complementarity of broadband internet. *The Quarterly Journal of Economics* 130(4), 1781–1824.
- Alavi, M. and D. Leidner (1999). Knowledge management systems: issues, challenges, and benefits. *Communications of the Association for Information systems* 1(1), 7.
- Alvehus, J. (2018). Conflicting logics? the role of hrm in a professional service firm. *Human Resource Management Journal* 28(1), 31–44.
- Amiti, M. and D. R. Davis (2012). Trade, firms, and wages: Theory and evidence. *The Review of economic studies* 79(1), 1–36.
- Amiti, M. and J. Konings (2007). Trade liberalization, intermediate inputs, and productivity: Evidence from indonesia. *American Economic Review* 97(5), 1611–1638.

- Andersen, P. H. (2006). Regional clusters in a global world: Production relocation, innovation, and industrial decline. *California Management Review* 49(1), 101–122.
- Anderson, M., R. Banker, R. Huang, and S. Janakiraman (2007). Cost behavior and fundamental analysis of sg&a costs. *Journal of Accounting, Auditing & Finance* 22(1), 1–28.
- Anyadike-Danes, M. and M. Hart (2014). All grown up? the fate after 15 years of a quarter of a million uk firms born in 1998. *Journal of Evolutionary Economics*, 1–32.
- Aoyama, H., H. Yoshikawa, H. Iyetomi, and Y. Fujiwara (2009). Labour productivity superstatistics. *Progress of theoretical physics supplement* 179, 80–92.
- Ariu, A., H. Breinlich, G. Corcos, and G. Mion (2019). The interconnections between services and goods trade at the firm-level. *Journal of International Economics* 116, 173–188.
- Arkolakis, C., A. Costinot, D. Donaldson, and A. Rodríguez-Clare (2019). The elusive pro-competitive effects of trade. *The Review of Economic Studies* 86(1), 46–80.
- Arkolakis, C., A. Costinot, and A. Rodríguez-Clare (2012). New trade models, same old gains? *American Economic Review* 102(1), 94–130.
- Arkolakis, C., T. Papageorgiou, O. Timoshenko, et al. (2015). Firm learning and growth. Technical report.
- Arkolakis, C., T. Papageorgiou, and O. A. Timoshenko (2018). Firm learning and growth. *Review of Economic Dynamics* 27, 146–168.
- Armbrüster, T. (2006). *The economics and sociology of management consulting*. Cambridge University Press.
- Armour, J. and M. Sako (2020). Ai-enabled business models in legal services: from traditional law firms to next-generation law companies? *Journal of Professions and Organization* 7(1), 27–46.
- Arnold, P. J. (2005). Disciplining domestic regulation: the world trade organization and the market for professional services. *Accounting, Organizations and Society* 30(4), 299–330.
- Arntz, M., T. Gregory, and U. Zierahn (2016). The risk of automation for jobs in oecd countries: A comparative analysis.
- Aron, R. and J. V. Singh (2005). Getting offshoring right. *Harvard business review* 83(12), 135–43.

- Audretsch, D. B., A. Coad, and A. Segarra (2014). Firm growth and innovation. *Small business economics* 43(4), 743–749.
- Audretsch, D. B., L. Klomp, E. Santarelli, and A. R. Thurik (2004). Gibrat’s law: are the services different? *Review of Industrial Organization* 24(3), 301–324.
- Autor, D. (2014). Polanyi’s paradox and the shape of employment growth. Technical report, National Bureau of Economic Research.
- Autor, D., D. Dorn, L. F. Katz, C. Patterson, and J. Van Reenen (2020). The fall of the labor share and the rise of superstar firms. *The Quarterly Journal of Economics* 135(2), 645–709.
- Autor, D. and A. Salomons (2018). Is automation labor-displacing? productivity growth, employment, and the labor share. Technical report, National Bureau of Economic Research.
- Autor, D. H., D. Dorn, G. H. Hanson, and J. Song (2014). Trade adjustment: Worker-level evidence. *The Quarterly Journal of Economics* 129(4), 1799–1860.
- Autor, D. H., L. F. Katz, and A. B. Krueger (1998). Computing inequality: have computers changed the labor market? *The Quarterly journal of economics* 113(4), 1169–1213.
- Autor, D. H., F. Levy, and R. J. Murnane (2003). The skill content of recent technological change: An empirical exploration. *The Quarterly journal of economics* 118(4), 1279–1333.
- Axtell, R. L. (2001). Zipf distribution of us firm sizes. *science* 293(5536), 1818–1820.
- Baldwin, R. and F. Robert-Nicoud (2014). Trade-in-goods and trade-in-tasks: An integrating framework. *Journal of international Economics* 92(1), 51–62.
- Balliester, T., A. Elsheikhi, et al. (2018). The future of work: a literature review. *ILO Research Department Working Paper* 29.
- Bar-Isaac, H., G. Caruana, and V. Cuñat (2012). Search, design, and market structure. *American Economic Review* 102(2), 1140–60.
- Bar-Isaac, H. and R. Lévy (2019). Motivating employees through career paths.
- Bar-Isaac, H., S. Tadelis, et al. (2008). Seller reputation. *Foundations and Trends® in Microeconomics* 4(4), 273–351.

- Barney, J. (1991). Firm resources and sustained competitive advantage. *Journal of management* 17(1), 99–120.
- Barrett, M., E. Davidson, J. Prabhu, and S. L. Vargo (2015). Service innovation in the digital age. *MIS quarterly* 39(1), 135–154.
- Bass, F. M., T. V. Krishnan, and D. C. Jain (1994). Why the bass model fits without decision variables. *Marketing science* 13(3), 203–223.
- Baumgarten, D., I. Geishecker, and H. Görg (2013). Offshoring, tasks, and the skill-wage pattern. *European Economic Review* 61, 132–152.
- Becker, G. S. (2009). *Human capital: A theoretical and empirical analysis, with special reference to education*. University of Chicago press.
- Becker, S. O., K. Ekholm, and M.-A. Muendler (2013). Offshoring and the onshore composition of tasks and skills. *Journal of International Economics* 90(1), 91–106.
- Bertrand, O. (2011). What goes around, comes around: Effects of offshore outsourcing on the export performance of firms. *Journal of International Business Studies* 42(2), 334–344.
- Bhalla, A., M. S. Sodhi, and B.-G. Son (2008). Is more it offshoring better?: An exploratory study of western companies offshoring to south east asia. *Journal of Operations Management* 26(2), 322–335.
- Bidwell, M. (2011). Paying more to get less: The effects of external hiring versus internal mobility. *Administrative Science Quarterly* 56(3), 369–407.
- Bidwell, M. and F. Briscoe (2010). The dynamics of interorganizational careers. *Organization Science* 21(5), 1034–1053.
- Bilbiie, F. O., F. Ghironi, and M. J. Melitz (2012). Endogenous entry, product variety, and business cycles. *Journal of Political Economy* 120(2), 304–345.
- Blinder, A. (2007). Offshoring: The next industrial revolution. *Offshoring*, 1000–1017.
- Blinder, A. S. and A. B. Krueger (2013). Alternative measures of offshorability: a survey approach. *Journal of Labor Economics* 31(S1), S97–S128.
- Blundell, R. and S. Bond (2000). Gmm estimation with persistent panel data: an application to production functions. *Econometric reviews* 19(3), 321–340.

- Bodenman, J. E. (2000). Firm characteristics and location: The case of the institutional investment advisory industry in the united states, 1983–1996. *Papers in Regional Science* 79(1), 33–56.
- Boeri, T. and L. Bellmann (1995). Post-entry behaviour and the cycle: Evidence from germany. *International Journal of Industrial Organization* 13(4), 483–500.
- Bottazzi, G. and A. Secchi (2003). Common properties and sectoral specificities in the dynamics of us manufacturing companies. *Review of Industrial Organization* 23(3-4), 217–232.
- Bottazzi, G. and A. Secchi (2006). Explaining the distribution of firm growth rates. *The RAND Journal of Economics* 37(2), 235–256.
- Bottazzi, G., A. Secchi, and F. Tamagni (2008). Productivity, profitability and financial performance. *Industrial and Corporate Change* 17(4), 711–751.
- Boussebaa, M. and G. Morgan (2015). Internationalization of professional service firms.
- Bowman, C. and J. Swart (2007). Whose human capital? the challenge of value capture when capital is embedded. *Journal of Management Studies* 44(4), 488–505.
- Bowman, D. and H. Gatignon (1996). Order of entry as a moderator of the effect of the marketing mix on market share. *Marketing Science* 15(3), 222–242.
- Breinlich, H. and C. Criscuolo (2011). International trade in services: A portrait of importers and exporters. *Journal of International Economics* 84(2), 188–206.
- Brennan, R. L. and D. J. Prediger (1981). Coefficient kappa: Some uses, misuses, and alternatives. *Educational and psychological measurement* 41(3), 687–699.
- Briscoe, F. and A. Von Nordenflycht (2014). Which path to power? workplace networks and the relative effectiveness of inheritance and rainmaking strategies for professional partners. *Journal of Professions and Organization* 1(1), 33–48.
- Broadie, M. and J. B. Detemple (2004). Anniversary article: Option pricing: Valuation models and applications. *Management science* 50(9), 1145–1177.

- Brock, D. M. and I. Alon (2009). Internationalization of professional service firms. *International Business: Research Teaching and Practice* 3(1), 52–70.
- Brynjolfsson, E. and A. McAfee (2014). *The second machine age: Work, progress, and prosperity in a time of brilliant technologies*. WW Norton & Company.
- Bryson, J., D. Keeble, and P. Wood (1993). The creation, location and growth of small business service firms in the united kingdom. *Service Industries Journal* 13(2), 118–131.
- Burdett, K. (1978). A theory of employee job search and quit rates. *The American Economic Review* 68(1), 212–220.
- BUREAU, O. L. S. (1997). Bls handbook of methods. *Boletín* (2490).
- Carman, J. M. and E. Langeard (1980). Growth strategies for service firms. *Strategic Management Journal* 1(1), 7–22.
- Carvalho, A. and C. Cabral-Cardoso (2008). Flexibility through hrm in management consulting firms. *Personnel Review*.
- Castellani, D. and F. Pieri (2013). R&d offshoring and the productivity growth of european regions. *Research Policy* 42(9), 1581–1594.
- Cengiz, E. and H. E. Yayla (2007). The effect of marketing mix on positive word of mouth communication: Evidence from accounting offices in turkey. *Innovative Marketing* 3(4), 73–86.
- Cerruti, C., E. Tavoletti, and C. Grieco (2019). Management consulting: a review of fifty years of scholarly research. *Management Research Review*.
- Chattopadhyay, A. K. and A. Gupta (2007). A stochastic manpower planning model under varying class sizes. *Annals of Operations Research* 155(1), 41–49.
- Chen, C. X., H. Lu, and T. Sougiannis (2012). The agency problem, corporate governance, and the asymmetrical behavior of selling, general, and administrative costs. *Contemporary Accounting Research* 29(1), 252–282.
- Chesher, A. (1979). Testing the law of proportionate effect. *The Journal of industrial economics*, 403–411.
- Chiacchio, F., G. Petropoulos, and D. Pichler (2018). The impact of industrial robots on eu employment and wages: A local labour market approach. Technical report, Bruegel working paper.

- Christensen, B. J., R. Lentz, D. T. Mortensen, G. R. Neumann, and A. Werwatz (2005). On-the-job search and the wage distribution. *Journal of Labor Economics* 23(1), 31–58.
- Chua, A. L. and S. L. Pan (2008). Knowledge transfer and organizational learning in is offshore sourcing. *Omega* 36(2), 267–281.
- Clementi, G. L. and B. Palazzo (2016). Entry, exit, firm dynamics, and aggregate fluctuations. *American Economic Journal: Macroeconomics* 8(3), 1–41.
- Coad, A. (2007). Firm growth: A survey.
- Coad, A., J. R. Holm, J. Krafft, and F. Quatraro (2017). Firm age and performance. *Journal of Evolutionary Economics*, 1–11.
- Coad, A. and R. Rao (2010). Firm growth and r&d expenditure. *Economics of Innovation and New Technology* 19(2), 127–145.
- Coad, A., A. Segarra, and M. Teruel (2016). Innovation and firm growth: does firm age play a role? *Research policy* 45(2), 387–400.
- Coad, A. and A. Vezzani (2019). Three cheers for industry: Is manufacturing linked to r&d, exports, and productivity growth? *Structural Change and Economic Dynamics* 50, 14–25.
- Colombo, M. G., M. Delmastro, and L. Rabbiosi (2012). Organizational design and firm performance. In *The Oxford Handbook of Managerial Economics*.
- Comanor, W. S. and T. A. Wilson (1972). Advertising market structure and performance. *J. Reprints Antitrust L. & Econ.* 4, 25.
- Cooley, T., R. Marimon, and V. Quadrini (2004). Aggregate consequences of limited contract enforceability. *Journal of Political Economy* 112(4), 817–847.
- Cooley, T. F. and V. Quadrini (2001). Financial markets and firm dynamics. *American economic review*, 1286–1310.
- Costinot, A. and A. Rodríguez-Clare (2014). Trade theory with numbers: Quantifying the consequences of globalization. In *Handbook of international economics*, Volume 4, pp. 197–261. Elsevier.
- Coucke, K. and L. Sleuwaegen (2008). Offshoring as a survival strategy: evidence from manufacturing firms in belgium. *Journal of International Business Studies* 39(8), 1261–1277.

