Arbitraging Labor Markets*

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January 15, 2024

Abstract

In this paper we develop a new rationale for the existence of business groups (BGs) and conglomerates that operate in multiple locations within the same country: They arbitrage local labor markets. We show that BG firms grow less if firms of the same group in other locations can offer more attractive access to employees in their local labor market. On the flip side BG firms grow faster if they offer such access to other firms in the group. Attractiveness is measured as labor costs, labor supply, and labor fit between the firm and the local labor force. Local labor conditions are of similar importance for location decisions of business group firms as general agglomeration economies. Internal flows of employees between BG firms account for only a small portion of the variation in employment growth rates. We conclude that business groups predominantly move jobs, but not employees, between their locations. As such, they arbitrage local labor markets.

Keywords: Business groups, location, employment, internal labor markets
JEL Classifications: G30, G34, J21, J24, J61, M51.

*The authors acknowledge funding through DFG grants 3317/3-2 and GE 3342/1-2.
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1 Introduction

Business groups and conglomerates form a large part of the economic activities of most developed economies. Why do business groups and conglomerates exist? The literature in finance and economics provides answers based on two mutually non-exclusive paradigms. The first group of answers argues for the superior efficiency of business groups because they operate internal markets for capital, goods, and labor, and these internal markets overcome frictions in the corresponding external markets. The second group is based on the notion that business groups are inefficient, but offer unique advantages to their owners to extract rents at the expense of other stakeholders by concentrating control rights through cross-ownership and pyramid structures. (See the discussion of the literature below.)

In this paper, we pursue a new explanation. We focus on business groups that operate in multiple locations and argue that the ability to shift operations across locations offers unique advantages. In principle, operating in multiple locations is costly because it involves additional monitoring costs.[1] The overarching hypothesis is that business groups choose their locations depending on how specific locations meet their resource requirements. The market for labor is special in this regard, since employees typically do not commute large distances, which sets labor markets apart from those for capital and goods.[2] Hence, differences between local labor markets regarding the availability, skills, and costs of employees can exist and persist over time. These differences create incentives for firms to move operations to new locations. We hypothesize that business groups that operate in different locations have a unique advantage in this setting, because they can move operations within the group without the fixed costs of setting up new establishments. Hence, the simple prediction is that BGs respond to variations in the costs and availability of employees across the locations in which they operate by expanding, shrinking, or exiting these locations. As such, they become arbitrageurs of local labor markets.

Our analysis studies a sample of 23,000 firms affiliated to more than 7,000 business groups in Germany over the period from 2005 to 2017. Germany is an ideal laboratory to study this question, because company law and labor regulations are decided at the federal level and do not vary across local labor markets. We follow the literature and define a business group as a collection of firms - at least two - that share the same ultimate owner. We

[1] See John, Knyazeva, and Knyazeva (2011), Giroud (2013), and Alam et al. (2014) for findings consistent with this notion. Gumpert, Steimer, and Antoni (2021) show that firms insert additional layers of management to monitor distant locations.

[2] The choice of domicile is arguably one of the most significant investments in firm-specific human capital that an employee can make. See Alesina et al. (2010) for a study on geographic mobility of workers and Prager and Schmitt (2021), Azar, Marinescu, and Steinbaum (2022), and Rinz (2022) for studies that also define labor markets at the local level for the same reason.

create an employer-employee matched data set and study the employment growth and job flows of business group firms across 400 German counties, which we identify as local labor markets. We characterize these local labor markets from the perspective of each business group firm along three dimensions: labor costs: how much it would cost for a BG firm to employ the same labor force at the wage costs of another location;[3] labor market tightness: whether firms in other locations of the same group experience positive shocks to the labor supply of occupations employed by the firm (see, e.g., Muehlemann and Strupler Leiser, 2018); and labor fit: how well the labor force of another location in which the group is present matches the labor force requirements of the focal firm.[4] We refer to these three dimensions comprehensively as *local labor market conditions*. Additionally, we follow the prior literature on firm location decisions and take into account agglomeration economies (e.g., Melo, Graham, and Noland, 2009; Combes et al., 2012). We find that the growth of business group firms depends systematically on how any particular firm relates to the other firms in the same group along all four dimensions: firms grow their workforce faster if they offer other firms in the same group more attractive labor market conditions and agglomeration economies, and they grow more slowly if other firms in the BG offer more attractive conditions. We conclude that business group structures may create efficiency gains by arbitraging differences between local labor markets.

We begin by analyzing employment growth at the intensive margin, i.e., we ask how existing BG firms grow depending on their own and their BG members' local labor market conditions, holding the membership of the firm fixed. By contrast, we refer to growth through entering and exiting locations as growth at the extensive margin, which involves changes in the composition of the BG. In the first step, we analyze firms from the perspective of potential donors of jobs. We hypothesize that any focal firm grows more slowly if other firms in the same group offer better labor market conditions and stronger agglomeration economies in the locations in which they operate. We find support for this hypothesis for all four measures of labor costs, labor supply, labor fit, and agglomeration economies: A BG firm grows more slowly if other firms in the same group operate in locations with lower labor costs, are subject to positive shocks to labor market supply, or have a skill composition of the local labor force that is more similar to the requirements of the focal firm in question. A one-

[3]See Bernard et al. (2003) for a cross-regional study and Bellak, Leibrecht, and Riedl (2008) for a cross-country study of how local differences in labor costs matter for economic activity and investment decisions of firms. However, these studies are about the location decisions of firms, whereas ours is about reallocation decisions across firms that belong to the same business group.

[4]The importance of the availability of workers with requisite skills is already recognized in Porter (1994). Some recent contributions emphasize the skill match of the labor force for mergers and acquisitions (Lee, Mauer, and Xu, 2018; Tate and Yang, 2022) and for location decisions of start-ups (Glaeser and Kerr, 2009) and first-time foreign entrants (Alcacer and Chung, 2014).

standard deviation increase in our measures of labor costs, labor supply, and labor fit lead to a reduction of BG firms' employment growth of about 34-44 basis points: about one-fifth of the mean and two-fifth of the median. Hence, our findings on three labor dimensions are economically important and in line with our expectations. They are also comparable in size with our findings for the benefits of agglomeration: A one-standard deviation increase in agglomeration economies offered by other BG firms reduces the employment growth at the focal firm by 36 basis points.

In the second step, we analyze firms from the perspective of potential recipients of jobs from other firms in the same group. If the location in which a focal firm operates offers better labor market conditions for particular operations compared to other group firms, then the focal firm should attract these operations and it should grow faster. These analyses from the perspective of recipients confirm the findings from the donor perspective: Measures of labor-market supply and labor fit are of first-order importance, and the results for reallocation potentials offered to other group firms are of comparable size to those for the internal opportunities discussed above; at the same time, offering lower labor costs to other group firms is never significant. The combined economic effect of a one-standard deviation increase in labor supply and labor fit is similar to a one-standard deviation increase in agglomeration economies, increasing labor growth by approximately 80 basis points.

The specifications in these analyses include a range of control variables and show that business group firms grow faster if they are smaller and younger; if they form the core of the business group; and if their workforce is more highly qualified and better educated. We interpret the last two measures as indicating higher knowledge intensity, so firms with more knowledge-intensive operations grow faster. In all regressions we control for time-varying economic conditions at the industry and county level.

Overall, our analyses of employment growth at the intensive margin reveal a coherent picture: BGs strategically choose the locations in which they grow their operations by exploiting the local availability and costs of employees with the requisite skills.

Next, we break up labor flows and distinguish between internal and external growth. Specifically, we define growth as internal if it results from employees who migrate between firms that belong to the same BG, so that firms show negative internal growth if they lose employees to other group firms, and positive internal growth if they gain employees from other group firms. By contrast, growth is external if it results from separations to and the hiring of employees from the external labor market, which includes other firms or different forms of non-employment. We are interested in this distinction, because several recent papers have emphasized the importance of internal labor markets in BGs for the ability of these firms to capture growth opportunities or to provide employment insurance to their employees

(Huneeus et al., 2021; Cestone et al., 2022; Beaumont, Hebert, and Lyonnet, 2023; Cestone et al., 2023). By contrast, we find that the observations we report above are mostly driven by growth through the external labor market. To begin, on average about 98% of labor growth in our sample is external and only 2% is internal (on the firm-level). In addition, if we break up labor growth into its internal and external components in our regression analyses, then about 80% of the size of the effects we report above come from external employment growth.

In the final set of analyses, we address growth at the extensive margin and analyze BG's decisions to affiliate firms in new locations in which the group was not present before (referred to as *entry*), or disaffiliate firms and thereby leave locations altogether (referred to as *exit*). We hypothesize that growth at the intensive and the extensive margins should respond to the same drivers, but entry and exit decisions will arguably involve higher fixed costs than reallocation decisions that affect only the intensive margin.

The most important finding in these analyses is that labor conditions are of first-order importance and highly significant for growth at the extensive margin. Business groups are more (less) likely to exit local labor markets with higher (lower) labor costs, worse (better) labor supply and labor fit, as well as weaker (stronger) agglomeration economies compared to other locations of the BG. In the group-level analysis, a one-standard deviation increase in the opportunities to benefit from lower labor costs in another BG location reduces the likelihood of entry in a new location (increases the likelihood of exit from an existing location) by 2.5% (1.7%), which reflects about 120% (50%) of the sample average. Labor fit has a similar economic significance. By contrast, labor shortages and agglomeration economies are quantitatively less important, although still significant.

Discussion of the literature. This paper pursues a new explanation for the existence of business groups and conglomerates. Thus, our results complement the literature on internal markets, which argues that business groups add value by substituting internal markets for external markets when frictions reduce the efficiency of external markets. This argument goes back at least to Teece (1982) and has been made particularly in relation to emerging economies with less developed external markets (e.g., Khanna and Palepu, 2000). This literature has two major strands. The first and larger strand of this literature argues that internal capital markets can add value by allowing conglomerate firms to make better investment decisions than standalone firms (Gertner, Scharfstein, and Stein, 1994; Stein, 1997; Khanna and Tice, 2001); by improving risk-sharing (Khanna and Yafeh, 2005, but they reject this hypothesis); or by supplying capital when external markets become inaccessible (Matvos and Seru, 2014; Almeida, Kim, and Kim, 2015). While some studies emphasize efficiency gains (e.g., Maksimovic and Phillips, 2002), others emphasize the costs from inefficient cross-

subsidization and reduced responsiveness to investment opportunities (e.g., Shin and Stulz, 1998; Rajan, Servaes, and Zingales, 2000; Ozbas and Scharfstein, 2010). In their surveys of the large literature on internal capital markets, Maksimovic and Phillips (2007; 2013) conclude that recent evidence is mostly consistent with a neoclassical model that emphasizes how conglomerates exploit their comparative advantages. We complement this literature by showing that business groups in Germany exploit their comparative advantage from operating in multiple locations by moving operations to more attractive labor markets. We complement the literature on conglomerates and the conglomerate discount, which analyzes how firms choose their industry portfolio and reallocate capital across industries, by showing how business groups reallocate capital across locations.

The second strand of this literature argues that business groups operate internal labor markets, which allow them to provide more attractive jobs to their employees by organizing careers (Doeringer and Piore, 1966; Baker and Holmstrom, 1995; Huitfeldt et al., 2022; Ferreira and Nikolowa, 2022), provide insurance to employees (Faccio and O'Brien, 2021), take advantage of new business opportunities (Beaumont, Hebert, and Lyonnet, 2023; Cestone et al., 2022), allocate workers to jobs more efficiently (Huneeus et al., 2021; Tate and Yang, 2022), and bypass labor market frictions (Cestone et al., 2023).[5] In contrast to this literature, our study focuses on the movement of jobs and not on the movement of employees. As discussed, our findings suggest that most of the employment growth of firms, and most of the reallocation of growth opportunities across locations is through external labor markets and not through internal labor markets. Thus, our findings resonate those of Gehrke et al. (2023), who show that most of the employment turnover after M&As is through external labor markets.

Another paradigm for explaining the existence of business groups is based on the notion that business groups provide a specific form of corporate governance. Some of the contributions in this literature emphasize the efficiency advantages of business groups in providing effective forms of corporate control (e.g., Berglof and Perotti, 1994 on Japanese *kereitsu*). Other contributions see them as potentially inefficient forms of economic organization, which provide nonetheless unique advantages to their majority owners, in particular through building pyramids that increase the separation of ownership and control.[6] Our paper is complementary to this literature and argues for a potential source of economic gains of business groups that may coexist with the governance advantages (and disadvantages) highlighted in

[5]See Silva (2021) for a study of the potential downsides of internal labor markets, which may force firms to pay higher wages to workers who compare themselves to more highly-paid workers in other parts of the same firm.

[6]See Morck (2010) for a discussion of pyramids; Bertrand, Mehta, and Mullainathan (2002) on Indian business groups; