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Competitive strategies, heterogeneous demand sources and firms' growth trajectories

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Abstract

The present paper explores the demand-pull effect of distinct demand sources (i.e. households and retailers, other firms and public sector) on Italian companies' growth patterns. Data relies on the PEC (Indagine sulle Professioni e le Competenze) survey carried out by the Institute for Public Policy Analysis (INAPP), which provides a rich set of information on a representative sample of Italian companies (~32.000) observed during the years 2012, 2014 and 2017. In particular, we investigate if and to what extent firm-level growth profiles are linked to the prevalent source of the demand flows that such firms face. The analysis contextually accounts for the role played by technological and knowledge-related heterogeneities in shaping the growth pattern-demand type relationship. The empirical analysis shows that the demand-pull effect on firms' growth is heterogeneous across different types of demand sources and that the ability to seize the growth-related chances provided by distinct demand conditions is contingent on firms' specific knowledge profiles.

Keywords: firms, growth, demand-pull, innovation

JEL codes: L1, L21, L22, L25

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1. Introduction

Technological upgrading and innovation, together with the enrichment of the internal knowledge-base, are the key strategies firms put in place to pursue market success. The effective adoption of such strategies is, nevertheless, not only conditioned by supply factors (i.e. the presence of an adequate absorptive capacity and/or advanced organizational capabilities that allow for the full exploitation of the economic potential of technological and organizational upgrading). On the contrary, firms' successful performances also rely on demand conditions (identified by demand flows), at length acknowledged as key drivers of innovation and growth by both classical and evolutionary economists (among the others, Kaldor, 1957; Schmookler, 1966; Scherer, 1982). By making the expected value of present investments less uncertain (in particular in the case of innovation-related investments, normally affected by greater uncertainty as compared to other type of investments), sustained demand flows might incentivize the adoption of competitive strategies based on innovation and technological upgrading. The same

competitive strategies that, on the contrary, are less likely to be adopted in the case of stagnant economies facing weak demand flows (Saviotti and Pyka, 2004).

On the other hand, qualitative and compositional changes in buyers' preferences might affect producers' decisions in terms of quantity, composition as well as of process and products' characteristics. Say that, for example, a large majority of consumers populating the smartphones' market start putting sharpness of videos and quality of photos at the top of their (personal) ranking of key product characteristics. It is quite likely that, as a result, smartphone producers will react increasing their R&D investment so to strengthen the photo-video apparatus embodied in the phones they commercialize. The stronger the competition in such markets the faster and intense the investment race is expected to be. On similar grounds, the joint adoption of a new organizational praxis (say, the externalization of some parts of the production process or the reliance on a new organizational model implying greater internal flexibility) by a certain cluster of firms is likely to stimulate investments and innovation on the side of the (specialized) suppliers providing them machineries. In this case, an initial organizational change affecting companies' decisions regarding the intermediate goods and machineries they consider best suited to fuel their productive process may assume the form of an incentive, for another group of producers, to invest in innovation and products' quality.

Demand can then 'pull' innovation and growth, the latter being strictly intertwined, both on the quantity side, reducing the uncertainty that firms face and stimulating new investments and dimensional enlargement; as well as on the quality side, favouring a continuous process of change and upgrading aimed at following (and meeting) the evolution of buyers (households, firms and government)' preferences. Different buyer categories tend to match with highly differentiated type of markets. When considering households' demand the chances to face markets where goods are rather homogenous wherein price factors are likely to weight more with respect to technology and quality-related factors are greater. On the contrary, the demand coming from firms usually requires a continuous tension towards quality improvement or cost reduction in intermediate inputs. The companies' demand for intermediate goods, in turn, may significantly stimulate growth and technological upgrading. In the case of machineries and electronic devices, for example, the importance that buyers attach to the scope (i.e. the specific tasks that a machine might be required to perform) and performance of such products constitute a fundamental incentive (for suppliers) to invest and innovate more. The public component of demand is not less relevant as regards its pro-growth and transformative potential. Being often based on large amount of resources and related to long-term investment projects – as those described by Mazzucato (2013) and aimed at meeting relevant (and complex) societal needs – public procurement (PP) – i.e. the direct purchase of goods and services by the public sector – is indeed one of the critical policy tools to foster innovation, industry and firms' growth. By targeting the most promising

sectors, products and technologies, in fact, PP helps promoting technological upgrading and virtuous structural change (i.e. the increasing share of high-value high-tech sectors in the economy). Given its strong linkage with technological change and innovation, the importance of PP as an element capable to spur companies' growth prospects, vis-à-vis other demand sources, is now widely recognized (Mazzucato, 2013; Edquist, 2015).

However, the growth-enhancing and transformative potential of demand might be affected by the technological and organizational features that heterogeneously characterize firms. To begin, the relative ability of firms in capturing the opportunities opened by an unexpected demand flow is linked to their responsiveness in terms of quantity and quality of production. Similarly, in absence of strong capabilities and absorptive capacity, firms are likely to miss the opportunity to strengthen and enlarge their productive base even if a strong demand opportunity is in sight. In sectors where large firms are prevalent, moreover, it is likely that the degree of responsiveness - as well as the propensity to invest and enlarge the productive base – in the event of an unexpected demand flow is higher as compared to other sectors. Analogously, in industries where competitive strategies are mostly based on innovation and knowledge accumulation (Peneder, 2010) attributes as flexibility and readiness to adjust production (in both qualitative and quantitative terms) are likely to be highly diffused among firms. The demand-pull effect on companies' growth, therefore, might vary significantly according to, on the one hand, the type of demand flow that companies are facing. On the other hand, the same effect might vary given the technological, organizational and structural characteristics of the firm as well as of the industry where the latter operates.

Focusing on a large set of Italian companies observed between 2012 and 2017, this paper adds to the literature exploring the role of demand in explaining company-level growth simultaneously accounting for the technological and knowledge-related capabilities of firms. Relying on a rich set of information concerning both the type of demand flows that firms face as well as the innovative activities and the knowledge base they rely upon, this work provides a number of contributions to the existing literature. First, we provide fresh micro-level evidence on the prominent role of demand as a factor driving Italian companies' growth. Second, the paper sheds light on the heterogeneous impact that different demand sources (households, other firms and PP) might have on growth. Third, the demand-growth relationship is explored accounting explicitly for the type of innovation that companies prevalently adopt and the nature of the competences characterizing their workforce.

The article is organized as follows. Section 2 briefly reviews the relevant literature focusing on the role of demand in explaining growth as well as on the crucial importance of innovation and knowledge in shaping such relationship. The thirds section spells out the working hypothesis and the specifications adopted to test them. The fourth describes

the unique integrated database[1] used for the analysis, reports some descriptive evidence on the demand-innovation-growth nexus and illustrates the cluster-analysis performed to cluster firms according to their technological and knowledge-related characteristics The fifth section depicts the econometric strategy and the results while the sixth section discusses the key results providing some policy considerations.

2. Background literature: demand-pull and firms' growth

The expansion of the firm is a crucial driver of the overall growth of an economic system. During the past decades, the increase in production experienced in Western countries largely stemmed from the expansion of existing structures, while only one third depended on the creation of new established firms (Rajan and Zingales 1998).

Given such an extreme relevance as economic phenomenon, the exploration of the determinants of firms' size stood at the core of an intense and constant research effort (Kumar et al. 1999). Though extensive and continuative, the study of the firm's growth has been, nonetheless, changing over time, with old questions continuously reformulated and new issues emerging. Significant steps forwards in this field occurred in recent years, when the focus on *why* and *how* firms grow (Delmar 1997; Davidsson et al. 2005; Traù 1996; Sutton 1997) leaving the floor to a new interest on *which* firms actually increase their size (Arrighetti and Ninni, 2009). The main difference between the two approaches, is that the second - which are the firms that actually grow – intends the event "growth" as not only spurred by exogenous forces (technological supply, end-products, demand, market size, etc) but also contingent on the asymmetric distributions of firms' internalized resources.

Such a shift has been essentially due to new empirical evidences showing that firms' growth is far from the random walk predicted by the Gibrat's law (Becchetti and Trovato, 2002; Lotti et al. 2003; 2009).[2] In this respect, as pointed out by Geroski (1999), growth's unpredictability is likely to depend on certain unobservable advantages rather than being the fruit of pure randomness. Seen in this perspective, chances of growth are thus expected to be higher for specific groups of firms (i.e. small firms, innovative, etc..) and lower in others, thus suggesting that the growth's opportunities experienced by companies are ultimately shaped by both external and internal firms' features.

Among the former, demand trends are thought to play a central role as exogenous factors enabling and enhancing firms' growth processes. First speculations about the link between demand conditions and growth date back to the Keynesian demand theory

[1] The adopted database integrates variables on companies' innovative activities and knowledge-base characteristics, stemming from the *Indagine sulle Professioni e le Competenze nelle Imprese* realized by the National Institute for Public Policy Analysis (INAPP); and on age and sectoral composition from *Archivio Statistico delle Imprese Attive* (ASIA) maintained by ISTAT.

[2] In the Gibrat's framework the trend of size expansion followed by a given firm is supposed to be independent from its starting size.

(1936). Using Keynes's words, favourable demand expectations positively influence the desirability and realization of investments, with important implications for growth opportunities at the firm-level (Brouwer et al. 1993; Hughes, 1986; Brouwer and Kleinknecht, 1999; Geroski et al. 1993). In this context, low demand is considered to be one of the major causes of capacity underutilization (Hoekman and Sanfilippo, 2018) and underinvestment (Garcìa-Quevedo et al. 2017). On the other hand, great potential is attached to demand-side incentives in triggering both capacity utilization and growth-enhancing investment activities.

The importance of demand in influencing firms' investment decisions has been strongly emphasized by innovation studies. Since the seminal contributions by Schmookler (1962) and Myers and Marquis (1969), demand conditions are recognized as key factors explaining both innovation and growth (Mowery and Rosenberg, 1979; Kleinknecht and Verspagen, 1990). Additional evidences on the causal nexus between expected profitability and the potential expansion of market demand have been collected by the evolutionary literature (Andersen, 2001; Metcalfe, 2001; Saviotti and Pyka, 2004; Crespi and Pianta, 2007, 2008; Piva and Vivarelli, 2007; Gallup 2011; Uyarra et al. 2014; Antonelli and Gehringer, 2015) which ascribes to demand flows an undiscussed centrality as enablers of innovative investments.

However, as highlighted by a bulk of managerial studies devoted at assessing the functioning and the properties of market demand at the micro-level (see for example Batterzaghi and Verganti 1995; Fisher et al., 1997; Adner and Zemsky 2006; Zhou et al., 2009), not all firms front the same possibilities to take advantage from demand conditions. On the contrary, demand-growth opportunities might differ across companies on the basis of the degree of demand uncertainty they face. Uncertainty is something determined by a number of characteristics (Barber et al. 2016) ranging from market dynamics (size, types and frequency of purchases), market segmentation (market concentration) to market growth (fluctuations in demand). These features are ultimately influenced by two key aspects. One is the predominant type of goods offered by the firm (intermediate goods or final commodities/services), while the other is the public or private nature of its prevalent buyer(s). Bringing together these two dimensions, it can be argued that the demand-pull effect on growth could vary on whether the market demand sources from households and retailers (i), firms (ii) or public entities(iii).

For instance, providers might be grouped into final firms or suppliers whether their predominant buyer category is represented by (i) households/retailers or (ii) other firms, respectively. Considering the different configuration of the markets in which they operate, there is reason to believe that, in relation to final firms, suppliers are more shielded from rapid variations in demand flows and unexpected shocks due to cyclical or seasonal factors. At least three reasons could motivate such a conjecture. First, when compared to final firms, suppliers are generally less exposed to external turbulences (Kimura, 2002) –

such as growing competitive pressures, market internationalization processes and increasing complexity in product technologies – that are more likely to affect final markets. Second, since as suppliers just fulfil production orders by constantly providing large batch of goods to their buyers, they do not have to manage with usual marketing problems related to outlets, brand names, advertising and market research (Agostino et al., 2015). Third, suppliers might better benefit from higher levels of cooperation and trust from their served customers, especially when grouped into geographically coupled supply systems (Brusco, 1999; Rama et al., 2003). In addition, as a result of the intensive globalization of production activities that has increased the demand for highly skilled suppliers capable of producing for the top-quality market (Amighini and Rabellotti 2006), suppliers are, to date, more prone towards technological and quality upgrading (Rabellotti et al. 2009).

Overall, all these conditions lead suppliers to be provided with constant, less volatile and more advanced demand flows entailing, as a consequence, better growth opportunities. Similar arguments hold for companies who predominantly serve the public sector through their engagement in PP. Operatively, when constant and massive, PP has the potential to increase trust and accountability towards external investors, with the main effect of relaxing financial barriers to external credit and enhancing capital investment opportunities (Hebous and Zimmerman, 2016). Furthermore, when requiring advanced and innovative products, public contracts can improve firms' ability in competing on new markets by prompting the development of new products (Ferraz et al. 2015; Edler and Yeow, 2016, Lee 2017; Florio et al. 2018; Czarnitzki et al. 2018). All these conditions are expected to pave the way for better firms' performances, with positive implications on their growth's chances. However, the potentialities attached to PP as a firms' growth driver mostly depend on the content and the scope of procuring entities, that might vary across countries, sectors and firms.

For example, in the OECD countries – where PP involves about 30% of the total government spending by accounting for a share of above 12% of GDP[3] – beyond the simple provision of public goods and services to citizen, public demand also addresses additional goals, such as redistribution, growth, sustainability and industrial development objectives (Geroski, 1990; Evenett and Hoekman, 2005; Kattel and Veiko, 2010; Uyarra and Flanagan 2010; OECD, 2013; Rodrik, 2015; UNIDO, 2017). Among this wide array of aims, procurement can, and actually does, create demand for innovative technologies and sustainable goods (OECD, 2013; Rodrik, 2015; UNIDO, 2017), opening up for the overall industrial development at both macro (OECD, 2013; Ribiero and Furtado, 2014; Altenburg and Lütkenhorst, 2015; Dawar and Oh, 2017; Crespi and Guarascio, 2019) and

[3] Data available at the web site https://stats.oecd.org/index.aspx?r=171728#

micro-levels (Geroski, 1990; Acemoglu et al., 2013; Ferraz et al., 2015; Hoekman and Sanfilippo, 2018).

However, as recalled before, the ability to seize the chances provided by PP and, more in general, by any advantageous demand condition is contingent on firms' specific features, rather than being equally distributed across them. Actually, some companies are more likely than others to exploit demand-related growth opportunities even if facing similar "demand environments". What basically explains why the exposure to the same type of demand flow engender heterogenous rather than isomorphic responses by firms is their *ex ante* heterogeneity. Such heterogeneity across companies mainly relies on different configurations within their resource profiles (Pfeffer and Salancik, 2003) that, in line with the resource-based view (RBV) (see, for instance, Oliver 1997), reveal much of the variance that companies show in grasping demand-led growth opportunities. In the RBV perspective, the ability to manage resources in a way that generates rare, not substitutable and valuables capabilities is considered the main explanation of why a firm outperforms its competitors (Barney et al., 2001). Higher levels of internal resources provide companies with better chances to understand external influences and opportunities (Cyert and March, 1963), strengthen organizational capabilities (Makadok and Barney, 2001) and create knowledge (Penrose, 1959). For instance, those endowed with many and well assorted internal resources are more likely to better develop information networks, research skills, technological and knowledge capabilities (Smith et al., 1991). This implies better opportunities to search for the most profitable external chances (including those related to demand conditions) and respond them in timely and effective manners.

As far as resource profiles are concerned, they essentially mirror firms' dynamism in both organizational and technological capabilities. The former allows firms facing unexpected changes in the external environment to go beyond passive adjustments and reshape both their operational *routines* and the environment itself (Penrose, 1959; Bourgeois, 1981). The latter enable companies towards more uncertain and risky initiatives (Chattopadhyay, 2001), thus favouring their match with advanced and sophisticated flows of demand (Divella and Sterlacchini, 2018). Therefore, when possessing technological skills, firms are able to deliver more technologically complex products and services.

In a nutshell, it could be argued that, while different types of demand flows might be seen as predictors of demand-led growth at the micro level, internal firm resources act instead as moderators. So that, for companies fronting the same stream of demand, it would be more likely to find heterogeneity rather than iso-morphism in their related demand growth-premium. As much of this heterogeneity is mostly explained by the variance that firms show in their technological and organizational configurations, resource profiles gain a central relevance in shaping the growth opportunities opened by demand conditions.

3. Research questions

The aim of this work is to empirically analyse the role of demand, distinguished by type, in explaining companies' growth patterns. More specifically, we test whether companies prevalently facing a specific type of demand (i.e. demand for consumption goods by households, for intermediate and final goods by other firms or PP) tend to grow more than other firms. Having the demand for consumption as a reference point, the first research question can be spelled out as follows:

RQ1. Do companies that prevalently sell goods to other firms grow more than their peers?

RQ2. Do companies that prevalently sell goods to government and public bodies grow more than other firms?

As argued in the previous sections, demand flows stemming from other firms are more likely – as opposed to demand for consumption by households – to favour a process of growth and technological upgrading. This is mostly due to the fact that such demand flows tend to be related to the purchase of large batches of goods, often repeated over time, whose qualitative and technological characteristics are usually of utmost importance for buyers. The same argument applies, eventually in an even stronger way, to PP. When strategically oriented towards specific sectors and product classes (Crespi and Guarascio, 2019), in fact, PP has the explicit objective of promoting the growth of firms populating such sectors. As a result, our expectations concerning RQ1 and RQ2 is to detect a positive 'growth premium' for firms prevalently facing demand stemming from other firms and PP. To properly isolate the role of demand in explaining growth we account for firm-level characteristics (as age, size, degree of internationalization, sector and geographical localization) which are likely to affect the relationship under scrutiny.

On the other hand, as recalled before, the demand-pull effect might vary according to the technological and organizational characteristics of the firm. For instance, companies endowed with strong technological capabilities and relying on product innovation as a major competitive strategy are more likely to capture demand flows directed toward high–tech high-quality products. If such capabilities are lacking, in turn, companies are expected to be overcome by their more technologically advanced peers. A similar heterogeneity tends to characterize firms with respect to their skill and competences endowment. Companies characterized by a strong knowledge base (i.e. those employing a large share of high-skilled workers and updating their knowledge base relying on training programs and new hiring, see Fanti et al. 2019 for a discussion on this point) are expected to be more capable to adjust so to serve unexpected demand flows. This is particularly true, for example, in the service sector where the contribution of specific high-skilled workers as

well as the readiness of the organizational structure is crucial to provide just-in-time answers to quantitative and qualitative changes occurring on the demand side. In both the descriptive and the econometric sections that follow, we provide evidence concerning the heterogeneity of the demand-growth relationship when such technological and organizational characteristics are explicitly accounted for.

4. Data, descriptive statistics and cluster analysis

This section illustrates the database used for the empirical analysis; provides a set of descriptive statistics concerning the main relationships at stake; and describes the cluster analysis by means of which firms have been grouped according to their innovativeness, on the one hand, and to the relative dynamism of their knowledge base (see the data and variables description below), on the other.

4.1 The PEC survey

The analysis is based on a database providing a rich set of information on a representative sample of Italian companies observed during the years 2012, 2014 and 2017. The information stem from the *Indagine sulle Professioni e le Competenze* (PEC) carried out by the Institute for Public Policy Analysis (INAPP). The survey involves a representative sample of ~32.000 Italian firms stratified by sector, size and geographical area. Concerning standard firm-level variables, the PEC survey provides information on: age, size and composition of the workforce, type of innovation (product, process and organizational), internationalization (Franceschetti et al. 2019). On the demand side, variables regarding the type of purchasers that firms predominantly serve (individuals and households demanding consumption goods, retailers, other firms demanding both final and intermediate goods and the public sector) are also reported. Distinguishing itself from most of the existing enterprise-level surveys, in addition, the PEC reports information related to the contingent 'skill-need' of the employed workforce (information is reported by entrepreneurs and HR responsible). Companies are asked to indicate (up to a maximum of 5 professional categories): i) which occupations, within their employed workforce, are in need of skill upgrading ii) which kind of skills need to be added. The firm-specific skill need is mapped relying on the O*NET repertoire: respondents are asked to identify abilities, skills and knowledge in need using the taxonomy comprised in the relevant O*NET sections.[4] This set of variables allow to quantitatively characterize and rank companies according to the nature of their knowledge base and needs.

[4] The PEC survey is realized by the National Institute of Public Policy Analysis in parallel to the 'Italian O*NET' providing more than 300 variables on Italian occupations' task, skills and work attitudes (see Gualtieri et al. 2018 for a description of the database).

4.2 Data and descriptive evidence

The PEC survey is representative of the Italian firms' population. Out of the three waves, we count on 98276 observations embracing a total of 71657 surveyed firms, more or less equally divided between waves.

Table 1. Distribution of firms (observations) by PEC wave.

Wave	**Observations**	**Firms**
First	33699	1571434
Second	32600	1563085
Third	31977	1573479

The sample is further explored by providing a set of descriptive statistics focusing on key dimensions (Table 2) as: innovative activities (product, process and organizational innovation); firms' skill need (i.e. proxing companies' relative dynamics in terms of knowledge base upgrading); main customer (i.e. proxing the type of demand firms are prevalently facing) and size. The skill need is captured relying on a categorical variable ranging from 0 (no declared need) to 3 (high need) and based on the count of different, unique skills demanded.

Table 2. Variables included in the analysis

Variables' name	**Description**
Employment Growth	Log variation of the number of employees between two consecutive waves.
Source of demand	Categorical variables reporting firms' prevalent client. Four PEC items grouped in three: demand by firms, by public bodies, by family and retail.
Internationalization	Dummy variable assuming value 1 when firms sell their products/services abroad, 0 otherwise.
Size	Log # of employees
Age	Log # of years from foundation.
Product Innovation	Dummy variable assuming value 1 if the firm has introduced a product innovation in the past 3 years, 0 otherwise.
Process Innovation	Dummy variable assuming value 1 if the firm has introduced a process innovation in the past 3 years, 0 otherwise.
Organizational Innovation	Dummy variable assuming value 1 if the firm has introduced an organizational innovation in the past 3 years, 0 otherwise.
Skill Need	Categorical variable reporting the # of skills that the respondent firm needs to add to her knowledge-base: high (more than 33 skills), medium (between 14 and 33 skills), low intensity (between 0 and 14 skills) and none.
Skill Demand composition	Categorical variable reporting the characteristics of the skill-need: Management, STEM, Social, Soft, Technical Operative and Humanities related skills.

Table 3 depicts the distribution of firms distinguishing the latter between those reporting a skill need and those who do not. Moreover, firms reporting a skill need are ranked according to the relative intensity of such need (i.e. following Fanti et al. (2019) we count the number of skills 'in need' as reported by the interviewee, e.g. in the field of managerial competences or mathematic knowledge): high (more than 33 skills), medium (between 14 and 33 skills), low intensity (between 0 and 14 skills) and none. It turns out that almost one third of firms in each wave (2012, 2014, 2017) is in the process of upgrading her knowledge base (cumulative sum of the last three rows by column), with a peak in 2014 when a percentage of about 32.4 is reached.

Table 3. Distribution of firms by intensity of the skill need

Skill Need	2012	2014	2017
None	67.4	67.5	64.9
Low	16.4	11.4	22.6
Medium	13.3	15.8	10.6
High	2.7	5.2	1.7

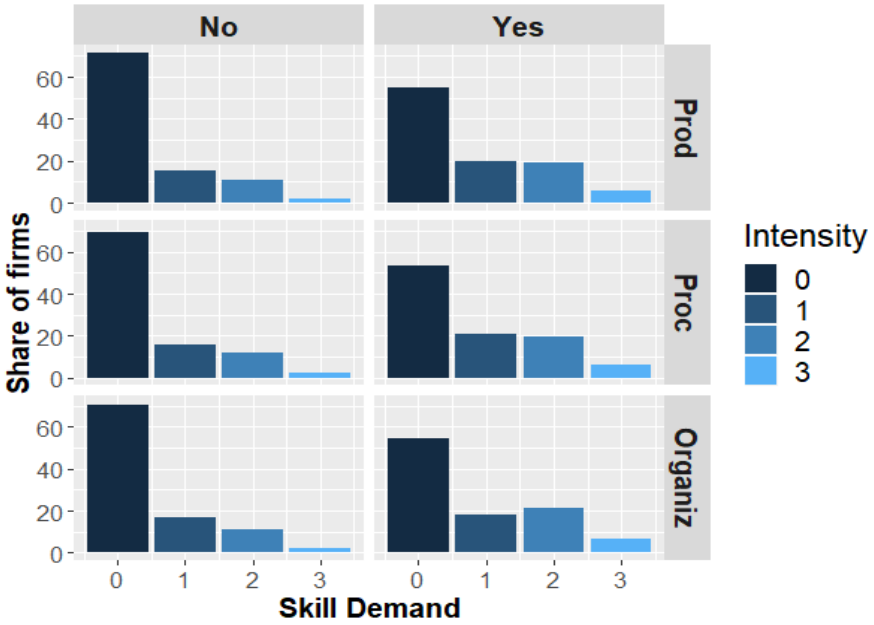
Concerning the distribution of companies by innovation type (Table 4), product and organizational innovation seem to prevail among the companies included in the PEC survey. In 2017, however, the share of firms doing product and process is more balanced while the share of those performing organizational innovation shrinks to the 13%.

Table 4. Distribution of firms by type of innovation

Share of innovators over the population and distribution by type of innovation			
	2012	**2014**	**2017**
Innovators (over the total)	42	54	39
Distribution by type of innovation among innovators			
Product	28	35	25
Process	12	15	23
Organizational	24	33	13

The distribution of firms by intensity of the skill need and innovation type is reported in Figure 1. It emerges a correlation between presence and intensity of the skill need, on the one hand, and innovation, on the other. In particular, the stronger skill-need intensity is detected among firms relying on product and organizational innovation. In this respect, the presence of a large share of companies manifesting a skill need among those introducing innovation as compared to other firms, supports the hypothesis of a complementarity between innovativeness and propensity towards knowledge-based upgrading (Fanti et al. 2019).

Figure 1. Distribution of firms by intensity of the skill need and innovation type



To go more in depth into companies' skill needs, we distinguish them according to the following six domains: Management, STEM, Social Skills, Soft Skills, Humanities and Technical Operatives.

Figure **2** depicts the distribution of firms by skill domain and type of innovation. Overall, managerial, social and soft skills emerge as the 'most wanted' skills. However, when skills are disarticulated in different domains, no significant heterogeneity is detected between innovators and non-innovators; as well as by different innovation types.

Figure 2. Distribution of skill demand in six domains by kind of innovative activity.

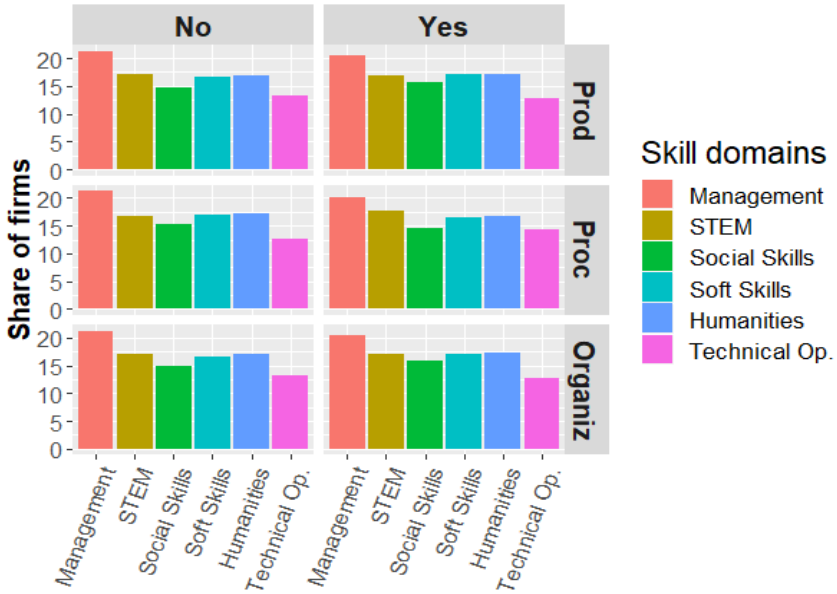


Table 5 provides evidence regarding the type of demand prevalently served by the companies included in the analysis. A significant heterogeneity is detected by both rows and columns. In the first case, it emerges that the share of companies serving prevalently other firms remains stable over the considered time period (despite a peak in 2014). The group of firms having PP as the major source of demand is the smallest among those reported in table 5, always smaller than the 5% of the total Italian population of firms with a lowest hit in 2017. On the contrary, those prevalently serving "Individuals and families" and "Retailers" covers about the 70% of the whole population. Among one third of firms has instead declared to serve other firms as main customer.

Table 5. Distribution of firms by main customer within PEC waves (column = 1)

Source of demand	2012	2014	2017
Other firms	28.1	30.8	27.1
Retailers	10.6	9.0	7.5
Public bodies	4.1	4.1	2.1
Individuals and families	57.1	56.1	63.3

The peculiar distribution of firms across demand types reflects both the different nature of such types; as well as the prevalent characteristics of the Italian productive structure. The relatively small share of companies having PP as key demand source can be partly explained by the specific nature of government's driven demand. The latter is in fact often directed towards very specific product classes: i.e. goods with predefined quality requirements and low levels of substitutability. Companies facing prevalently PP flows, moreover, are also asked to succeed in public competition in order to be selected as procurers. As a result, these companies tend often to be circumscribed to a relatively small cluster wherein firms are endowed with technological and organizational capabilities suitable to successful respond to governments' needs. A similar, but less narrow argument, goes for companies mainly serving 'other firms'. As argued in the previous section, companies selling to other firms are more likely to compete on quality and technology basis rather than on prices. This, again, might restrict the number of successful firms to those capable to reach the required quality standards. On the other hand, within the largest group (i.e. firms serving individuals, families and retailers), heterogeneity is supposed to be stronger with an intense presence of small low-tech firms, mostly competing on prices. In the Italian case, this group tend to be majoritarian and largely populated by small and micro firms operating in the service sector selling to both individual consumers and retailers.

By combining the information on the intensity of the skill need and the type of demand companies prevalently serve (Table 6), it can be observed that those selling to public

entities and other firms are also characterized by a stronger propensity towards the upgrading of their knowledge-base.

Table 6. Distribution of firms by intensity of SD and main customer (rowsum = 1)

Source of demand	0	1	2	3
Other firms	65.1	16.7	14.3	3.9
Retailers	67.9	15.2	13.4	3.6
Public bodies	63.5	14.4	16.3	5.8
Individuals and families	67.3	17.4	12.6	2.7

The descriptive exploration proceeds by linking the information on the type of demand prevalently served with that on firms' age. Lending some support to the above considerations,
Table **7** shows that firms selling in prevalence to public bodies are, on average, bigger than the others. A first explanation of this evidence relates to the fact that small firms are more likely to lack the scale (and the complexity) of production needed to provide goods or services to public bodies, whose orders are expected to be quantitatively, and sometimes, qualitatively, more demanding than those expressed by other customers. On the other hand, small and micro firms turn out to be the dominant-type among those selling prevalently to individuals and households.

Table 7. Distribution of firms by main customer and size (rowsum = 1)

Source of demand	<= 5	> 5, <= 25	> 25, <= 400	> 400
Other firms	64.5	29.1	6.0	0.1
Retailers	62.3	30.8	6.5	0.2
Public bodies	56.7	32.2	10.4	0.5
Individuals and families	86.6	12.0	1.1	0.0

Finally, the companies included in analysis are ranked according to demand and innovation type, on the one hand, and growth (employment) rate, on the other (Table 8). Firms serving prevalently public bodies rank in the first positions, either that they innovate or not. Interestingly enough, among those serving other firms, being innovative seems to grant a 'growth premium'.

Table 8. Variation of firms' size by main customer and innovative activity

Source of demand	Innovation	Mean	Coeff Variation
Public bodies	0	29.88	6.04
Public bodies	1	27.36	24.45
Other firms	1	19.46	12.14
Individuals and families	0	12.55	17.92
Retailers	0	11.98	22.87
Retailers	1	8.87	8.76
Other firms	0	7.79	28.03
Individuals and families	1	7.09	38.14

4.3 Firms' knowledge profiles: cluster analysis

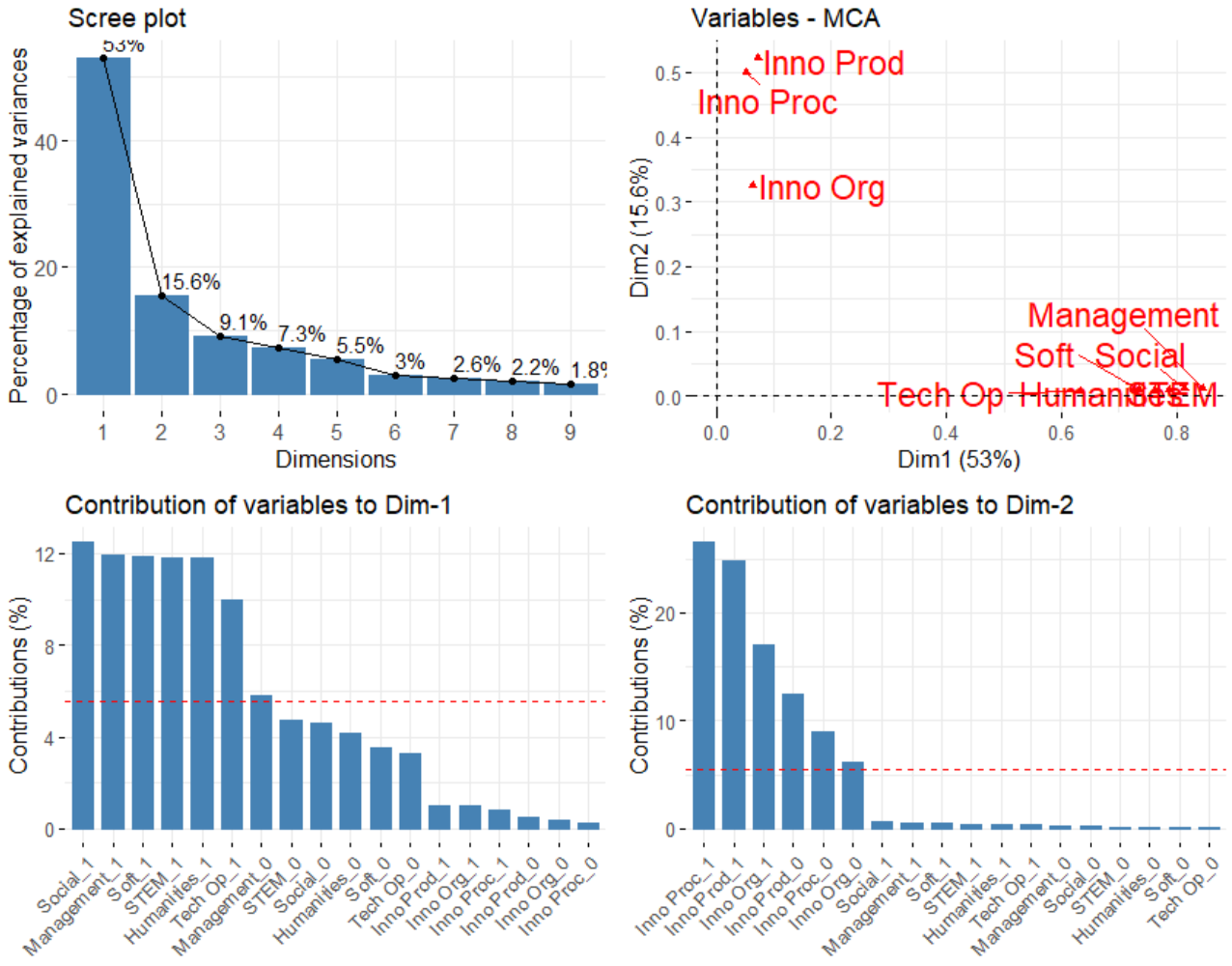
As discussed in the Introduction, the nature and the intensity of the demand-pull effect can be fundamentally mediated by the peculiar technological and organizational characteristics of the firm. As said, the ability of a firm to rapidly adjust (both quantitatively and qualitatively) her production flows to changes in demand might crucially depend on how her productive, technological and knowledge endowment allows such kind of adjustment. In order to explore in depth and make more explicit the role of such technology and knowledge-related heterogeneities we run a cluster analysis (CA) relying on some of the variables illustrated above (see Table 2).[5]

The CA is based on two key dimensions: innovative activity and characteristics of the companies' skill need, the latter being interpreted as a signal of companies' relative dynamism in terms of knowledge-base upgrading. Given the combination of high numerosity of the adopted sample and discrete nature of the variables used for the CA, our preferred methodological choice is to first reduce the dimensionality of the data into a restrained set of continuous indexes; to then run the CA exercise on these latter indexes. As a result, we rely on the Multiple Correspondence Analysis (MCA). Relying on standard procedures, we reduce the initial number of indexes to two.[6] Figure 3 reports the results. The MCA identifies two main sources of variations in the data, corresponding to the two knowledge dimensions.

[5] As it is in every classification exercise, the output is a mixture of empirical evidence and authors' discretion. We reach the four profiles settings since we see it as the most parsimonious and, at the same time, explicative settings the data retrieve.

[6] The criterion is to keep the MCA indexes whose eigenvalue is bigger than the maximum between (1 / the number of rows in the dataset – 1) and (1 / the number of columns in the dataset – 1). See Lorenzo-Seva (2011) and Bendixen, (1995).

Figure 3. MCA results



The next step is the CA on the MCA results. We use a *kmeans* algorithm to cluster observations around a 'centroid'.[7] Observations (i.e. firms) falling within a cluster display the stronger similaritiesbeing heterogeneous with respect to those outside the cluster. The Within Sum of Squares (WSS) plot (Figure 4) suggests that the highest level of clusters' internal homogeneity is achieved going from one to two clusters. However, we favour a theoretically driven decision rule, where identifying four clusters emerging as a combination of the innovation and skill dimensions the CA relies upon.

[7] The centroid is defined as the point whose Euclidean distance to all other observations in the cluster is minimized.

Figure 4. WSS plot of a kmeans algorithm

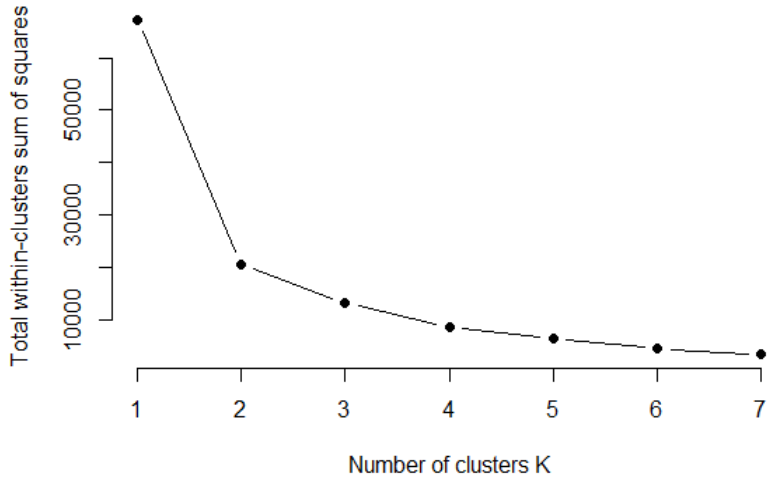
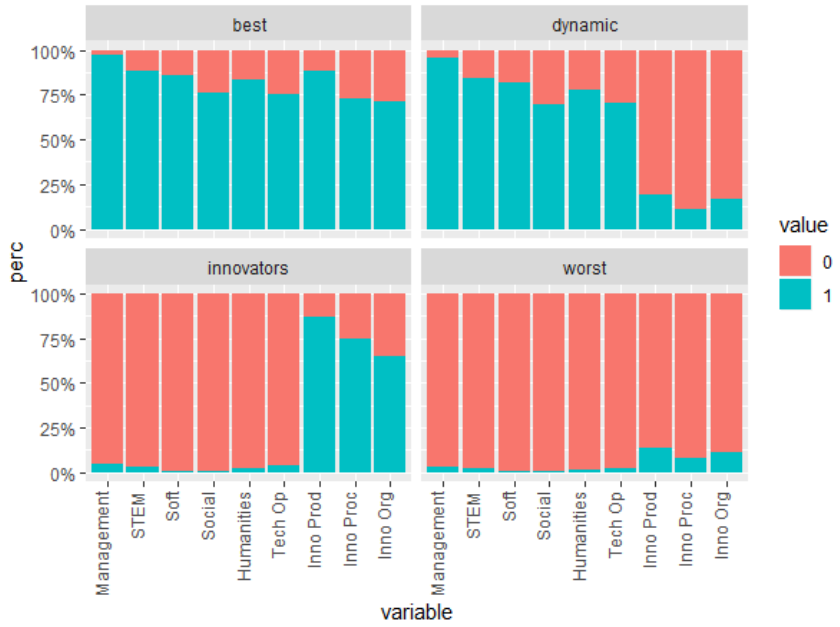


Figure 5. Knowledge profiles. Output of *kmeans* CA on MCA indexes.



Given their relative intensity in terms of both innovation and skill-need, the clusters are labelled as follows:

1. Low-innovation and low-knowledge (worst)
2. Knowledge intensive (dynamic)
3. Innovation intensive (innovators)
4. Innovation and knowledge intensive (best)

Figure 5 reports the distribution of firms, for each of the four clusters, according to the variables used to compute the MCA indexes (innovation and skill-need). In other words, each quadrant displays the share of firms displaying a skill need or performing innovation

in each of the four clusters. Table 9 and Table ***10***, in turn, allow characterizing each cluster. Unsurprisingly, we notice that the innovation and skill-need intensive cluster is characterized by the prevalence of large firms likely to sell their products on foreign markets. The opposite occurs in clusters where small and micro firms represent the largest share. In clusters where both innovation and skill-need display low intensity, in turn, the number of internationalized companies is also relatively lower as compared to the other clusters (Table 9**Table *8***).

Table 9. Clusters' characteristics

		worst	**dynamic**	**innovators**	**best**
Variables not used for the CA	size	5.5	11.2	10.4	26.8
	Δsize	13.8	10.9	6.4	11.8
	Age	25.0	24.6	24.0	24.1
	Pop	2.8 10^6	9.2 10^5	4.9 10^5	4 10^5
	Inter.	9.3	11.8	19.6	21.1
Variables used for the CA	Prod. inn	13.3	19.1	90.4	90.9
	Proc. inn	5.2	8.0	60.5	61.9
	Organ. inn	9.8	15.0	71.8	73.8
	Skill need	6.5	100	9.3	100
	# of skills need	0.2	17.9	0.4	21.5

Regarding the distribution of firms by sector and cluster, some interesting evidence emerge. Despite some heterogeneities in terms of relative weight are detectable, firms belonging to the 'worst' cluster (low-innovation and low intensity of the skill-need) represent a relevant share all across clusters. This evidence reflects the peculiar character of the Italian industrial structure wherein small low-tech firms tend to be the prevalent firm type. Concerning the 'dynamic' cluster (i.e. those displaying the stronger dynamics in terms of skill need and knowledge base upgrading), the sectors characterized by the largest shares of firms belonging the former are, not surprisingly, health, education, finance and business-related services; while those reporting the largest share of firms belonging to the 'innovators' cluster are, as expected, chemicals and electronics. The latter are also those with the largest share of companies stemming from the 'best' cluster (i.e. companies resulting dynamic in terms of both innovation and propensity towards knowledge-base upgrading).

Table 10. Distribution of firms by sectors and clusters

	worst	dynamic	innovators	best
Chemicals, Pharmaceuticals and Plastics	50.5	15.7	18.8	14.9
Commerce, Transportation and Tourism	63.6	17.6	10.6	8.1
Communication, Financial Services and other	58.5	23.6	9.0	8.9
Construction	65.5	20.2	7.7	6.6
Education, Healthcare and Services to persons	52.3	26.0	10.6	11.2
Electronics	50.7	16.7	17.8	14.8
Energy, Water and Garbage	59.8	22.6	9.3	8.3
Food and Textile	62.4	15.1	14.1	8.4
Furniture and Other	57.4	17.1	15.1	10.4
Metallurgical	58.6	17.8	14.0	9.7
Mining	72.6	14.4	9.8	3.2
Non-Metalliferous Minerals	63.3	15.9	13.0	7.7
Wood and Paper	58.8	14.9	16.6	9.8

Section 5. Econometric analysis and results

The differences in terms of firms' growth patterns, on the one hand, and type of demand, on the other, is now studied relying on regression analysis. We exploit all companies included in the PEC survey adopting a Repeated Cross-Section (RCS) approach. The regressions are run using a standard OLS model clustering standard errors according to the 2-digit sector companies belong to. In addition, a large number of firm-level control alongside a set of time and macro-regional dummies is included to at least partly control for firm, sector and regional level fixed effects.[8] We include in the analysis all PEC's companies appearing more than once out of three waves (2012, 2014 and 2017). In practice, we consider 13379 firms observed twice and 6620 firms observed three times (our approach is close to the one followed by Pellegrino and Savona, 2017). We end up with a sample of 26.247 firms. The baseline specification is the following:

$$Growth(Y)_i = lnY_{i,t} - lnY_{i,t-1} = \alpha_0 + DEM\_TYPE_{i,t} + \ln(Y_{i,t-1}) + \beta X'_{i,t} + \varepsilon_{it} \quad (1)$$

For each firm i, the (log) difference between employment in t and in t-1 is regressed against: the lagged employment level; a categorical variable indicating the prevalent type of demand firms tend to face (i.e. having individuals, households and retailers as omitted category, this variable allows capturing the 'demand-pull effect' of serving prevalently

[8] Due to the peculiar characteristics of our data (i.e. very large N and small T together with the presence of a large share of firms repeating only twice out of 3 time periods), standard panel techniques are not particularly suitable. As a result, we opt for a RCS approach exploiting all firms included in the PEC sample controlling, as much as possibile, for all sources of firm and sectoral level heterogeneities. As underlined in Pellegrino and Savona (2017), this approach may present some limitations. However, the vast amount of firm-level controls (together with the sector, region and time dummies) included in our specifications significantly reduce the potential bias stemming from firm-specific, time-invariant characteristics corroborating the robustness of the results.

other firms or public bodies); a set of firm-level controls (age, size and a dummy variable indicating if a firm is internationalized or not) and of sectoral, regional and time dummies comprised in the matrix $X_{i,t}$. Finally, $\varepsilon_{i,t}$ is the error term with the usual statistical properties.

Among the list of possible growth indicators (assets, employment, market share, physical output, profits, sales), the use of employment dynamics allows to satisfy some relevant methodological issues. As noticed by Delmar et. al. (2003), employment is robust to cross-sectoral comparison as opposed to indicators, as market share and physical output, which might be qualitatively and quantitatively affected by sector (and product class)-specific characteristics. In addition, as a growth variable, employment turns out be less volatile as compared to revenues and even more so profits (i.e. due to a lower sensitivity of employment to key macroeconomic variables as inflation and exchange rate fluctuations). Employment, moreover, is also relatively less sensitive to sectoral heterogeneities in terms of capital intensity and of vertical integration.

Table 11. Baseline model (Eq.1)

	Dependent variable:
	Log variation of employment
Demand from firms	8.04***
	(1.79)
Public demand	16.92***
	(2.67)
Internationalization (Yes)	5.85***
	(1.71)
Size (log)	-10.89***
	(1.07)
Age (log)	-0.69*
	(0.29)
Observations	26,247
R^2	0.05
Adjusted R^2	0.05
Residual Std. Error	45.71 (df = 26225)

. p<0.001

Note: Ref Demand: family and retail

Table 11 shows the result for Eq.1. Starting from the controls, we recognize the existence of growth advantages for the newly created and smaller companies, a finding in line with most of the recent empirical literature (Coad et. al., 2013). According to the minimum-efficient size (MES) argumentation, firms must reach and cross a certain size threshold to keep existing and maintaining a market preserve (Almus, 2002). Furthermore, as stated by the passive and active learning theories (Ericson and Pakes, 1995; Jovanovic, 1982), small and young firms are likely to grow faster than their peers as, by possessing more

information about their effectiveness in the market, can better adjust their size if the level is suboptimal. Finally, the exporting status (Internationalization) is found to be positively correlated with the pace of growth of the firm. Firms serving new and foreign markets are indeed more likely to be equipped with searching, absorbing and transforming capabilities (Autio et al., 2000), with better opportunities to enter in a growth path.

Focusing now on the core variables, i.e. the type of demand flows to which a firm is exposed, interesting findings have emerged. Both the pull effects on growth exerted by firms' demand (ii) and public bodies procurement activities (iii) are found to be greater than that deriving from households and retailers (i). With respect to our RQ1, these results show that, compared to firms selling on final markets, those prevalently suppling other firms and public bodies grow more.

These findings are line with the main argumentations reported in sections 2 concerning the links between growth and different types of economic demand. Briefly, it could be argued that the low exposition to external turbulences, together with more constant less volatile demand flows, are the main factors explaining how, as compared to final-goods oriented companies, suppliers are likely to better experience growth-related opportunities, regardless they serve other firms or public entities. In both cases, unexpected variations in demand flows are in fact less recurrent than those detected on final markets. Meaning less uncertainty on demand expectations, this provides suppliers with positive stimuli for the desirability and realization of new investments and better opportunities for their dimensional enlargement.

Moreover, demand for intermediate goods, and the same goes for PP, is more likely to show higher quality-related requirements relative to those generally expressed by households' demand, which is instead mainly oriented by price-related considerations. This opens up for the engaging in kinds of growth' patterns essentially based on technological and quality upgrading. Of course, this discourse does not apply to all types of firms since only when equipped with knowledge and innovation capabilities, companies are able to intercept the more qualified and advanced part of demand. Bearing this consideration in mind, we recognize the need to add a second step in the analysis (RQ2).

In what follows, we explore the role of technological and knowledge-related heterogeneities in shaping the growth pattern-demand type relationship, estimating the same specification proposed in (1) by breaking down our sample according to the four clusters emerging from the CA (see above). The purpose of this second step is to recognize the presence of differentiated demand-pull growth premium across firms endowed with different internal resource profiles in terms of technological and organizational structure. Table 12 reports the results.

Table 12. Results from the regression model (Eq.2)

	Dependent variable:			
	Log variation of employment			
	CLUSTER 1. Low-innovation and low-knowledge	**CLUSTER 2. Knowledge intensive**	**CLUSTER 3. Innovation intensive**	**CLUSTER 4. Innovation and knowledge intensive**
Demand from firms	5.9***	9.9***	18.3***	9.5*
	(1.6)	(2.3)	(5.3)	(3.7)
Public demand	17.8***	12.4***	12.3	22.3***
	(3.0)	(1.0)	(9.9)	(5.0)
Internationalization (Yes)	5.7***	-0.6	15.2**	3.1
	(1.0)	(1.7)	(5.6)	(8.9)
Size (log)	-12.5***	-7.1***	-12.7**	-10.1***
	(1.1)	(0.6)	(4.3)	(1.8)
Age (log)	-0.01	-1.0	-3.0·	-3.0
	(0.5)	(1.4)	(1.6)	(2.4)
Observations	13,896	5,385	3,612	3,354
R^2	0.1	0.03	0.1	0.1
Adjusted R^2	0.05	0.03	0.1	0.1
Residual Std. Error	46.2 (df = 13874)	45.4 (df = 5363)	46.7 (df = 3590)	40.8 (df = 3332)