- Coviello, N. E., R. J. Brodie, and H. J. Munro (2000). An investigation of marketing practice by firm size. *Journal of business venturing* 15(5-6), 523–545.
- Cowling, M., W. Liu, and N. Zhang (2018). Did firm age, experience, and access to finance count? sme performance after the global financial crisis. *Journal of Evolutionary Economics* 28(1), 77–100.
- Cozzi, G. and G. Impullitti (2016). Globalization and wage polarization. *Review of Economics and Statistics* 98(5), 984–1000.
- Craswell, A. T., J. R. Francis, and S. L. Taylor (1995). Auditor brand name reputations and industry specializations. *Journal of accounting and economics* 20(3), 297–322.
- Crawford, V. P. and J. Sobel (1982). Strategic information transmission. *Econometrica: Journal of the Econometric Society*, 1431–1451.
- Dachs, B. and C. Zanker (2014). Backshoring of production activities in european manufacturing. european manufacturing survey. *Fraunhofer Institute for Systems and Innovation Research* 3(3), 8.
- Dauth, W., S. Findeisen, J. Suedekum, N. Woessner, et al. (2018). Adjusting to robots: Worker-level evidence. *Opportunity and Inclusive Growth Institute Working Papers* 13.
- David, H. (2015). Why are there still so many jobs? the history and future of workplace automation. *Journal of economic perspectives* 29(3), 3–30.
- Davies, S. (1980). Minimum efficient size and seller concentration: an empirical problem. *The Journal of Industrial Economics*, 287–301.
- De Backer, K., C. Menon, I. Desnoyers-James, and L. Moussiégt (2016). Reshoring: Myth or reality?
- Delmar, F., P. Davidsson, and W. B. Gartner (2003). Arriving at the high-growth firm. *Journal of business venturing* 18(2), 189–216.
- den Bergh, J. V., J. Beliën, P. D. Bruecker, E. Demeulemeester, and L. D. Boeck (2013). Personnel scheduling: A literature review. *European Journal of Operational Research* 226(3), 367 – 385.
- D’Erasmus, P. (2007). Investment and firm dynamics.
- Dessein, W. (2002). Authority and communication in organizations. *The Review of Economic Studies* 69(4), 811–838.

- Dhandapani, K. and R. S. Upadhyayula (2015). Two paths to diversification: Performance implications of related diversification across two dimensions in professional service firms. *International Journal of Emerging Markets* 10(1), 32–51.
- Di Gregorio, D., M. Musteen, and D. E. Thomas (2009). Offshore outsourcing as a source of international competitiveness for smes. *Journal of International Business Studies* 40(6), 969–988.
- Dibbern, J., J. Winkler, and A. Heinzl (2008). Explaining variations in client extra costs between software projects offshored to india. *MIS quarterly*, 333–366.
- Díez, F. J. (2014). The asymmetric effects of tariffs on intra-firm trade and offshoring decisions. *Journal of International Economics* 93(1), 76–91.
- Disney, R., J. Haskel, and Y. Heden (2003). Entry, exit and establishment survival in uk manufacturing. *The Journal of Industrial Economics* 51(1), 91–112.
- Doh, J. P., K. Bunyaratavej, and E. D. Hahn (2009). Separable but not equal: The location determinants of discrete services offshoring activities. *Journal of International Business Studies* 40(6), 926–943.
- Dossani, R. and M. Kenney (2007). The next wave of globalization: Relocating service provision to india. *World Development* 35(5), 772–791.
- Doumic, M., B. Perthame, E. Ribes, D. Salort, and N. Toubiana (2017). Toward an integrated workforce planning framework using structured equations. *European Journal of Operational Research* 262(1), 217–230.
- Draca, M., R. Sadun, and J. Van Reenen (2007). Productivity and icts: A review of the evidence. *The Oxford handbook of information and communication technologies*.
- Dunbar, R. I. (1993). Coevolution of neocortical size, group size and language in humans. *Behavioral and brain sciences* 16(4), 681–694.
- Dunne, T., M. J. Roberts, and L. Samuelson (1988). Patterns of firm entry and exit in us manufacturing industries. *The RAND journal of Economics*, 495–515.
- Ellram, L. M., W. L. Tate, and C. Billington (2008). Offshore outsourcing of professional services: A transaction cost economics perspective. *Journal of operations Management* 26(2), 148–163.
- Ellram, L. M., W. L. Tate, and K. J. Petersen (2013). Offshoring and reshoring: an update on the manufacturing location decision. *Journal of Supply Chain Management* 49(2), 14–22.

- Empson, L. and C. Chapman (2006). Partnership versus corporation: Implications of alternative forms of governance in professional service firms. In *Professional service firms*, pp. 139–170. Emerald Group Publishing Limited.
- Empson, L., D. Muzio, J. Broschak, and B. Hinings (2015a). Researching professional service firms: An introduction and overview. *The Oxford handbook of professional service firms*, 1–22.
- Empson, L., D. Muzio, J. P. Broschak, and C. R. Hinings (2015b). *The Oxford handbook of professional service firms*. Oxford University Press, USA.
- Eppinger, P. S. (2019). Service offshoring and firm employment. *Journal of International Economics* 117, 209–228.
- Erber, G. and A. Sayed-Ahmed (2005). Offshore outsourcing. *Intereconomics* 40(2), 100–112.
- Evans, D. S. (1987). Tests of alternative theories of firm growth. *journal of political economy* 95(4), 657–674.
- Farinas, J. C. and L. Moreno (2000). Firms' growth, size and age: A non-parametric approach. *Review of Industrial organization* 17(3), 249–265.
- Farkas, M. (2002). On the stability of stationary age distributions. *Applied mathematics and computation* 131(1), 107–123.
- Feng, A. and G. Graetz (2015). Rise of the machines: The effects of labor-saving innovations on jobs and wages. Technical report, IZA Discussion Papers.
- Ferguson, J.-P. and S. Hasan (2013). Specialization and career dynamics: Evidence from the indian administrative service. *Administrative science quarterly* 58(2), 233–256.
- Foerstl, K., J. F. Kirchoff, and L. Bals (2016). Reshoring and insourcing: drivers and future research directions. *International Journal of Physical Distribution & Logistics Management*.
- Ford, M. (2015). Rise of the robots. *New York*.
- Frey, C. B. and M. A. Osborne (2017). The future of employment: How susceptible are jobs to computerisation? *Technological forecasting and social change* 114, 254–280.
- Gabaix, X. (2009). Power laws in economics and finance. *Annu. Rev. Econ.* 1(1), 255–294.

- Gabaix, X. and R. Ibragimov (2011). Rank- $1/2$: a simple way to improve the ols estimation of tail exponents. *Journal of Business & Economic Statistics* 29(1), 24–39.
- Gabaix, X. and A. Landier (2008). Why has ceo pay increased so much? *The Quarterly Journal of Economics* 123(1), 49–100.
- Galanter, M. and T. Palay (1994). *Tournament of lawyers: The transformation of the big law firm*. University of Chicago Press.
- Galanter, M. and T. M. Palay (1990). Why the big get bigger: The promotion-to-partner tournament and the growth of large law firms. *Virginia Law Review*, 747–811.
- Gallouj, F. and O. Weinstein (1997). Innovation in services. *Research policy* 26(4-5), 537–556.
- Geishecker, I. and H. Görg (2013). Services offshoring and wages: Evidence from micro data. *Oxford Economic Papers* 65(1), 124–146.
- Geroski, P. A. (1995). What do we know about entry? *International Journal of Industrial Organization* 13(4), 421–440.
- Geroski, P. A. (1998). An applied econometrician’s view of large company performance. *Review of Industrial Organization* 13(3), 271–294.
- Gervais, A. and J. B. Jensen (2013). The tradability of services: Geographic concentration and trade costs. Technical report, National Bureau of Economic Research.
- Gibrat, R. (1931). *Les inégalités économiques*. Recueil Sirey.
- Gilbert, B. A., P. P. McDougall, and D. B. Audretsch (2006). New venture growth: A review and extension. *Journal of management* 32(6), 926–950.
- Gilley, K. M. and A. Rasheed (2000). Making more by doing less: an analysis of outsourcing and its effects on firm performance. *Journal of management* 26(4), 763–790.
- Gilson, R. J. and R. H. Mnookin (1989). Coming of age in a corporate law firm: The economics of associate career patterns. *Stanford Law Review*, 567–595.
- Gomes, D. A., J. Mohr, and R. R. Souza (2013). Continuous time finite state mean field games. *Applied Mathematics & Optimization* 68(1), 99–143.
- Goos, M. and A. Manning (2007). Lousy and lovely jobs: The rising polarization of work in Britain. *The review of economics and statistics* 89(1), 118–133.

- Goos, M., A. Manning, and A. Salomons (2009). Job polarization in Europe. *American Economic Review* 99(2), 58–63.
- Graetz, G. and G. Michaels (2018). Robots at work. *Review of Economics and Statistics* 100(5), 753–768.
- Grazzi, M. and D. Moschella (2015). Small, young, and exporters: New evidence on the determinants of firm growth. *Journal of Evolutionary Economics*, 1–28.
- Greenwood, R. and L. Empson (2003). The professional partnership: Relic or exemplary form of governance? *Organization Studies* 24(6), 909–933.
- Greenwood, R., C. R. Hinings, and J. Brown (1990). “p2-form” strategic management: corporate practices in professional partnerships. *Academy of Management Journal* 33(4), 725–755.
- Greenwood, R., S. X. Li, R. Prakash, and D. L. Deephouse (2005). Reputation, diversification, and organizational explanations of performance in professional service firms. *Organization Science* 16(6), 661–673.
- Greenwood, R., R. Prakash, et al. (2017). 25 years of the professional partnership (p2) form: time to foreground its social purpose and herald the p3? *Journal of Professions and Organization* 4(2), 112–122.
- Größler, A., B. T. Laugen, R. Arkader, and A. Fleury (2013). Differences in outsourcing strategies between firms in emerging and in developed markets. *International Journal of Operations & Production Management*.
- Grossman, G. M. and E. Rossi-Hansberg (2008). Trading tasks: A simple theory of offshoring. *American Economic Review* 98(5), 1978–97.
- Grover, V., J. Teng, A. H. Segars, and K. Fiedler (1998). The influence of information technology diffusion and business process change on perceived productivity: The executive’s perspective. *Information & Management* 34(3), 141–159.
- Groysberg, B., A. Nanda, and N. Nohria (2004). The risky business of hiring stars. *Harvard Business Review* 82(5), 92–101.
- Gueant, O., J.-M. Lasry, and P.-L. Lions (2011). Mean field games and applications. *Paris-Princeton lectures on mathematical finance 2010*, 205–266.
- Guiltinan, J. P. (1987). The price bundling of services: A normative framework. *Journal of Marketing* 51(2), 74–85.

- Gurtin, M. E. and R. C. MacCamy (1974). Non-linear age-dependent population dynamics. *Archive for Rational Mechanics and Analysis* 54(3), 281–300.
- Hadfield, G. K. (1999). The price of law: how the market for lawyers distorts the justice system. *Mich. L. Rev.* 98, 953.
- Hakkala, K. N., F. Heyman, and F. Sjöholm (2014). Multinational firms, acquisitions and job tasks. *European Economic Review* 66, 248–265.
- Hall, B. H. (1986). The relationship between firm size and firm growth in the us manufacturing sector.
- Halpern, L., M. Koren, and A. Szeidl (2015). Imported inputs and productivity. *American Economic Review* 105(12), 3660–3703.
- Haltiwanger, J., R. S. Jarmin, and J. Miranda (2013). Who creates jobs? small versus large versus young. *Review of Economics and Statistics* 95(2), 347–361.
- Hanel, P. and A. St-Pierre (2002). Effects of r & d spillovers on the profitability of firms. *Review of Industrial Organization* 20(4), 305–322.
- Hansen, T. (2010). Tariff rates, offshoring and productivity: evidence from german and austrian firm-level data. Technical report, Munich Discussion Paper.
- Harrington, J. W. (1995). Producer services research in us regional studies. *The professional geographer* 47(1), 87–96.
- Harrison, A. and M. McMillan (2011). Offshoring jobs? multinationals and us manufacturing employment. *Review of Economics and Statistics* 93(3), 857–875.
- Hawksworth, J., R. Berriman, and S. Goel (2018). Will robots really steal our jobs? an international analysis of the potential long term impact of automation. *PricewaterhouseCoopers*, <http://pwc.co.uk/economics>, access 13.
- Hillman, R. W. (2002). The hidden costs of lawyer mobility: Of law firms, law schools, and the education of lawyers. *Ky. LJ* 91, 299.
- Hinings, B., T. Gegenhuber, and R. Greenwood (2018). Digital innovation and transformation: An institutional perspective. *Information and Organization* 28(1), 52–61.
- Hitt, M. A., L. Bierman, K. Shimizu, and R. Kochhar (2001). Direct and moderating effects of human capital on strategy and performance in professional service firms: A resource-based perspective. *Academy of Management journal* 44(1), 13–28.

- Hopenhayn, H. A. (1992). Entry, exit, and firm dynamics in long run equilibrium. *Econometrica: Journal of the Econometric Society*, 1127–1150.
- HUallacháin, B. Ó. and N. Reid (1991). The location and growth of business and professional services in american metropolitan areas, 1976–1986. *Annals of the Association of American Geographers* 81(2), 254–270.
- Hummels, D., R. Jørgensen, J. Munch, and C. Xiang (2014). The wage effects of offshoring: Evidence from danish matched worker-firm data. *American Economic Review* 104(6), 1597–1629.
- Hummels, D., J. R. Munch, and C. Xiang (2018). Offshoring and labor markets. *Journal of Economic Literature* 56(3), 981–1028.
- Hutzschenreuter, T., A. Y. Lewin, and S. Dresel (2011). Time to success in offshoring business processes. *Management International Review* 51(1), 65–92.
- Ijiri, Y. and H. A. Simon (1964). Business firm growth and size. *The American Economic Review* 54(2), 77–89.
- Inklaar, R., M. P. Timmer, and B. Van Ark (2008). Market services productivity across europe and the us. *Economic Policy* 23(53), 140–194.
- Intriligator, M. D. (2002). *Mathematical optimization and economic theory*. SIAM.
- Jensen, J. B. and L. G. Kletzer (2010). Measuring tradable services and the task content of offshorable services jobs. In *Labor in the new economy*, pp. 309–335. University of Chicago Press.
- Jensen, J. B., L. G. Kletzer, J. Bernstein, and R. C. Feenstra (2005). Tradable services: Understanding the scope and impact of services offshoring [with comments and discussion]. In *Brookings trade forum*, pp. 75–133. JSTOR.
- Jiang, B., J. A. Belohlav, and S. T. Young (2007). Outsourcing impact on manufacturing firms' value: Evidence from japan. *Journal of Operations Management* 25(4), 885–900.
- Jovanovic, B. (1979). Job matching and the theory of turnover. *Journal of political economy* 87(5, Part 1), 972–990.
- Jovanovic, B. (1995). Learning and growth. *NBER working paper* (w5383).
- Kaiser, S., A. Kozica, J. Swart, and A. Werr (2015). Human resource management in professional service firms: Learning from a framework for research and practice. *German Journal of Human Resource Management* 29(2), 77–101.

