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RESEARCH

Business group affiliation in resource-scarce locations

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Abstract
Business groups are sets of firms tied together by a centralized control mechanism, and they represent the most common form of business organization worldwide. Business groups have internal labor and capital markets that help them overcome institutional voids. Despite the abundant literature on the location of business groups across countries, little is known about the factors that explain the choice of a location of firms affiliated with (or controlled by) business groups within a country. Building on business group literature and agglomeration economics, we propose in this study that more firms are affiliated with business groups in regions with limited access to strategic resources, finance, and labor. Empirical results based on a large sample of privately held French firms support the idea that business group affiliation is more common in regions with limited access to the workforce. However, we could not find any evidence in support of the argument that the degree of regional financial development influences the likelihood of a business group affiliation. Overall, the study provides evidence that the way businesses are organized, for instance, as business groups, depends on the degree of resource scarcity of the locations in which firms are created.

Keywords Business groups · Resources · Geographical location · L25 · R11

JEL Classification L25 · R11

Introduction

The literature suggests that a large fraction of businesses are not isolated, standalone entities, but they belong to larger and more complex organizations. The existence of business groups (BGs), which are sets of legally independent firms bound together by various economic, social, or equity ties, is acknowledged worldwide (Khanna and Yafeh 2005; Granovetter 2010). The internal organization of a BG is heterogeneous, as is the nature of the ties between the firms affiliated with (or controlled by) a BG. For instance, in Western Europe, BGs are sets of subsidiaries controlled by equity ties that are centralized in a holding company. Well-known European BGs, such as LVMH or Volkswagen, have hundreds of subsidiaries worldwide, which are controlled through a pyramidal structure of equity ties. These subsidiaries reflect geographical and product diversification as well as the development of various activities by BGs along the value chain. In other countries, such as India, BGs commonly correspond to family controlled firms (Masulis et al. 2011). In Indian BGs, the centralization of control comes from the fact that all firms are held and managed by one of the family members. Even if no equity ties exist between these firms, joint family management acts as a coordinating device.

The key feature of BGs is the existence of internal labor and capital markets, indicating that human and financial resources can be transferred from one BG firm to another[1] (Khanna and Palepu 1997; Holmes et al. 2018). BGs exist, because their internal markets are useful alternatives to external markets. Thus, BGs represent a mode of business organization that answers the low development of institutions, such as financial markets and labor markets, especially

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[1] In that sense, BGs share a common attribute with conglomerates. However, BGs and conglomerates are distinct in at least one essential aspect. Firms affiliated with a BG are legally distinct, which is not the case for the divisions in a conglomerate. This means that firms affiliated with a BG can enter contracts by themselves. See Samphantarak (2007) for a detailed discussion of the differences between BGs and conglomerates.

in developing countries (Leff 1978; Khanna and Palepu 1997; Khanna and Yafeh 2005; Larrain and Urzúa 2016; Tajeddin and Carney 2019; Liang and Carney 2020). In Western Europe and more developed countries, the internal labor and capital markets of BGs reflect market frictions related to strong labor rights protection systems and the low development of financial markets (Botero et al. 2004; Belenzon et al. 2013; Belenzon and Tsolmon 2016).

The location decision of BG-affiliated firms is a topic that has received considerable academic attention. In particular, the role of the strength and development of institutions is a key mechanism that explains the distribution of BGs and their affiliates (Leff 1978; Khanna and Palepu 1997; Khanna and Yafeh 2005; Belenzon et al. 2013; Belenzon and Tsolmon 2016). However, the BG literature mostly focuses on the differences among countries in the development of institutions, such as legal and tax factors, thus implicitly assuming that the development of institutions is relatively homogenous within a country. In this study, we take the opposite view and argue that there are important regional differences within a given country in terms of the degree of development of two key institutions: the capital and labor markets. These regional differences mean that the degrees of access that firms have to capital and labor markets strongly depend on their location. Because affiliation to a BG means having access to the internal capital and labor markets of the BG, firms affiliated with a BG are less affected by regional constraints that limit their access to resources that correspond to a lower development of institutions. Thus, this study joins an important discussion about the fact that institutional development is not uniform in a country, and that the differences, resulting from such nonuniform institutional development, in regional access to resources likely shape the way businesses are organized as well as businesses outcomes (Fisman and Khanna 2004; Chan et al. 2010; Shi et al. 2012). Broadly speaking, subnational institutions play an important role in shaping economic activities.

To develop our ideas, we build our theoretical arguments on agglomeration economics. The literature on agglomeration economics provides strong evidence that firms largely agglomerate in delineated regions to benefit from the resources they provide, either because the region is resource rich or because the concentration of activities increases resource availability (McCann and Folta 2008; Puga 2010). Recent research on agglomeration economics and strategy shows that multiunit firms locate new business units close to older ones to create local synergies (Woo et al. 2019). These synergies act as useful alternatives when strategic resources are scarce in the environment and contribute to a firm's growth and survival (Pe'er et al. 2016). Although the decision taken by BGs to locate new business activities has been explored, a question remains: is this decision driven by regional characteristics; if yes, then to what extent?

We explored this question in the context of a developed economy, France, characterized by a strong contrast between resource-rich regions, such as Paris, resource-scarce regions, and a vast number of BG-affiliated firms (Hamelin 2011; Belenzon et al. 2013). Cainelli et al. (2006) investigated whether BGs are more prevalent in regions, where the spatial agglomeration of firms is high. They found evidence that BGs are more spatially concentrated and less diversified in regions with high economic agglomeration than in those with low economic agglomeration. However, their purpose was not to explore whether resource scarcity in a given region influences the presence of BG-affiliated firms. Thus, this study contributes to the literature on the persistence of BGs in developed economies. For instance, Colpan and Hikino (2018) showed that the persistence of BGs in Western Europe is largely related to BGs' ability to adjust to changes in their environments through their internal markets. In turn, the strong economic resilience of BGs contributes to the shape of the environment. The empirical findings of this study extend the understanding of the persistence of BGs in Western Europe by showing that French BGs fill regional resource voids, while BGs in emerging economies fill institutional voids. Unlike institutions in emerging economies, regional access firms have to key strategic resources is shaped by geographical characteristics and history; thus, it does not change quickly, explaining why BGs persist in a resource-scarce context.

The results of this study are based on a large sample of French firms. They indicate that a BG affiliation is more likely to exist in regions with lower access to the workforce, as measured by the extent to which a vast fraction of the population lives in a large city. In France, the higher education system is highly centralized, and the best universities and business schools are largely concentrated in the largest cities (Duru-Bellat 2015). Thus, access to a highly trained and qualified workforce is much easier for firms located in large cities and populated regions. However, we did not observe that the degree of financial development in a region influences the likelihood of a BG affiliation. In the rest of this paper, we develop our hypotheses and present BGs as a solution to locational resource scarcity. Then, we present our methodological approach and the results of our estimations. Finally, we discuss the results and present conclusions and directions for future research.

Theoretical framework

BG expansion as a corporate entrepreneurship phenomenon to overcome resource scarcity

BGs are a collection of firms that are tied together by common interests that coordinate their actions (Granovetter

1995). BGs take different forms worldwide, ranging from the Japanese keiretsus, which are firms organized across a banking structure that allocates funds to BG subsidiaries, to Indian family groups and South American and Spanish Grupos (Guillen 2001; Khanna and Yafeh 2005). In Western Europe, in the context of this study, BGs represent a ubiquitous form of business organization, encompassing up to one-half of the total number of firms (Belenzon et al. 2013). Western European BGs comprise of firms typically arranged in pyramidal structures of firms controlled by a holding company that sits at the top of the pyramid and possesses and exercises centralized equity control (Almeida and Wolfenzon 2006; Masulis et al. 2011; Belenzon et al. 2013). The existence of BGs is generally attributed to institutional voids (Leff 1978). In other words, BGs are considered a solution to the poor development of tangible and legal infrastructure in a country, such as transport networks, capital markets, and legal protection in business environments.

While the institutional void perspective has been commonly studied in the context of BG formation in developing economies, it finds little ground in Western Europe, where the development of infrastructure is largely comparable to US standards. Belenzon et al. (2013) reported that the formation of BGs in Western Europe is a consequence of the low development of equity capital markets. Indeed, the formation of a BG indicates the existence of an internal capital market among BG-affiliated firms, and this market allocates resources to the affiliates that present the best business opportunities (Khanna and Palepu 1997; Manikandan and Ramachandran 2015). A BG raises and allocates financial resources to affiliated firms through various mechanisms. For example, if one of the BG entities is listed in public equity markets, this entity raises money in external capital markets and then acts as a liquidity provider to other BG entities through intragroup loans (Gopalan et al. 2007; Belenzon et al. 2013).

Another important benefit of BG affiliation is the existence of an internal labor market that facilitates training and transfer of employees across BG subsidiaries (Holmes et al. 2018). As shown by Belenzon and Tsolmon (2016), the flexibility provided by internal labor markets helps BG-affiliated firms outperform standalone firms, especially in countries with strong labor rights protection. It follows that a BG subsidiary benefits from direct access to the BG's pool of a highly qualified workforce, which is most useful when it is difficult to hire workers directly in regions, where population density is low and the lack of large cities drastically limits the presence of a workforce. Belenzon et al. (2013) and Belenzon and Tsolmon (2016) concluded that BGs also exist in developed economies as a solution to problems arising from frictions in the financial and labor markets. However, the benefits provided by internal markets of BGs have only been studied in certain countries. The idea that different regions have different degrees of access to finance and labor markets within a given country and that BGs can leverage their internal markets to create subsidiaries in such territories has received little attention.

Despite the obvious advantages in terms of access to BG resources, few studies have considered the expansion and growth of a BG as a form of corporate entrepreneurship that denotes a strong entrepreneurial orientation. As noted by Phan et al. (2009), entrepreneurship research has overlooked the considerable organizational heterogeneity of firms active in corporate entrepreneurship. For instance, Nason et al. (2015) showed that the size and complexity of organizations largely condition their competitive advantages when creating new ventures and the benefits they earn from such practices. These authors focused on distinguishing between small firms and large, publicly listed firms, and they did not explicitly focus on the business organization of firms.

Only recently have scholars recognized that the growth of BGs represents a form of corporate entrepreneurship, and this observation mostly concerns family BGs (Randolph et al. 2017). Lechner and Leyronas (2009) were the first to propose that the development of firms as BGs represents a growth mode per se, which facilitates growth management by creating a structure that is especially agile in allocating resources and transferring knowledge. BGs form and expand through a gradual diversification process (Iacobucci and Rosa 2005). As entrepreneurs accumulate experience and skills in a business industry, they learn to use and transfer these skills to other industries that are increasingly distant from their initial core business (Iacobucci 2002). BGs grow, because new subsidiaries are created to host new activities (Iacobucci and Rosa 2010). A BG can be considered a form of internal corporate venturing (Sharma and Chrisman 1999), because the subsidiaries created are hosted in the BG structure. The limited empirical evidence available suggests that external corporate venturing, which corresponds to investments made by firms in businesses created by external parties, is rather limited in BGs, assuming that large and publicly listed BGs are excluded (Iacobucci and Rosa 2005, 2010; Lechner and Leyronas 2009; see also Phan et al. (2009) for a discussion of the various forms of corporate venturing). In other words, the formation and expansion of BGs is a top-down process in which BGs create new subsidiaries, rather than a bottom-up process in which BGs seek to acquire and buy out other firms.

BGs and locational resource scarcity

The organizational phenomenon of BG expansion is facilitated by the ability of BGs to allocate key strategic resources to affiliated firms. This ability is especially useful for creating new business entities, because they are not affected by the liabilities of smallness and newness (Stinchcombe 1965;

Aldrich and Auster 1986). These liabilities refer to the great challenges that small and young organizations face in accessing resources because of their lack of reputation and a high degree of informational opacity. Two main expressions of these liabilities are the limited access to finance, which small and young firms have, and a specialized and highly qualified workforce. Small and young firms have limited access to finance, because informational opacity increases the risk that investors take when investing in or lending money to these firms (Stiglitz and Weiss 1981; Berger and Udell 1998; Cassar 2004). In addition, because small and new firms lack reputation, their ability to attract highly qualified people is lower than that of more established firms (Stinchcombe 1965; Aldrich and Auster 1986).

Crucially, the degree of access to these key strategic resources depends on the strength of formal institutions that provide infrastructure to support economic activities. However, the development of institutions is not homogenous in a given country, which makes some regions more attractive than others for creating new businesses (Chung and Alcacer 2002). Geographical and historical factors explain that specific regions develop specialized types of infrastructure but lack others, which results in variation in the degree to which firms have access to key resources. Thus, heterogeneity in regional institutions results in heterogeneity in regional access to resources, which influences business development (Chan et al. 2010).

The development of regional institutions in two aspects appears to be especially important for economic activities: capital and labor markets. The geographic economics literature has widely documented substantial regional differences in firms' access to finance and labor in most countries (see McCann and Folta (2008) for a review). For instance, salaries are higher in urban, highly populated regions than in more rural areas, which facilitates the recruitment of workers in large cities (Wheaton and Lewis 2002). With respect to firms' access to finance, the centralization of banks' decision centers gives rise to a liability of distance, where new firms that operate in isolated regions, everything else being equal, face more difficulties in obtaining loans than firms located in urban regions (Lee and Brown 2017).

In contrast, the strong agglomeration of economic activities, which is a characteristic of urban areas, provides substitutes to firms that have limited access to key resources because of their small size (Pe'er et al. 2016). A direct consequence of economic activities agglomeration in terms of business organization is that the location choices of new businesses are shaped by the distribution and agglomeration of other preexisting firms. For instance, multiunit firms commonly locate new units close to older units to benefit from local synergy (Woo et al. 2019). Thus, complex organizations can develop strategies to create new businesses in resource-scarce regions[2] by relying on their capacity to allocate resources internally (Busenbark et al. 2017; Lovallo et al. 2020).

It follows that the privileged channels of the internal labor and financial markets of a BG are likely sources of competitive advantage for BG-affiliated firms, especially in the early stages. In regions characterized by a lack of specialized, highly qualified workforce and poor financial development, the competitive advantage of BGs through internal markets should facilitate the creation of new firms. We suggest that the presence of BG-affiliated firms in resource-scarce regions should be higher than that in resource-rich regions to reflect the resource allocation capacity of a BG.

Hypothesis 1: BG affiliation is less likely in regions characterized by higher access to the workforce.

Hypothesis 2: BG affiliation is less likely in regions characterized by higher financial development.

Methods

Sample and data sources

First, we used the Amadeus database of Bureau Van Dijk to collect the data. Amadeus is a well-known, high-quality source of information that provides access to accounting and financial information for both privately held and publicly traded European firms. Importantly, Amadeus provides relatively detailed information about a firm's ownership structure, which makes it possible to accurately identify whether a firm is affiliated with a BG and, therefore, has been used in prior research on BGs (Belenzon et al. 2013; Belenzon and Tsolmon 2016). We collected data for privately held French firms only, because firms listed in public equity markets have direct access to external finance and a greater capacity to attract a specialized workforce because of their reputation (Belenzon et al. 2013).

The choice of a single-country study was motivated by the fact that it is difficult to compare regions and disadvantages related to the location of businesses in these regions across countries. In France, population density, an indicator of rurality, is 119 people per square kilometer, while it is 236

[2] One could question why an organization would decide to locate a new business entity in a resource-scarce region that appears to be, at least intuitively, a complicated hunting ground. In fact, entering peripheral regions instead of the largest cities is a common growth strategy for large and internationalized business organizations. (Shi et al. 2012). Resource-scarce regions are also commonly much less populated, and competition is less intense there and prices are higher (Atsom et al. 2011).

in Germany, 275 in the UK, and 200 in Italy (UNO 2019). France has a strong contrast between the region around Paris, which centralizes the vast majority of economic activity and political power, and highly rural territories at the center of the country. Such contrasts are less sharp in other countries, such as the UK (Curran and Storey 2016), and make France an interesting field of investigation. France has a bank-oriented economy with many BGs (Hamelin 2011; Belenzon et al. 2013). We excluded financial institutions and banks from our data set, which is a common practice in the literature (Belenzon et al. 2013). We collected information about BG affiliations from Amadeus for 2017. Information about BG affiliation is time invariant in Amadeus, which was a limitation of our empirical design, because it meant that we cannot explore whether firms are acquired or sold by BGs and become "standalone." However, acquisition activity by BGs is reputed as marginal (except for very large BGs), because European BGs grow by creating new subsidiaries; therefore, it is unlikely that this issue is a serious concern (Lechner and Leyronas 2009; Iacobucci and Rosa 2010). Overall, after considering the missing data, our sample comprised 50,183 firm-year observations.

Second, to measure the extent to which a given region provides access to firms to key strategic resources, finance, and workforce, we used data provided by the websites of the French National Institute for Statistics and Economics (INSEE) and the Bank of France.[3] Specifically, we used the administrative classification of French territories into 104 regions called "départements," which include the main French overseas territories[4] (Guadeloupe, Martinique, French Guiana, and La Réunion). For each of these regions, we measured the fraction of the population living in cities with more than 10,000 people and the degree of financial development. These variables were measured in 2017 only, because they were not available for another year.

Variables

Dependent variable

Our dependent variable was a dummy variable called BG affiliation, which took the value 1 if a firm was affiliated with a BG and 0 otherwise. To identify firms affiliated with a BG, we first followed the suggestion of Belenzon et al. (2013): a firm is affiliated with a BG if it is the subsidiary of another firm or if it has its own subsidiaries. In other words, BGs are made up of at least two legally distinct firms, one of which is the majority shareholder of the other. The criterion used by Amadeus to define whether a firm was a subsidiary of another firm was based on a direct or ultimate ownership share of at least 50%. Of course, the case of firms that were affiliated with a BG and did not have subsidiaries might have been significantly different from that of firms that were affiliated with a BG and had subsidiaries. Therefore, in the empirical analysis, we also distinguished BG-affiliated firms with subsidiaries from those without subsidiaries.

Independent variables

We focused on access to two key strategic resources: workforce and finance. We measured access to the workforce as the fraction of the population in a given region that lived in a city with at least 10,000 people. The higher the fraction of the population in a given region, the easier it is to access the workforce, especially the specialized workforce. Alternatively, we used robustness tests for the fraction of the population in cities with more than 50,000 people, with similar results. Our use of a criterion based on city size was in line with recent studies (Baú et al. 2018). For access to finance, we used the regional degree of financial development calculated as private credit by depositing money banks to gross domestic product (GDP) calculated at the regional level. This measure was interesting, because it represented the degree of banking credit activity in a region. Focusing on banking activity in a bank-oriented economy, such as France makes sense. In addition, recent studies in economic geography have highlighted substantial differences in firms' access to banking debt depending on the regions in which the firms operated (see Lee and Brown (2017) for a detailed discussion). Belenzon et al. (2013) used this measure (at the national level), among others, including the development of financial markets. However, because it did not really make sense to use the degree of financial market development at the regional level, we relied only on the ratio of private credit by deposit money banks on the GDP.

Control variables

Research on BG affiliation in a single country is in its infancy, making the identification of adequate control variables challenging. We followed Belenzon and Tsolmon (2016) in selecting several control variables. First, regional-level controls were included. We controlled for regional GDP per capita, which measures regional average wealth. Specifically, we used the natural logarithm of the regional GDP per capita. We also controlled for the unemployment rate at the regional level. These two controls ensured that the

[3] For the INSEE website, data are available at https://www.insee.fr/fr/statistiques/2521169. For the Bank of France, data are available at https://www.banque-france.fr/sites/default/files/webstat_pdf/cre_reg_fra_2176_fr_credits_regions_122017.pdf.

[4] Information is often lacking or incomplete for overseas territories. Specifically, companies that operate in overseas territories are excluded from the analysis because information for the financial development variable is not available.

overall economic attractiveness of a region did not affect the independent variables.

We then included firm-level controls and used size (natural logarithm of total assets), age (natural logarithm of the number of years since creation of the firm), profitability (return on assets (ROA), operating income over total assets), growth (annual percentage change in full-time equivalent employees), investment (annual percentage change in fixed assets), productivity (sales divided by the number of full-time equivalent employees), leverage (short-term plus long-term financial debt divided by total assets), and cash ratio (cash and equivalents over total assets). All of these variables contributed to ensuring that a BG affiliation was not driven by the acquisition strategies set by BG-acquiring firms with a given profile. Finally, we included industry-level controls: the Hirschman–Herfindahl Index of industry complexity (sum of the squared market shares of the firms in a given industry), the mean size of competitors in a given industry, the natural logarithm of the number of competitors in a given industry, and the annual mean ROA in a given industry. These variables ensured that a BG affiliation was not driven by differences between industries, as a BG affiliation may present more benefits in specific industries that could be located in rural regions. We calculated the industry-level variables at the national (total number of firms within an industry in France) and regional levels (using the 104 regions' classification). All industry-dependent calculations used two-digit standard industrial classification (SIC) codes. We also included industry dummies with two-digit SIC codes in all regressions to capture the remaining heterogeneity at the industry level and year dummies to account for macroeconomic conditions. In the regressions, we present the results obtained with national-level industry controls; however, the results are fully comparable with regional-level values. All variables were winsorized at 1% threshold.

Econometric approach

We used mixed-effects logistic regression on our panel data[5] to address the multilevel nature of our data (firm, region, and industry levels). Mixed-effects models allow for the introduction of both random and fixed effects in the specifications. As our research implies, we crossed several levels of analysis, and as firms are located in regions and can belong to BGs, we hypothesized that the distribution of BG-affiliated firms depends on regional characteristics. Specifically, we used a two-level model with random intercepts at the regional level and included industry dummies at the first level to deal with industry-level clustering.

Results

Univariate analysis

We began our empirical analysis by describing the sample firms. As shown in Table 1, 74.20% of the firms considered in this study were affiliated with a BG and 25.60% were standalone firms, highlighting the large proportion of firms affiliated with BGs in France,[6] which is in line with Belenzon et al. (2013). Firms held 4.78 M€ of total assets on average (median was 4.16 M€) and were 20.26 years (median was 23 years). While our sample firms were not especially "young," most of them were small. The mean growth rate in fixed assets (investment) was 18.21%, mean sales growth was 10.48%, and mean ROA was 6.14%. Leverage represented only 10.68% of total assets, and cash holdings represented 15.70% of total assets. However, we observed significant differences between standalone and BG-affiliated firms. We have presented the results of the mean comparison test in Table 2. Firms affiliated with a BG were, on average, larger and older, invested less, grew slowly, and were less profitable and more productive than standalone firms. They were also less leveraged, and held less cash.

Next, we present the correlation matrix between the main variables in Table 3. BG affiliation was found to be negatively correlated with the fraction of the population in large cities and the degree of financial development (private credit). These observations were consistent with our hypotheses. BG affiliation was found to be positively (but not statistically significantly) correlated with regional GDP and negatively correlated with the unemployment rate. Larger and older firms were more frequently affiliated with BGs. Profitability, growth, investment, leverage, and cash holdings were found to be negatively correlated with BG affiliation; however, productivity was found to be positively correlated with BG affiliation. As our independent variables (fraction of population in large cities and financial development) and two control variables were measured at the regional level, we faced the potential problem of multicollinearity among these variables. Indeed, all of these variables measure dimensions of regional prosperity that are likely correlated. To ensure that multicollinearity was not a problem, we calculated variance inflation factors (VIF). The highest VIF

[5] It is possible to run estimations at the regional level instead of the firm level. However, firm-level regressions provide us the option to include many firm-level controls that likely drive a BG affiliation. For instance, BGs may decide to acquire firms that exhibit specific characteristics.

[6] The proportion of BG-affiliated firms is lower in the French population and close to 50% (Deroyon 2016). In fact, Amadeus has a relatively poor coverage of microfirms, which are less likely to be affiliated to a BG in France.

Table 1 Descriptive statistics

Variables	Mean	Standard deviation	Min	25th percentile	Median	75th percentile	Maximum
BG affiliation	0.742	0.437	0.000	0.000	1.000	1.000	1.000
Population density (log)	5.994	1.944	3.401	4.595	5.313	6.576	9.941
Fraction of the population in large cities	0.575	0.278	0.114	0.340	0.538	0.786	1.000
Regional gdp per capital (log)	9.997	0.129	9.775	9.912	9.965	10.036	10.237
Regional unemployment rate	0.062	0.009	0.043	0.057	0.062	0.064	0.088
Regional deposit money banks (log)	1.394	0.645	0.728	1.012	1.184	1.378	2.863
Size (log)	8.471	1.418	5.919	7.405	8.334	9.338	12.255
Age (log)	3.009	0.725	1.099	2.565	3.135	3.526	4.111
Investment	0.182	0.924	−0.705	−0.100	−0.010	0.128	5.500
Growth	0.105	0.434	−0.486	−0.040	0.030	0.128	2.376
ROA	0.061	0.125	−0.401	0.010	0.054	0.117	0.441
Productivity (log)	5.523	0.918	3.513	4.888	5.431	6.042	8.425
Leverage	0.107	0.148	0.000	0.000	0.043	0.160	0.690
Cash holdings	0.157	0.171	0.000	0.024	0.094	0.236	0.727
Industry complexity	0.178	0.276	0.000	0.013	0.065	0.179	1.019
Mean size of competitors (log)	3.344	0.549	1.980	2.960	3.354	3.627	4.835
Number of competitors (log)	6.559	1.296	3.091	5.638	6.692	7.582	8.528
Mean industry ROA	0.066	0.026	0.002	0.051	0.067	0.082	0.129

$N = 50{,}183$

Table 2 Comparison between standalone and BG firms

Variables	Mean (standalone firms)	Mean (BG firms)	*t* test	*p* value
Size	7.666	8.751	−79.625	0.000
Age	2.760	3.095	−46.244	0.000
Investment	0.224	0.168	6.078	0.000
Growth	0.121	0.088	8.970	0.000
ROA	0.082	0.055	21.400	0.000
Productivity	5.524	5.567	−4.072	0.000
Leverage	0.111	0.102	6.041	0.000
Cash holdings	0.212	0.138	43.178	0.000

was 5.68 (regional GDP per capita), and the mean VIF was 1.75. Only one variable had a VIF higher than the threshold of 5 (regional GDP per capita), and none had a VIF higher than 10. Multicollinearity was thus unlikely to be a serious concern in this context. Nevertheless, we reran our regressions without the regional GDP per capita control variable to ensure that our results were not affected by multicollinearity. The results were the same; we did not report them for brevity.

Multivariate analysis

To test our hypotheses, we used a mixed-effects panel logistic regression model in which BG affiliation was the dependent variable, and the fraction of the population in large cities (access to workforce) and regional financial development (private credit by deposit money banks over GDP) were the independent variables. The results are presented in Table 4. Model 1 presents the results of the estimations for the full sample, while Model 2 includes only standalone firms and BG-affiliated firms that do not have any subsidiaries. According to our hypotheses, we expected the probability of BG affiliation to be lower in contexts characterized by a lower fraction of the population living in large cities and a lower degree of financial development, reflecting that BG affiliation is more common in resource-scarce locations. In other words, we expected the coefficients of the independent variables to be negative.

As can be seen in Model 1 of Table 4, the coefficient of the fraction of the population in large cities was negative and statistically significant ($p = 0.009$), confirming Hypothesis 1. Hence, BG affiliation was more common in regions characterized by a lower proportion of the population in large cities. These regions were more rural and provided less access to specialized workforces. The internal labor market of BG

Table 3 Correlation matrix

	Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1	BG affiliation																
2	Fraction of the population in large cities	−0.053															
3	Regional deposit money banks (log)	−0.010	0.523														
4	Regional gdp per capita (log)	−0.005	0.628	0.767													
5	Regional unemployment rate	−0.050	0.259	−0.115	−0.362												
6	Size (log)	0.335	0.063	0.099	0.107	−0.039											
7	Age (log)	0.202	−0.080	−0.053	−0.044	−0.040	0.266										
8	Investment	−0.019	0.042	0.032	0.037	0.002	−0.005	−0.102									
9	Growth	−0.052	0.043	0.037	0.038	0.009	−0.019	−0.225	0.184								
10	ROA	−0.100	−0.006	−0.024	−0.014	0.001	−0.087	−0.033	0.010	0.066							
11	Productivity (log)	0.024	0.057	0.037	0.046	0.007	0.239	−0.009	0.044	0.084	0.091						
12	Leverage	−0.033	−0.107	−0.027	−0.067	−0.031	0.036	−0.063	0.024	0.020	−0.167	0.007					
13	Cash holdings	−0.185	0.050	0.014	0.031	0.018	−0.217	−0.019	0.008	0.017	0.245	−0.020	−0.204				
14	Industry complexity	−0.020	0.046	0.056	0.049	0.006	−0.002	−0.046	0.001	0.024	−0.037	−0.113	0.049	−0.003			
15	Mean size of competitors (log)	0.161	−0.083	−0.048	−0.038	−0.045	0.193	0.094	−0.018	−0.018	−0.027	−0.355	−0.042	−0.067	0.002		
16	Number of competitors (log)	−0.061	0.040	−0.003	0.013	0.015	−0.172	−0.100	0.007	0.027	0.009	0.001	0.017	0.044	0.211	−0.248	
17	Mean industry ROA	−0.091	0.120	0.041	0.078	0.025	−0.149	−0.093	0.007	0.018	0.201	−0.123	−0.094	0.084	−0.154	−0.138	0.062

$N = 50{,}183$. Correlation coefficients greater than 0.009 in absolute value are significant at the 0.05 significance threshold

Table 4 Results of the mixed-effects logistic regression of the impact of location on BG affiliation

BG affiliation is the dependent variable	Model 1		Model 2	
	Coef	Std. Error	Coef	Std. Error
Fraction of population in large cities	−0.481	0.184	−0.494	0.187
	0.009		0.008	
Deposit money banks	0.072	0.080	0.070	0.081
	0.364		0.390	
Regional-level controls				
Regional GDP per capita	0.762	0.504	0.905	0.512
	0.131		0.077	
Regional unemployment rate	2.048	4.049	2.335	4.116
	0.613		0.571	
Firm-level controls				
Size	0.609	0.011	0.459	0.012
	0.000		0.000	
Age	0.330	0.017	0.254	0.017
	0.000		0.000	
Investment	0.003	0.012	0.003	0.012
	0.831		0.801	
Growth	−0.067	0.026	−0.075	0.027
	0.010		0.006	
ROA	−0.844	0.094	−0.748	0.096
	0.000		0.000	
Productivity	−0.070	0.016	−0.059	0.017
	0.000		0.001	
Leverage	−1.068	0.082	−1.141	0.085
	0.000		0.000	
Cash-ratio	−1.706	0.067	−1.662	0.069
	0.000		0.000	
Industry-level controls				
Industry complexity	0.258	0.074	0.295	0.078
	0.000		0.000	
Mean size of competitors	0.566	0.038	0.599	0.039
	0.000		0.000	
Number of competitors	−0.017	0.015	−0.006	0.015
	0.263		0.708	
Mean industry ROA	3.130	0.630	3.139	0.651
	0.000		0.000	
Constant	−14.068	5.075	−14.688	5.157
	0.006		0.004	
Industry dummies	Yes		Yes	
Number of observations	50,183		39,345	
Wald chi^2 (degrees of freedom) and p value	6681.7	0.000	4501.18	0.000
LR test versus pooled logistic regression	179.060	0.000	162.500	0.000

Standard errors are robust and clustered at the regional level. p values are indicated below the coefficients

represented an alternative source of workforce that facilitated the creation of subsidiaries in resource-scarce regions. However, the coefficient of the financial development variable (private credit by deposit money banks to GDP) was positive and not statistically significant; thus, we could not find any support for Hypothesis 2.[7] With respect to our control variables, BG affiliation was more common in regions,

[7] Given the nonresult in Hypothesis 2, we ran additional estimations by splitting the sample into quartiles of cash holdings, capital intensity, and capital expenditures. The nonresult in Hypothesis 2 was con-

where the GDP per capita was higher. BG affiliation was also more likely for larger firms and older firms but less likely for more profitable, faster growing, and more productive firms. BG affiliation was also more likely when industry profitability was higher and when competing firms were larger and more numerous. The results of Model 2 were found to be comparable to those of Model 1. It is important to note that even if we considered only BG subsidiaries that did not have subsidiaries, Hypothesis 1 remained valid. One of our main assumptions was that BG formation is a top-down process. By restricting our sample to BG-affiliated firms that did not have subsidiaries, we observed firms that were likely to be the outcome of corporate entrepreneurship actions decided by the BG. In terms of economic significance, a 1% increase in the fraction of the population living in cities with more than 10,000 people decreased the odds that a firm was affiliated with a BG by 0.62.

To ensure that our results reflected corporate entrepreneurship activities by BGs, we ran our regressions on a set of subsamples: young firms (less than 10 years), old firms (more than 10 years), large firms, medium firms, small firms, and micro firms. The size classification was based on the European Commission's definition. Specifically, firms are micro if their number of full-time equivalent employees is lower than 10, and their total assets or sales turnover is lower than 2 M€. Firms are small if they are not micro, their number of full-time equivalent employees is lower than 50, and their total assets or sales turnover is lower than €10 million. Firms are medium if they are neither micro nor small, their number of full-time equivalent employees is lower than 250, their total assets are lower than €43 million, or their sales turnover is lower than €50 million. Firms that are not micro, small, or medium are large. Table 5 presents the results of the regressions for these subsamples. We corroborated Hypothesis 1 for all categories of firms, except medium and large firms. The coefficient of the proportion of the population in large cities was negative and statistically significant for all categories of firms, except medium firms (the coefficient was negative and not statistically significant) and large firms (the coefficient was positive and not statistically significant). It was surprising that we did not observe any difference when classifying firms by age category, since we intuitively expected the relationship between the likelihood of BG affiliation and resource scarcity to be stronger for younger firms than for older firms. With respect to the results by subsamples based on firm size, the lack of a significant result for larger firms was in line with our view, since large firms are obviously less constrained in their access to resources, especially the workforce, than are smaller firms. However, we found no evidence that the degree of financial development plays a role in the likelihood of being affiliated with a BG in any of the subsamples.

Additional results

We further explored whether the previous findings depended on the characteristics of the considered BGs. BGs are non-homogeneous entities; some are very large organizations made of numerous subsidiaries, while others are very modest organizations (Holmes et al. 2018). We focused on three characteristics of BGs that have been commonly considered important drivers of the capacity of BGs to allocate resources and that influenced their strategic objectives. Specifically, we considered the role of BG size, because larger BGs have larger internal capital and labor markets, which can allocate more resources to their affiliates, if necessary (Khanna and Palepu 1997; Belenzon et al. 2013; Belenzon and Tsolmon 2016). We also considered the extent to which a BG was diversified using the number of affiliated firms as a proxy (Khanna and Palepu 2000; Iacobucci and Rosa 2005). More diversified BGs possess a greater capacity to allocate resources during economic downturns, thanks to their diversified activities (Bamiatzi et al. 2014). Finally, we considered that the BG head firm may not be based in France. France-based BGs are more likely to be family BGs, with targets different from those of foreign-based BGs (Masulis et al. 2011). An average BG held 75.26 M€ of total assets (median was 27 M€) and 13 affiliated firms (median was 7). In addition, 38.00% of our sample firms were affiliated with a BG with its head firm in France, and 62.00% were based in foreign countries. In Table 6, we present the results of a set of regressions conducted on the following subsamples: standalone firms and firms affiliated with larger BGs (highest quartile of BG total assets), lower BGs (lowest quartile of BG total assets), diversified BGs (highest quartile of the number of firms affiliated with the BG), focused BGs (lowest quartile of the number of firms affiliated with the BG), BGs with a head firm in France, and BGs with a foreign head firm.

First, the results showed that Hypothesis 1 held for each of these subsamples, as the coefficient of the fraction of the population in large cities was negative and statistically significant, except that for the subsamples made of standalone firms and largely diversified BGs. Surprisingly, this meant that the higher likelihood of a firm being affiliated with a BG in resource-scarce locations was not driven by a more diversified BG, which theoretically had a greater capacity to allocate various resources to its subsidiaries. Second, we checked whether there were statistically significant differences between the fractions of population in large cities' coefficients for larger versus smaller BGs, diversified versus

Footnote 7 (continued)

firmed in each case. The results are unreported for brevity but available upon request.

Table 5 BG affiliation by categories of age and size

BG affiliation is the dependent variable	Younger firms		Older firms		Micro firms		Small firms		Medium firms		Large firms	
	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
Fraction of population in large cities	−0.576	0.238	−0.425	0.191	−0.582	0.199	−0.579	0.218	−0.037	0.196	0.510	0.358
	0.015		0.027		0.004		0.008		0.850		0.154	
Deposit money banks	0.105	0.103	0.060	0.083	0.121	0.088	0.040	0.095	0.010	0.080	0.058	0.138
	0.308		0.467		0.167		0.670		0.897		0.676	
Regional-level controls												
Regional GDP per capita	0.080	0.681	0.760	0.524	0.191	0.588	0.808	0.605	0.488	0.547	−1.468	0.989
	0.906		0.147		0.745		0.182		0.372		0.137	
Regional unemployment rate	−5.223	5.883	2.907	4.252	−5.529	5.146	3.696	4.951	−1.468	4.893	−15.081	9.350
	0.375		0.494		0.283		0.455		0.764		0.107	
Firm-level controls												
Size	0.604	0.024	0.618	0.013	0.404	0.037	0.485	0.023	0.384	0.039	0.737	0.039
	0.000		0.000		0.000		0.000		0.000		0.000	
Age	0.537	0.062	0.211	0.030	0.401	0.035	0.322	0.024	0.244	0.040	0.416	0.081
	0.000		0.000		0.000		0.000		0.000		0.000	
Investment	−0.007	0.018	0.008	0.016	−0.008	0.024	0.025	0.017	−0.023	0.028	−0.052	0.055
	0.692		0.635		0.722		0.142		0.416		0.345	
Growth	−0.026	0.037	−0.068	0.040	−0.125	0.051	−0.044	0.039	−0.057	0.057	0.134	0.128
	0.481		0.085		0.013		0.262		0.321		0.297	
ROA	−1.441	0.179	−0.646	0.112	−0.947	0.186	−1.046	0.128	−0.421	0.260	0.251	0.516
	0.000		0.000		0.000		0.000		0.106		0.626	
Productivity	−0.046	0.030	−0.088	0.020	0.040	0.038	−0.106	0.024	−0.209	0.036	−0.272	0.068
	0.135		0.000		0.292		0.000		0.000		0.000	
Leverage	−1.276	0.154	−0.949	0.099	−0.566	0.170	−1.020	0.115	−1.070	0.185	−1.198	0.380
	0.000		0.000		0.001		0.000		0.000		0.002	
Cash-ratio	−1.081	0.150	−1.869	0.076	−1.155	0.134	−1.678	0.092	−2.095	0.172	−1.772	0.345
	0.000		0.000		0.000		0.000		0.000		0.000	
Industry-level controls												
Industry complexity	−0.058	0.151	0.352	0.086	0.314	0.146	0.223	0.100	0.207	0.211	0.666	0.442
	0.700		0.000		0.031		0.026		0.327		0.132	
Mean size of competitors	0.535	0.082	0.580	0.044	0.439	0.083	0.473	0.053	0.856	0.092	0.435	0.171
	0.000		0.000		0.000		0.000		0.000		0.011	
Number of competitors	−0.014	0.032	−0.010	0.017	−0.028	0.032	−0.014	0.021	−0.004	0.036	0.012	0.068
	0.655		0.551		0.389		0.501		0.907		0.865	
Mean industry ROA	−0.921	1.362	4.181	0.720	1.461	1.358	2.390	0.866	3.227	1.511	−0.621	3.133
	0.499		0.000		0.282		0.006		0.033		0.843	
Constant	−6.725	6.899	−13.972	5.286	−6.919	5.968	−12.968	6.106	−8.733	5.558	9.005	10.057

Table 5 (continued)

BG affiliation is the dependent variable	Younger firms		Older firms		Micro firms		Small firms		Medium firms		Large firms	
	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
	0.330		0.008		0.246		0.034		0.116		0.371	
Year and industry dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Number of observations	9278		40,900		7826		22,177		14,535		5474	
Wald chi^2 (degrees of freedom) and p value	1425.09	0.000	4605.52	0.000	701.03	0.000	1944.66	0.000	808.85	0.000	736.13	0.000
LR test versus pooled logistic regression	36.000	0.000	120.500	0.000	7.130	0.004	107.080	0.000	3.140	0.038	0.030	0.437

Standard errors are robust and clustered at the regional level. p values are indicated below the coefficients

focused BGs, and French versus foreign BGs. We calculated the difference between coefficients as coefficients in Model A, with a smaller coefficient in Model B divided by the square root of the sum of the squared standard errors. We observed no statistically significant difference in the likelihood of BG affiliation depending on size and diversification of the BGs or whether the BG head firm was French.

These observations also helped alleviate an important causality concern. The two processes (top-down versus bottom-up) potentially led to a higher presence of BG-affiliated firms in resource scarcity. First, firms operating in such contexts sought to be acquired by a BG, because their access to resources was scarce (bottom-up process), and second, BGs, through corporate entrepreneurship, were the most active players in firm creation in rural regions (top-down process). Our results regarding the higher likelihood of BG affiliation in the case of very simple, activity-concentrated BGs provided support for the top-down process.

Follow-up analysis of Hypothesis 1

Our previous results indicated that business group affiliation is more likely in regions characterized by lower population density, which is a characteristic of more rural regions. This result also suggested that BG affiliation facilitates access to the workforce through the internal labor market channel in more rural, less populated regions. Next, we turned to the question whether access to skilled or unskilled workforces (or both) is the main driving force for our results. At first glance, one could argue that one of the main benefits of BG internal labor markets is their ability to transfer highly skilled workers from one affiliated firm to another to facilitate knowledge diffusion (Ahmadjian and Lincoln 2001; Holmes et al. 2018). In rural regions, knowledge transfers between universities and industries are more difficult, making BG internal labor markets theoretically powerful mechanisms for overcoming such market failures (Johnston and Huggins 2016).

At the same time, it was not clear whether a skilled workforce could be effectively transferred. Breschi and Lissoni (2009) showed that knowledge is localized, and thus constrained by geography, because while individuals can be transferred, their networks cannot be. Focusing on inventors, they showed that mobile researchers do not relocate in space, because their invention networks are localized. Charnoz et al. (2018) showed that BG-affiliated firms located in less accessible and more rural regions tend to transfer highly skilled managers to the BG headquarters and refocus on production activities when communication costs drop. Thus, their results suggest that BG subsidiaries located in less accessible and more rural regions mostly need an unskilled labor force for production activities.

Table 6 Role of BG characteristics

BG affiliation is the dependent variable	Affiliation to a large BG		Affiliation to a small BG		Affiliation to a diversified BG		Affiliation to a concentrated BG		Affiliation to a French BG		Affiliation to a foreign BG	
	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
Fraction of population in large cities	−0.416	0.181	−0.561	0.224	−0.067	0.238	−0.391	0.140	−0.496	0.197	−0.414	0.177
	0.022		0.012		0.780		0.005		0.012		0.020	
Deposit money banks	0.065	0.078	0.083	0.097	0.048	0.102	−0.018	0.062	0.079	0.085	0.059	0.077
	0.411		0.390		0.636		0.766		0.354		0.441	
Regional-level controls												
Regional GDP per capita	0.625	0.498	0.162	0.623	1.433	0.655	0.207	0.393	0.637	0.542	0.646	0.488
	0.209		0.795		0.029		0.599		0.240		0.185	
Regional unemployment rate	0.796	4.034	0.489	5.313	8.481	5.463	1.228	3.378	0.898	4.410	1.362	3.980
	0.844		0.927		0.121		0.716		0.839		0.732	
Firm-level controls												
Size	0.580	0.012	0.219	0.024	0.936	0.017	0.194	0.015	0.728	0.014	0.545	0.012
	0.000		0.000		0.000		0.000		0.000		0.000	
Age	0.326	0.018	0.328	0.035	0.170	0.026	0.522	0.023	0.322	0.021	0.319	0.018
	0.000		0.000		0.000		0.000		0.000		0.000	
Investment	0.000	0.013	0.025	0.025	−0.016	0.019	0.023	0.016	0.003	0.015	0.003	0.013
	0.972		0.317		0.393		0.163		0.831		0.805	
Growth	−0.064	0.028	−0.106	0.060	−0.072	0.040	−0.047	0.037	−0.054	0.034	−0.073	0.029
	0.021		0.077		0.076		0.202		0.106		0.011	
ROA	−0.850	0.101	−1.119	0.206	−1.760	0.141	−0.291	0.140	−0.866	0.125	−0.840	0.104
	0.000		0.000		0.000		0.037		0.000		0.000	
Productivity	−0.068	0.017	−0.160	0.034	−0.120	0.025	−0.056	0.021	−0.091	0.020	−0.078	0.018
	0.000		0.000		0.000		0.010		0.000		0.000	
Leverage	−1.061	0.088	−1.510	0.193	−2.338	0.123	−0.005	0.118	−1.359	0.107	−1.026	0.090
	0.000		0.000		0.000		0.968		0.000		0.000	
Cash-ratio	−1.764	0.072	−1.725	0.148	−3.716	0.118	−0.184	0.087	−1.935	0.088	−1.754	0.074
	0.000		0.000		0.000		0.034		0.000		0.000	
Industry-level controls												
Industry complexity	0.292	0.079	0.215	0.157	0.059	0.114	0.419	0.101	0.175	0.096	0.305	0.080
	0.000		0.170		0.605		0.000		0.068		0.000	
Mean size of competitors	0.545	0.040	0.368	0.075	0.915	0.058	0.216	0.048	0.622	0.047	0.523	0.041
	0.000		0.000		0.000		0.000		0.000		0.000	
Number of competitors	−0.020	0.016	−0.018	0.031	0.040	0.024	−0.026	0.019	0.009	0.019	−0.022	0.016
	0.216		0.562		0.094		0.179		0.619		0.170	
Mean industry ROA	3.362	0.662	3.429	1.258	8.342	0.929	1.333	0.840	3.050	0.780	3.426	0.679
	0.000		0.006		0.000		0.113		0.000		0.000	

Table 6 (continued)

BG affiliation is the dependent variable	Affiliation to a large BG		Affiliation to a small BG		Affiliation to a diversified BG		Affiliation to a concentrated BG		Affiliation to a French BG		Affiliation to a foreign BG	
	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
Constant	−12.660	5.016	−6.076	6.299	−26.277	6.611	−6.199	3.983	−14.925	5.464	−12.579	4.916
	0.012		0.335		0.000		0.120		0.006		0.011	
Year and industry dummies	Yes		Yes		Yes		Yes		Yes		Yes	
Number of observations	39,327		15,401		23,431		21,735		27,883		35,237	
Wald chi^2 (degrees of freedom) and *p* value	5692.28	0.000	848.16	0.000	5864.28	0.000	1597.000	0.000	5383.49	0.000	4984.34	0.000
LR test versus pooled logistic regression	149.170	0.000	28.600	0.000	130.730	0.000	16.680	0.000	120.670	0.000	128.200	0.000

Standard errors are robust and clustered at the regional level. *p* values are indicated below the coefficients

To answer this question, we split our sample into four quartiles based on labor productivity. The productivity variable has already been defined in section 3.3. We then ran the estimations on each subsample. The results are displayed in Table 7. As can be seen, Hypothesis 1 is supported in the first three models but not in the fourth model, which corresponds to the highest productivity quartile. In other words, it appears that BG affiliation is more likely in less densely populated regions for firms that rely on a relatively less skilled workforce, but not for firms that rely on a highly skilled workforce. These observations were in line with the results observed by Charnoz et al. (2018).

Robustness checks

We performed several robustness tests to ensure the credibility of our findings. Our first concern was related to potential sample selection bias. Indeed, the use of productivity as a control variable required the number of full-time equivalent employees. However, this variable was available only for approximately one-half of the sample firms in Amadeus. A possible reason for this could be that standalone firms disclose less information, especially regarding the number of employees. Indeed, BG firms are likely to disclose more information, because the BG head firm faces different reporting requirements. In France, smaller firms have lower reporting requirements than larger firms, and smaller firms are typically standalone more often than those affiliated with a BG. To ensure that our results were not driven by this problem, we ran our regressions without the productivity control variable, as shown in Table 8 (Model 1). The results supporting hypothesis 1 hold, and the number of firm-year observations in the sample was 91,354 versus 50,183 in section "Multivariate analysis".

Our second concern was that BG affiliation may be motivated by fiscal considerations (Newberry and Dhaliwal 2001; Harford et al. 2017). Therefore, we calculated a firm's income tax rate as income tax divided by earnings before tax and included this variable as an additional control variable in our regression. This did not affect the results, and the coefficient of the income tax rate variable was not statistically significant (Model 2 in Table 8).

Our third concern was to check whether the geographical distance between a BG head firm and a given affiliated firm influenced the results. Our main theoretical argument was that BG affiliation is more common in rural contexts, because it facilitates access to resources that are otherwise limited. If a BG expands by creating subsidiaries in a close geographical context, the benefits of internal labor and capital markets appear limited compared to the case of a large geographic distance between an affiliated firm and a BG head firm. Therefore, we excluded firms that operated in the same city as their BG head firm, and reran our regression

Table 7 Results of the follow-up analysis on hypothesis 1 (labor productivity is used to split the sample)

BG affiliation is the dependent variable	First quartile		Second quartile		Third up quartile		Fourth quartile	
	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
Fraction of population in large cities	−0.639	0.239	−0.590	0.255	−0.429	0.216	−0.163	0.218
	0.008		0.021		0.047		0.455	
Deposit money banks	0.089	0.102	−0.033	0.111	0.098	0.092	0.066	0.098
	0.385		0.764		0.290		0.497	
Regional-level controls								
Regional GDP per capita	0.542	0.673	0.675	0.717	0.453	0.608	0.095	0.627
	0.420		0.346		0.456		0.879	
Regional unemployment rate	1.972	5.684	−1.109	6.045	2.247	5.336	−4.178	5.414
	0.729		0.854		0.674		0.440	
Firm-level controls								
Size	0.622	0.024	0.687	0.025	0.635	0.023	0.565	0.021
	0.000		0.000		0.000		0.000	
Age	0.299	0.033	0.306	0.035	0.333	0.036	0.362	0.035
	0.000		0.000		0.000		0.000	
Investment	−0.012	0.025	−0.038	0.030	0.018	0.026	0.011	0.020
	0.646		0.200		0.491		0.566	
Growth	−0.184	0.053	−0.087	0.062	−0.057	0.058	0.016	0.044
	0.001		0.159		0.329		0.725	
ROA	−0.888	0.168	−0.959	0.200	−1.179	0.195	−0.555	0.219
	0.000		0.000		0.000		0.011	
Productivity	0.240	0.068	−0.180	0.155	−0.341	0.139	−0.171	0.040
	0.000		0.246		0.014		0.000	
Leverage	−1.167	0.153	−0.880	0.176	−1.326	0.173	−0.593	0.168
	0.000		0.000		0.000		0.000	
Cash-ratio	−2.334	0.130	−1.604	0.138	−1.583	0.140	−1.271	0.141
	0.000		0.000		0.000		0.000	
Industry-level controls								
Industry complexity	0.504	0.135	0.159	0.146	0.197	0.177	−0.100	0.182
	0.000		0.275		0.265		0.583	
Mean size of competitors	0.387	0.076	0.299	0.086	0.714	0.089	0.770	0.074
	0.000		0.001		0.000		0.000	
Number of competitors	−0.018	0.036	0.011	0.031	−0.040	0.030	−0.034	0.030
	0.621		0.717		0.184		0.249	
Mean industry ROA	2.610	1.184	1.967	1.339	4.891	1.424	4.320	1.419
	0.028		0.142		0.001		0.002	
Constant	−12.770	6.823	−11.920	7.290	−9.921	6.218	−6.486	6.340
	0.061		0.102		0.111		0.306	
Industry dummies	Yes		Yes		Yes		Yes	
Number of observations	12,544		12,543		12,543		12,536	
Wald chi^2 (degrees of freedom) and p value	1670.97	0.000	1662.61	0.000	1906.42	0.000	1746.96	0.000
LR test versus pooled logistic regression	32.950	0.000	36.220	0.000	23.850	0.000	24.730	0.000

Standard errors are robust and clustered at the regional level. p values are indicated below the coefficients

(Model 3, Table 8). There were 49 BG-affiliated firms that accounted for 230 firm-year observations located in the same city as their BG head firms, and the results remained the same, even after excluding these firms.

Our fourth concern was the exclusion of all firms operating in Paris and its vast suburbs from the sample and rerun the estimation. Indeed, it was possible that the concentration of economic activity and easier access to key strategic

Table 8 Results of the robustness tests

BG affiliation is the dependent variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
Fraction of population in large cities	−0.535	0.175	−0.487	0.184	−0.482	0.185	−0.393	0.220	−0.394	0.222
	0.002		0.008		0.009		0.074		0.076	
Deposit money banks	0.067	0.075	0.070	0.080	0.067	0.080	0.143	0.094	0.128	0.088
	0.375		0.378		0.400		0.127		0.145	
Regional-level controls										
Regional GDP per capita	0.868	0.470	0.784	0.504	0.749	0.506	0.866	0.566	0.294	0.446
	0.065		0.120		0.139		0.126		0.510	
Regional unemployment rate	3.468	3.684	2.286	4.051	1.958	4.064	3.445	4.149	−0.276	3.969
	0.347		0.573		0.630		0.406		0.945	
Firm-level controls										
Size	0.574	0.008	0.608	0.011	0.607	0.011	0.578	0.013	0.609	0.011
	0.000		0.000		0.000		0.000		0.000	
Age	0.345	0.012	0.333	0.017	0.331	0.017	0.323	0.019	0.330	0.017
	0.000		0.000		0.000		0.000		0.000	
Investment	−0.004	0.008	0.004	0.012	0.003	0.012	−0.005	0.014	0.003	0.012
	0.631		0.764		0.813		0.748		0.830	
Growth	−0.069	0.017	−0.067	0.026	−0.065	0.026	−0.118	0.031	−0.067	0.026
	0.000		0.010		0.012		0.000		0.010	
ROA	−0.555	0.065	−0.861	0.103	−0.845	0.094	−0.681	0.112	−0.843	0.094
	0.000		0.000		0.000		0.000		0.000	
Productivity			−0.069	0.017	−0.071	0.016	−0.088	0.019	−0.070	0.016
			0.000		0.000		0.000		0.000	
Income tax rate			0.024	0.086						
			0.776							
Leverage	−0.828	0.054	−1.065	0.082	−1.067	0.082	−1.178	0.094	−1.066	0.082
	0.000		0.000		0.000		0.000		0.000	
Cash-ratio	−1.537	0.046	−1.707	0.068	−1.703	0.067	−1.805	0.079	−1.705	0.067
	0.000		0.000		0.000		0.000		0.000	
Industry-level controls										
Industry complexity	0.278	0.051	0.258	0.074	0.253	0.074	0.333	0.092	0.257	0.074
	0.000		0.001		0.001		0.000		0.001	
Mean size of competitors	0.517	0.025	0.567	0.038	0.566	0.038	0.628	0.043	0.567	0.038
	0.000		0.000		0.000		0.000		0.000	
Number of competitors	−0.035	0.011	−0.016	0.015	−0.016	0.015	−0.031	0.017	−0.017	0.015
	0.001		0.278		0.287		0.072		0.266	
Mean industry ROA	2.339	0.442	3.095	0.631	3.118	0.630	3.739	0.710	3.118	0.629

Table 8 (continued)

BG affiliation is the dependent variable	Model 1		Model 2		Model 3		Model 4		Model 5	
	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error	Coef	Std. Error
	0.000		0.000		0.000		0.000		0.000	
Constant	−15.158	4.725	−14.313	5.075	−13.909	5.095	−15.172	5.702	−9.470	4.516
	0.001		0.005		0.006		0.008		0.036	
Year and industry dummies	Yes		Yes		Yes		Yes		Yes	
Number of observations	91,354		50,108		49,953		39,631		50,183	
Wald chi^2 (degrees of freedom) and p value	11,890.56	0.000	6674.02	0.000	6637.34	0.000	5036.40	0.000	6676.57	0.000
LR test versus pooled logistic regression	445.20	0.000	176.63	0.000	187.61	0.000	141.18	0.000	182.73	0.000

Standard errors are robust and clustered at the regional level. p values are indicated below the coefficients

resources in Paris drove the results. When excluding firms located in Paris and its surroundings, the coefficient of the population fraction in large cities remained negative and statistically significant (Model 4, $p = 0.074$).

Our fifth concern was ensuring that our results were not driven only by our measure of access to workforce, the fraction of population in cities of 10,000 people, because the 10,000 threshold is arbitrary. Therefore, we used a more conservative threshold and considered the fraction of the population in cities with more than 50,000 people. The results displayed in Model 5 of Table 8 support Hypothesis 1 ($p = 0.076$). Taken together, these additional robustness tests provided greater credibility for our findings.

Conclusions and discussion

In this study, we proposed that BG affiliation is more common in resource-scarce regions because of the benefits provided to affiliated firms that have access to internal capital and labor markets. Access to BG internal markets compensates for the more difficult access to key strategic resources (finance and workforce) that characterize some regions, even in a developed economy. BGs appear to be a form of business organization that alleviates the resource scarcity of territories that appear to be more rural. Compared to other entrepreneurs, BGs have a competitive advantage when founding new business entities in resource-scarce locations because of their greater ability to allocate resources. We found strong empirical support for the idea that BG affiliation is more common in regions with limited access to the workforce. However, we did not observe that the degree of regional financial development influences the likelihood of BG affiliation. A possible interpretation of this nonresult is that capital markets operate quite homogenously across France, which means that benefits are few for firms that have access to internal capital markets. Indeed, even if financial development is relatively low in a region, firms still have the option to apply for loans in neighboring regions.

To the best of our knowledge, this study is the first attempt to explore the influence of geographical factors and locational resource scarcity on the prevalence of BGs. To date, the literature on BGs has mostly considered the presence of BGs and BG-affiliated firms as a matter of institutional setting and economic development (Khanna and Palepu 1997; Maman 2002; Larrain and Urzúa 2016; Zhang et al. 2016). By focusing on the role of geographic factors and related access to resources in a developed country, our study shows that our understanding of the role of BGs is incomplete. BGs exist, because they represent a way of organizing businesses especially suited to contexts with limited access to key strategic resources. Although

this idea was not new (Leff 1978), showing that within-country and not between-country differences influence the distribution of BG-affiliated firms broadened our perspective of the process through which BGs expand. The fact that BGs exist, and in fact, represent the dominant form of business organization in Western Europe, has been overlooked in the management literature, except some papers in the field of entrepreneurship (Iacobucci and Rosa 2005, 2010; Lechner and Leyronas 2009). This study shows that the expansion of BGs is a form of corporate entrepreneurship suited to specific contexts characterized by limited access to resources.

The results of this study have interesting implications for the BG literature. Although BG expansion has received relatively little attention, the impact of BG affiliation on affiliated firms' performance has been widely studied. In their meta-analyses of the literature, Carney et al. (2011) and Holmes et al. (2018) pointed out inconclusive results from the empirical literature on the benefits of BG affiliation. The literature on BGs implicitly assumes that BG affiliation is homogeneous within countries. Inconclusive results may derive from the fact that BG affiliation can provide benefits in some geographical contexts, such as resource-scarce regions, but it has limited advantages in more urban regions, where agglomeration of economic activity facilitates access to resources. In other words, we suggest that scholars might have attempted too quickly to answer the question, "Does BG affiliation influence performance?" before answering the question, "Where and why does BG affiliation occur?" This proposition represents a promising avenue for future research. Once it has been established that BG affiliation is more common in rural regions, the next question would be, "Is BG affiliation more beneficial to performance in more rural contexts?".

Moreover, our additional analysis suggests that BG affiliation in a rural context facilitates access to an unskilled workforce rather than a skilled workforce. An interpretation of this result is that because access to the workforce is constrained in more rural regions due to a lower population density, competition occurs between BG-affiliated firms and standalone firms to attract workers. Because BGs are more established and larger organizations than standalone firms, it is possible that BGs benefit from a reputation effect that facilitates the attraction of workers. Past research has highlighted that BG-affiliated firms are perceived positively in their environment, which facilitates access to resources (Vanacker and Forbes 2016; Holmes et al. 2018). In more rural regions, BGs may be seen as stable organizations to work for by local workers, which would provide BG-affiliated firms with an important competitive advantage over standalone firms. The fact that we could not confirm Hypothesis 1 for the most diversified BG suggests that the reputation effect of BG does not play a role in this category of BG. This interpretation is in line with the work of Mukherjee et al. (2018), who argue that product relatedness (opposed to product diversification) in BG activities enhances BG reputation. The strong expertise and supply chain networks of BGs with related activities appear to contribute to their reputation and facilitate the recruitment of workers. Whether BGs deliberately leverage this competitive advantage and decide to locate subsidiaries in more rural regions and what impact this decision has on BG-affiliated firms' performance are important questions that future research can examine.

This study has its limitations. The choice of France, the country in our study, was motivated by the existence of strong contrasts between regions. However, such differences are less sharp in other Western European countries, such as Germany and the UK. Whether our results are generalizable to other countries with alternative geographical characteristics is an interesting empirical question for future research. For example, it would be interesting to conduct a multinational study of BG affiliation in rural versus urban contexts to determine whether a BG affiliation is driven by the intensity of the differences between regional contexts. Furthermore, the pyramidal structure of BGs in France and Western Europe is not generalizable to other countries, where BGs are known to be built on other ties between firms. Therefore, it would be interesting to know if BGs in other parts of the world, such as China or India, which are common fields of investigation for BG literature, are also more likely to emerge in rural contexts.

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