Note: . p<0.001

Ref Demand: family and retail

Findings from Eq.2 show a more nuanced and complete picture than that retrieved from Table 12. Indeed, we observe that the distinct demand-led growth effects differently score across the four clusters. We start from cluster 1, to which firms with low levels of innovation and knowledge capabilities belong. Given such a weakness in their internal resources' profiles, there is reason to believe that the kind of demand these companies generally intercept is the less advanced one. Nevertheless, we find that those serving other firms, as well as public bodies, grow more than their final market peers. A partial explanation of this result might be provided by the major opportunities ascribed to the "supplier status", which turns out to be particularly advantageous when firms are placed in district-areas, as it frequently happens in the Italian case. Actually, the social relationships connecting suppliers to external actors (buyers and/or other sellers) might stimulate the formers' competitiveness thanks to district-related dynamics, as "learning by interacting processes", that help in entering into sustained growth patterns (Canello et al. 2017). Regarding the growth-premium attached to PP, it might be useful to highlight that public demand flows, even for deliveries of basic and standard goods, are nothing less than exogenous increases in demand for the firm's output (Hoekman and Sanfilippo, 2019). This allows for preventing, at least partially, public providers from being harmed

by international price-based competitition which, for some types of consumption goods, might be particularly strong.

Similarly to cluster 1, also in cluster 3 – encompassing all companies denoting dynamism in updating their knowledge profiles – the demand from firms and public bodies appears to lead a growth-premium over companies basically serving households and retailers. A large component of this group is made of firms belonging to service sectors (health, education, finance and business-related services) and *utilities* divisions. Given such a peculiar composition, we might suppose that providing services to other firms and/or public entities is different from selling them to households. Demand from firms and/public sectors might in fact be quantitively and qualitatively different, as services are expected to be demanded more frequently, in larger quantities and for satisfying more articulated needs.

Concerning cluster 4, including companies display the stronger dynamics in terms of technological upgrading, the only buyer category that positively affects growth is that referring to "other firms". The "lion share" of this group is represented by that sectors traditionally included in the high-tech class, such as chemicals and electronics. Our finding might suggest that, within this cluster, the distinction between suppliers and not-suppliers is what that actually matters for growth-related purposes. Relative to downstream innovators (those selling on final markets), suppliers with high propensity to innovate seems to show better performances (Agostino et al. 2015). Valuable opportunities to grow might be provided by the increasing ability of innovative suppliers to address product and process innovation strategies. First, the ability to meet, by means of product innovation, buyer preferences oriented towards high-quality and more sophisticated goods. Second, the efficiency gains, resulting in increasing price competitiveness, related to process innovations. Third, the selection of higher quality functions, as well as the upgrading of those already exploited, by means of organizational innovations.

However, all these features might be only partially sufficient to grasp the growth-opportunities provided by PP, whose exploitation requires dynamism also under the knowledge/organizational profile. In this respect, we observe that cluster 4, i.e. including companies ranking high in terms of both innovation and propensity towards knowledge-base upgrading, is the one receiving the highest growth-premium from PP. Plausibly, considering the "exceptionality" of their internal resources' profiles, this bulk of suppliers is the only one able to intercept the most advanced and articulated part of public demand. On their own, complex demand requirements might incentivize pursuing relatively riskier activities, such as innovative investments (Edler and Georghiou, 2007; Aschhoff et al. 2009; Slatchev and Wiederhold, 2016) likely to enhance competitiveness and growth chances. Furthermore, the distinction between suppliers and non-suppliers is almost negligible for companies belonging to cluster 4. In this respect, we do not recognize differences in terms of growth-premium between serving final markets or other firms.

Indeed, this kind of companies are supposed to basically compete on technological grounds positioning themselves on the more advanced market niches, regardless they are placed down (suppliers) or upstream (final firms).

6. Conclusions

Focusing on the Italian case, the present paper investigated the role of demand factors in enabling and enhancing firms' growth processes by considering heterogeneity across their internal resources' profiles. Relying on distinct streams of literature (Keynesian, evolutionary, innovation-related, managerial), the study contributes to the existing literature by providing new evidence on the link between demand and growth thanks to the fresh information provided by the PEC survey about the predominant type of buyers and firms' technological and knowledge-base characteristics.

Taken together, findings stemming from the whole empirical analysis provide relevant suggestions about the actual effectiveness of demand elements in sustaining firms' growth patterns when accounting for the issue of heterogeneity across firms.

In general, we find evidence that certain demand flows impact higher than others on the selected growth indicator (employment growth). In particular, relative to companies prevalently facing demand from households and retailers (i), those mainly receiving demand from other firms (ii) and public bodies (iii) are likely to grow more. This is basically explained by the higher exposition to external turbulences the former are likely to suffer, together with the more constant, less volatile and eventually more advanced demand flows that suppliers and procuring providers benefit from.

Nevertheless, we claim that the ability to seize the growth-related chances provided by distinct demand conditions is contingent on firms' specific features, rather than being equally distributed across them. Actually, we recover that internal resources profiles matter in shaping the ability to exploit demand-related growth opportunities. Thanks to the data-driven taxonomy retrieved from the PEC data, we distinguished across four clusters of firms characterized by distinct level of knowledge and innovation capabilities. In particular, for cases where innovation and investments in workers' competences are the dominant competitive strategy (cluster 4), we detect a stronger 'growth-premium' from public demand as a result of the relatively stronger responsiveness of firms to particularly complex and articulated demand needs. Surprisingly, the same does not apply for firms that are innovative but not dynamic under their knowledge profiles (cluster 3), who mostly belong to high-tech sectors. For this group, the positive impact on growth mainly stems from the "supplier status", proving that in these divisions, the demand from firms is often more frequent and advanced than that sourcing from final markets. The same argument holds, and might be extended to public demand, also for the group resulting not innovative but dynamic on knowledge profile (cluster 2), that mainly operate in the service sector.

Finally, where the propensity towards innovation and competences upgrading is weak (cluster 1) the demand-pull premium sourcing from (ii) and (iii) is found to be positive and significant. This proves that, compared to firms mostly oriented towards final-goods market, being embedded within B-to-B (business-to-business) relationships as well as being involved into PP activities might better enhance growth-opportunities also for firms competing on price-based factors, thanks to suppling-relations effects on the one hand, and additional outputs required by public demand on the other.

These findings militate in favour of three main policy considerations, which appear to be particularly relevant for Italy, where economic stagnation and the historic prevalence of SMEs call for the urgency of stimulating the growth of firms. Firstly, the provided evidence suggest that public demand is able to sustain firms' growth, and this appears to be true both for less innovative and dynamic firms and for most advanced ones. This implies not only that public demand can be used to generically foster the growth of firms, but also that procurement activities can be used as an industrial policy instrument to target innovative and knowledge based firms in order to sustain their expansion and their weight in the production system. Secondly, considering that intermediate demand arising from firms appear to have a qualified effect in terms of growth enhancing effects and given the central role played by suppliers (both nationally and internationally oriented) in the Italian production system, all policies aimed at increasing supplying companies' competitiveness and the quality and quantity of qualified interactions acquire a strategic relevance. In this respect, policies enhancing the quality of both physical and immaterial infrastructures, supporting activities (including those related to the diffusion of digital technologies) aimed at increasing the ability of firms to intercept international (private and public) intermediate demand appear to be of utmost importance. Finally, since the level of internal competences is able to shape the ability of firms to translate demand impulses into growth dynamics, the key role of public intervention in continuously improving the quality of the education and training systems and in sustaining firms aiming at upgrading and integrating their internal competences clearly emerge from the present study.

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