- Kaldor, N. (1961). Capital accumulation and economic growth. In *The theory of capital*, pp. 177–222. Springer.
- Kang, S.-C., S. A. Snell, and J. Swart (2012). Options-based hrm, intellectual capital, and exploratory and exploitative learning in law firms' practice groups. *Human Resource Management* 51(4), 461–485.
- Kenney, M., S. Massini, and T. P. Murtha (2009). Offshoring administrative and technical work: New fields for understanding the global enterprise. *Journal of International Business Studies*, 887–900.
- Kenney, M. and J. Zysman (2019). Work and value creation in the platform economy. In *Work and Labor in the Digital Age*. Emerald Publishing Limited.
- Kipping, M. and L. Engwall (2002). *Management consulting: Emergence and dynamics of a knowledge industry*. OUP Oxford.
- Kipping, M. and I. Kirkpatrick (2013). Alternative pathways of change in professional services firms: The case of management consulting. *Journal of Management Studies* 50(5), 777–807.
- Kohler, W. (2004). International outsourcing and factor prices with multi-stage production. *The Economic Journal* 114(494), C166–C185.
- Kotabe, M. and K. S. Swan (1994). Offshore sourcing: Reaction, maturation, and consolidation of us multinationals. *Journal of international business studies* 25(1), 115–140.
- Kroes, J. R. and S. Ghosh (2010). Outsourcing congruence with competitive priorities: Impact on supply chain and firm performance. *Journal of operations management* 28(2), 124–143.
- Kronblad, C. (2020). How digitalization changes our understanding of professional service firms. *Academy of Management Discoveries* 6(3), 436–454.
- Krugman, P. (1980). Scale economies, product differentiation, and the pattern of trade. *The American Economic Review* 70(5), 950–959.
- Kubr, M. (2002). *Management consulting: A guide to the profession*. International Labour Organization.
- Kuruvilla, S. and E. Noronha (2016). From pyramids to diamonds: legal process offshoring, employment systems, and labor markets for lawyers in the united states and india. *ILR Review* 69(2), 354–377.

- Landers, R. M., J. B. Rebitzer, and L. J. Taylor (1996). Rat race redux: Adverse selection in the determination of work hours in law firms. *The American Economic Review*, 329–348.
- Larsen, M. M., S. Manning, and T. Pedersen (2013). Uncovering the hidden costs of offshoring: The interplay of complexity, organizational design, and experience. *Strategic Management Journal* 34(5), 533–552.
- Larsen, M. M., S. Manning, and T. Pedersen (2019). The ambivalent effect of complexity on firm performance: A study of the global service provider industry. *Long Range Planning* 52(2), 221–235.
- Lasry, J.-M. and P.-L. Lions (2007). Mean field games. *Japanese journal of mathematics* 2(1), 229–260.
- Lazear, E. P. (1999). Personnel economics: past lessons and future directions presidential address to the society of labor economists, san francisco, may 1, 1998. *Journal of Labor Economics* 17(2), 199–236.
- Lazear, E. P. and S. Rosen (1981). Rank-order tournaments as optimum labor contracts. *Journal of political Economy* 89(5), 841–864.
- Lazear, E. P. and K. L. Shaw (2007). Personnel economics: The economist’s view of human resources. *Journal of economic perspectives* 21(4), 91–114.
- Lee, J. (2009). Does size matter in firm performance? evidence from us public firms. *international Journal of the economics of Business* 16(2), 189–203.
- Leshner, M. and H. K. Nordås (2006). Business services, trade and costs.
- Levin, J. and S. Tadelis (2005). Profit sharing and the role of professional partnerships. *The Quarterly Journal of Economics* 120(1), 131–171.
- Lewin, A. Y., S. Massini, and C. Peeters (2009). Why are companies offshoring innovation? the emerging global race for talent. *Journal of international business studies* 40(6), 901–925.
- Lewin, A. Y. and C. Peeters (2006). Offshoring work: business hype or the onset of fundamental transformation? *Long range planning* 39(3), 221–239.
- Lieberman, J. I. (2004). Offshore outsourcing and america’s competitive edge: Losing out in the high technology r&d and services sectors. *White paper by office of senator, Washington DC 20510*.
- Liu, Y., L. Zhang, L. Nie, Y. Yan, and D. Rosenblum (2016). Fortune teller: predicting your career path. In *Proceedings of the AAAI conference on artificial intelligence*, Volume 30.

- Loebbecke, C. and A. Picot (2015). Reflections on societal and business model transformation arising from digitization and big data analytics: A research agenda. *The Journal of Strategic Information Systems* 24(3), 149–157.
- Lotti, F., E. Santarelli, and M. Vivarelli (2003). Does gibrat's law hold among young, small firms? *Journal of evolutionary economics* 13(3), 213–235.
- Løwendahl, B. (2005). *Strategic management of professional service firms*. Copenhagen Business School Press DK.
- Lucas, R. E. and E. C. Prescott (1971). Investment under uncertainty. *Econometrica* 39(5), 659–681.
- Lyons, B. (1980). A new measure of minimum efficient plant size in uk manufacturing industry. *Economica* 47(185), 19–34.
- Maister, D. H. (1982). Balancing the professional service firm. *Sloan Management Review* 24(1), 15–29.
- Maister, D. H. (2012). *Managing the professional service firm*. Simon and Schuster.
- Maister, D. H. and C. H. Lovelock (1982). Managing facilitator services. *Sloan Management Review (pre-1986)* 23(4), 19.
- Malevergne, Y., A. Saichev, and D. Sornette (2013). Zipf's law and maximum sustainable growth. *Journal of Economic Dynamics and Control* 37(6), 1195–1212.
- Malhotra, N., T. Morris, and M. Smets (2010). New career models in uk professional service firms: from up-or-out to up-and-going-nowhere? *The International Journal of Human Resource Management* 21(9), 1396–1413.
- Malhotra, N., M. Smets, and T. Morris (2016). Career pathing and innovation in professional service firms. *Academy of Management Perspectives* 30(4), 369–383.
- Malos, S. B. and M. A. Campion (1995). An options-based model of career mobility in professional service firms. *Academy of management Review* 20(3), 611–644.
- Malos, S. B. and M. A. Campion (2000). Human resource strategy and career mobility in professional service firms: A test of an options-based model. *Academy of Management Journal* 43(4), 749–760.

- Manning, S. (2013). New silicon valleys or a new species? commoditization of knowledge work and the rise of knowledge services clusters. *Research policy* 42(2), 379–390.
- Manning, S., A. Lewin, and S. Massini (2008). The globalization of innovation: a dynamic perspective on offshoring. *Academy of Management Perspectives* 22(3), 35–54.
- Mansfield, E. (1962). Entry, gibrat's law, innovation, and the growth of firms. *The American economic review* 52(5), 1023–1051.
- Markides, C. C. and N. Berg (1988). Manufacturing offshore is bad business. *Harvard Business Review* 66(5), 113–120.
- Mason, J. H. (1992). Innovation in professional services: Potential productivity and trade improvement. *Technological forecasting and social change* 42(1), 31–45.
- Mayhew, B. W. and M. S. Wilkins (2003). Audit firm industry specialization as a differentiation strategy: Evidence from fees charged to firms going public. *Auditing: A Journal of Practice & Theory* 22(2), 33–52.
- McCarthy, I. and A. Anagnostou (2004). The impact of outsourcing on the transaction costs and boundaries of manufacturing. *International journal of production economics* 88(1), 61–71.
- McColl-Kennedy, J. R., J. C. Sweeney, G. N. Soutar, and C. Amonini (2008). Professional service firms are relationship marketers: but does size matter? *Australasian Marketing Journal (AMJ)* 16(1), 30–47.
- McEvily, B., J. Jaffee, and M. Tortoriello (2012). Not all bridging ties are equal: Network imprinting and firm growth in the nashville legal industry, 1933–1978. *Organization science* 23(2), 547–563.
- McHugh, M. L. (2012). Interrater reliability: the kappa statistic. *Biochemia medica* 22(3), 276–282.
- McKelvie, A. and J. Wiklund (2010). Advancing firm growth research: A focus on growth mode instead of growth rate. *Entrepreneurship theory and practice* 34(2), 261–288.
- McKelvie, A., J. Wiklund, and P. Davidsson (2006). A resource-based view on organic and acquired growth. In *Entrepreneurship: Frameworks And Empirical Investigations From Forthcoming Leaders Of European Research*, pp. 175–194. Emerald Group Publishing Limited.
- Melitz, M. J. (2003). The impact of trade on intra-industry reallocations and aggregate industry productivity. *econometrica* 71(6), 1695–1725.

- Metters, R. (2008). A typology of offshoring and outsourcing in electronically transmitted services. *Journal of Operations Management* 26(2), 198–211.
- Metters, R. and R. Verma (2008). History of offshoring knowledge services. *Journal of Operations Management* 26(2), 141–147.
- Michaels, G., A. Natraj, and J. Van Reenen (2014). Has ict polarized skill demand? evidence from eleven countries over twenty-five years. *Review of Economics and Statistics* 96(1), 60–77.
- Mihalache, M. and O. R. Mihalache (2016). A decisional framework of offshoring: Integrating insights from 25 years of research to provide direction for future. *Decision Sciences* 47(6), 1103–1149.
- Miroudot, S., R. Lanz, and A. Ragoussis (2009). Trade in intermediate goods and services.
- Mithas, S. and J. Whitaker (2007). Is the world flat or spiky? information intensity, skills, and global service disaggregation. *Information systems research* 18(3), 237–259.
- Mol, M. J., R. J. Van Tulder, and P. R. Beije (2005). Antecedents and performance consequences of international outsourcing. *International Business Review* 14(5), 599–617.
- Morbey, G. K. and R. M. Reithner (1990). How r&d affects sales growth, productivity and profitability. *Research-Technology Management* 33(3), 11–14.
- Morris, T. and A. Pinnington (1998). Promotion to partner in professional service firms. *Human Relations* 51(1), 3–24.
- Mosonyi, S., L. Empson, and J.-P. Gond (2020). Management consulting: Towards an integrative framework of knowledge, identity, and power. *International Journal of Management Reviews* 22(2), 120–149.
- Mugele, C. and M. Schnitzer (2008). Organization of multinational activities and ownership structure. *International Journal of Industrial Organization* 26(6), 1274–1289.
- Murray, J. Y. and M. Kotabe (1999). Sourcing strategies of us service companies: a modified transaction–cost analysis. *Strategic management journal* 20(9), 791–809.
- Muzio, D. and J. Faulconbridge (2013). The global professional service firm: ‘one firm’ models versus (italian) distant institutionalized practices. *Organization Studies* 34(7), 897–925.

- Nachum, L. (1999). Measurement of productivity of professional services: An illustration on Swedish management consulting firms. *International Journal of Operations & Production Management* 19(9), 922–950.
- Narayanan, S., R. Desiraju, and P. K. Chintagunta (2004). Return on investment implications for pharmaceutical promotional expenditures: The role of marketing-mix interactions. *Journal of marketing* 68(4), 90–105.
- Nassar, I. A., M. K. Almsafir, and M. H. Al-Mahrouq (2014). The validity of gibrat's law in developed and developing countries (2008–2013): Comparison based assessment. *Procedia-Social and Behavioral Sciences* 129, 266–273.
- Nordås, H. K., S. Miroudot, and P. Kowalski (2006). Dynamic gains from trade.
- O'Farrell, P. N. and D. M. Hitchens (1988). Alternative theories of small-firm growth: a critical review. *Environment and Planning A* 20(10), 1365–1383.
- Oldenski, L. (2014). Offshoring and the polarization of the US labor market. *ILR Review* 67(3_suppl), 734–761.
- Oyer, P. and S. Schaefer (2012). Firm/employee matching: An industry study of American lawyers. Technical report, National Bureau of Economic Research.
- Palmrose, Z.-V. (1986). Audit fees and auditor size: Further evidence. *Journal of accounting research*, 97–110.
- Pemer, F., A. Werr, and M. Bianchi (2014). Purchasing professional services: A transaction cost view of the antecedents and consequences of purchasing formalization. *Industrial Marketing Management* 43(5), 840–849.
- Penrose, E. and E. T. Penrose (2009). *The Theory of the Growth of the Firm*. Oxford university press.
- Peris Bonet, F. J., M. Peris-Ortiz, and I. Gil-Pechuan (2010). Integrating transaction cost economics and the resource-based view in services and innovation. *The Service Industries Journal* 30(5), 701–712.
- Perthame, B. (2007). *Transport equations in biology*. Frontiers in Mathematics. Birkhäuser Verlag, Basel.
- Perthame, B., E. Ribes, and D. Salort (2018a). Career plans and wage structures: a mean field game approach.

- Perthame, B., E. Ribes, and D. Salort (2018b). Career plans and wage structures: a mean field game approach. *Mathematics in Engineering* 1, 38.
- Perthame, B., E. Ribes, and D. Salort (2019). Career plans and wage structures: a mean field game approach. *Mathematics in Engineering* 1(1), 38–54.
- Pesaran, M. H., R. G. Pierse, K. C. Lee, et al. (1993). Persistence, cointegration, and aggregation: A disaggregated analysis of output fluctuations in the us economy. *Journal of econometrics* 56(1-2), 57–88.
- Phillips, D. J. (2001). The promotion paradox: Organizational mortality and employee promotion chances in silicon valley law firms, 1946–1996. *American Journal of Sociology* 106(4), 1058–1098.
- Pisani, N. and J. E. Ricart (2016). Offshoring of services: A review of the literature and organizing framework. *Management International Review* 56(3), 385–424.
- Pisano, G. P. and W. C. Shih (2012). Does america really need manufacturing. *Harvard business review* 90(3), 94–102.
- Pisano, G. P., W. C. Shih, et al. (2009). Restoring american competitiveness. *Harvard business review* 87(7/8), 114–125.
- Podolny, J. M. (1993). A status-based model of market competition. *American journal of sociology* 98(4), 829–872.
- Porter, M. E. (2001). The value chain and competitive advantage. *Understanding business processes* 2, 50–66.
- Porter, M. E. and J. W. Rivkin (2012). The looming challenge to us competitiveness. *Harvard Business Review* 90(3), 54–61.
- Prasad, S. (2009). Task assignments and incentives: generalists versus specialists. *The Rand journal of economics* 40(2), 380–403.
- Quader, M. S. (2007). Human resource management issues as growth barriers in professional service firm smes. *Journal of Services Research* 7(2).
- Rao, H., H. R. Greve, and G. F. Davis (2001). Fool’s gold: Social proof in the initiation and abandonment of coverage by wall street analysts. *Administrative science quarterly* 46(3), 502–526.
- Ribes, E. (2018a). Growth patterns of professional services firms.
- Ribes, E. (2018b). What drives professional services firms prices? Technical report.

- Ribes, E. (2020). What does labor displacement mean for management consulting firms? *Management Research Review*.
- Ribes, E. (2021). What is the effect of labor displacement on management consultants? *SN Business & Economics* 1(2), 1–22.
- Ribes, E. et al. (2020). Organizational sustainability and career frameworks in professional services firms. *Economics Bulletin* 40(1), 880–889.
- Ribes, E., K. Touahri, and B. Perthame (2017). Employee turnover prediction and retention policies design: a case study. *arXiv preprint arXiv:1707.01377*.
- Rider, C. I. and D. Tan (2014). Labor market advantages of organizational status: A study of lateral partner hiring by large us law firms. *Organization Science* 26(2), 356–372.
- Rider, C. I. and D. Tan (2015). Labor market advantages of organizational status: A study of lateral partner hiring by large us law firms. *Organization Science* 26(2), 356–372.
- Rosen, S. (1989). Human capital. In *Social economics*, pp. 136–155. Springer.
- Rossi-Hansberg, E. and M. L. Wright (2007). Establishment size dynamics in the aggregate economy. *American Economic Review* 97(5), 1639–1666.
- Roza, M., F. A. Van den Bosch, and H. W. Volberda (2011). Offshoring strategy: Motives, functions, locations, and governance modes of small, medium-sized and large firms. *International Business Review* 20(3), 314–323.
- Safavi, T., M. Davoodi, and D. Koutra (2018). Career transitions and trajectories: A case study in computing. In *Proceedings of the 24th ACM SIGKDD International Conference on Knowledge Discovery & Data Mining*, pp. 675–684.
- Saichev, A. I., Y. Malevergne, and D. Sornette (2009). *Theory of Zipf's law and beyond*, Volume 632. Springer Science & Business Media.
- Sako, M. (2005). Outsourcing and offshoring: key trends and issues. *Available at SSRN 1463480*.
- Sako, M. (2006). Outsourcing and offshoring: Implications for productivity of business services. *Oxford Review of Economic Policy* 22(4), 499–512.
- Sako, M. (2009). technology strategy and management globalization of knowledge-intensive professional services. *Communications of the ACM* 52(7), 31–33.

- Sako, M. (2015). Outsourcing and offshoring of professional services. *The Oxford handbook of professional service firms*, 327–347.
- Sako, M. and A. Tierney (2005). Sustainability of business service outsourcing: The case of human resource outsourcing (hro). *Advanced Institute of Management Research Paper* (019).
- Santarelli, E., L. Klomp, and A. R. Thurik (2006). Gibrat's law: An overview of the empirical literature. *Entrepreneurship, growth, and innovation*, 41–73.
- Sarvary, M. (1999). Knowledge management and competition in the consulting industry. *California management review* 41(2), 95–107.
- Schmenner, R. W. (2004). Service businesses and productivity. *Decision Sciences* 35(3), 333–347.
- Shapiro, S. P. (2005). Agency theory. *Annu. Rev. Sociol.* 31, 263–284.
- Sharma, A. and P. Loh (2009). Emerging trends in sourcing of business services. *Business Process Management Journal*.
- Sherer, P. D. (1995). Leveraging human assets in law firms: Human capital structures and organizational capabilities. *ILR Review* 48(4), 671–691.
- Simon, H. A. (1991). Organizations and markets. *Journal of economic perspectives* 5(2), 25–44.
- Skaggs, B. C. and M. Youndt (2004). Strategic positioning, human capital, and performance in service organizations: A customer interaction approach. *Strategic Management Journal* 25(1), 85–99.
- Skjølsvik, T., F. Perner, and B. R. Løwendahl (2017). Strategic management of professional service firms: Reviewing abs journals and identifying key research themes. *Journal of Professions and Organization* 4(2), 203–225.
- Smets, M., T. Morris, and N. Malhotra (2012). Changing career models and capacity for innovation in professional services. In *Handbook of research on entrepreneurship in professional services*. Edward Elgar Publishing.
- Smets, M., T. Morris, A. von Nordenflycht, and D. M. Brock (2017). 25 years since 'p2': Taking stock and charting the future of professional firms. *Journal of Professions and Organization* 4(2), 91–111.
- Smith, A. and J. Anderson (2014). Ai, robotics, and the future of jobs. *Pew Research Center* 6, 51.
- Sonmez, M. and A. Moorhouse (2010). Purchasing professional services: which decision criteria? *Management Decision*.

- Spence, M. (1978). Job market signaling. In *Uncertainty in economics*, pp. 281–306. Elsevier.
- Stanley, M. H., L. A. Amaral, S. V. Buldyrev, S. Havlin, H. Leschhorn, P. Maass, M. A. Salinger, and H. E. Stanley (1996). Scaling behaviour in the growth of companies. *Nature* 379(6568), 804–806.
- Starbuck, W. H. (1992). Learning by knowledge-intensive firms. *Journal of management Studies* 29(6), 713–740.
- Stephan, M., M. Silvia, and L. Arie Y (2008). A dynamic perspective on next-generation offshoring: The global sourcing of science and engineering talent. *Academy of Management Perspectives* 22(3), 35–54.
- Stewman, S. (1986). Demographic models of internal labor markets. *Administrative Science Quarterly* 31(2), 212–247.
- Stiroh, K. J. (2002). Information technology and the us productivity revival: what do the industry data say? *American Economic Review* 92(5), 1559–1576.
- Stock, J. R. and P. H. Zinszer (1987). The industrial purchase decision for professional services. *Journal of Business Research* 15(1), 1–16.
- Storey, D. J. (2016). *Understanding the small business sector*. Routledge.
- Stringfellow, A., M. B. Teagarden, and W. Nie (2008). Invisible costs in offshoring services work. *Journal of Operations Management* 26(2), 164–179.
- Stumpf, S. A. (1999). Phases of professional development in consulting. *Career Development International*.
- Stumpf, S. A. (2002). Becoming a partner in a professional services firm. *Career Development International*.
- Sutton, J. (1997). Gibrat’s legacy. *Journal of economic literature* 35(1), 40–59.
- Sutton, J. (2002). The variance of firm growth rates: the ‘scaling’ puzzle. *Physica a: statistical mechanics and its applications* 312(3), 577–590.
- Swart, J., N. K. Hansen, and N. Kinnie (2015). Strategic human resource management and performance management in professional service firms. In *The Oxford handbook of professional service firms*.
- Sweeney, J. C., G. N. Soutar, and J. R. McColl-Kennedy (2011). The marketing practices-performance relationship in professional service firms. *Journal of service management*.

- Tadelis, S. (2007). The innovative organization: Creating value through outsourcing. *California Management Review* 50(1), 261–277.
- Tate, W. L. and L. Bals (2017). Outsourcing/offshoring insights: going beyond reshoring to rightshoring. *International Journal of Physical Distribution & Logistics Management*.
- Teece, D. J. (2003). Expert talent and the design of (professional services) firms. *Industrial and Corporate Change* 12(4), 895–916.
- Thatcher, M. E. and J. R. Oliver (2001). The impact of technology investments on a firm’s production efficiency, product quality, and productivity. *Journal of Management Information Systems* 18(2), 17–45.
- Toivonen, M. et al. (2004). Expertise as business: Long-term development and future prospects of knowledge-intensive business services (kibs).
- Ulrich, D. and W. Brockbank (2005). *The HR value proposition*. Harvard Business Press.
- Ulrich, K. T. and D. J. Ellison (2005). Beyond make-buy: Internalization and integration of design and production. *Production and Operations Management* 14(3), 315–330.
- Upadhyia, C. (2009). Controlling offshore knowledge workers: Power and agency in india’s software outsourcing industry. *New Technology, Work and Employment* 24(1), 2–18.
- U.S. Census Bureau (2015). SIPP Synthetic Beta version 6.0.2. [computer file], U.S. Census Bureau [producer] and Cornell University, Synthetic Data Server [distributor], Washington,DC and Ithaca, NY, USA.
- van Stel, A., A. Millán, J. M. Millán, and C. Román (2017). The relationship between start-up motive and earnings over the course of the entrepreneur’s business tenure. *Journal of Evolutionary Economics*, 1–23.
- Vermeulen, B., J. Kesselhut, A. Pyka, and P. P. Saviotti (2018). The impact of automation on employment: just the usual structural change? *Sustainability* 10(5), 1661.
- Wagner, J. (1992). Firm size, firm growth, and persistence of chance: Testing gibrat’s law with establishment data from lower saxony, 1978–1989. *Small Business Economics* 4(2), 125–131.
- Wagner, J. (2011). Offshoring and firm performance: self-selection, effects on performance, or both? *Review of World Economics* 147(2), 217–247.
- Wagner, J. (2012). International trade and firm performance: a survey of empirical studies since 2006. *Review of World Economics* 148(2), 235–267.

- Wang, W.-L., E. C. Malthouse, B. Calder, and E. Uzunoglu (2019). B2b content marketing for professional services: In-person versus digital contacts. *Industrial marketing management* 81, 160–168.
- Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic management journal* 5(2), 171–180.
- Wiklund, J., P. Davidsson, and F. Delmar (2003). What do they think and feel about growth? an expectancy–value approach to small business managers’ attitudes toward growth. *Entrepreneurship theory and practice* 27(3), 247–270.
- Williamson, O. E. (1967). Hierarchical control and optimum firm size. *Journal of political economy* 75(2), 123–138.
- Williamson, O. E. (1981). The economics of organization: The transaction cost approach. *American journal of sociology* 87(3), 548–577.
- Williamson, O. E. (1998). Transaction cost economics: how it works; where it is headed. *De Economist* 146(1), 23–58.
- Yamano, N. and N. Ahmad (2006). The oecd input-output database: 2006 edition.
- Yeaple, S. R. (2006). Offshoring, foreign direct investment, and the structure of us trade. *Journal of the European Economic Association* 4(2-3), 602–611.
- Youngdahl, W. and K. Ramaswamy (2008). Offshoring knowledge and service work: A conceptual model and research agenda. *Journal of operations management* 26(2), 212–221.
- Zerni, M. (2012). Audit partner specialization and audit fees: Some evidence from sweden. *Contemporary Accounting Research* 29(1), 312–340.

RÉSUMÉ

Cette thèse dépeint les mécanismes actuellement à l'œuvre dans la transformation de l'industrie des services professionnels.

Elle commence par une description analyse des dynamiques qui ont sous-tendues (et qui continuent à sous-tendre) la croissance de cette industrie. Cette description est principalement soutenue par des études empiriques, tandis que les analyses proposées sont conceptualisées par le biais de modèles théoriques. Ce premier ensemble de travaux montre que la survie des entreprises de ce milieu est aujourd'hui principalement une question d'adaptation et de passage à l'échelle. Cette thèse explore ensuite les tenants et aboutissants des deux instruments principaux utilisés par ces entreprises pour se transformer, à savoir la délocalisation & l'automatisation. Cette discussion est informée par un mélange d'étude empiriques (régressions, enquêtes de terrain. . .). Ces dernières sont ensuite utilisées pour proposer une scénarisation de l'évolution de l'industrie sur le long terme (ce qui est fait via une analyse à champ moyen, une technique très actuelle de l'écono-physique).

Cette thèse se conclue par une investigation des conséquences de la transformation du monde des services professionnels sur les pratiques managériales qui structurent ces entreprises (schéma d'apprentissage, règles de promotions et de rémunération. . .).

MOTS CLÉS

Services professionnels; Délocalisation; Croissance; Performance; Services légaux; Commerce international; Changement technologique; Théorie des jeux à champs moyen

ABSTRACT

This PhD provides an up-to-date view of the mechanisms at play in the transformation of the professional services industry.

It first explores the dynamics that have sustained and keep on sustaining the growth of the associated industry (through a mix of theoretical modelling and empirical analysis) and highlights that survival in this industrial realm is now a question of adaptation to deliver services at scale.

This thesis then discusses the two key instruments available for such firms: namely labor displacement off/near-shore and labor replacement thanks to automation technology. This discussion is informed by a mix of empirical analysis (survey, regression analysis) which is latter used to propose a view of the end state of the sector (by means of a mean field game analysis). Finally, this thesis investigates the implications of such a transformation on professional services human resources practices (apprenticeship paradigm, promotion rules & employees compensation incentives).

KEYWORDS

Professional Services; Labor displacement; Firm growth; Firm performance; Legal services; International business; Technological change; Mean Field Games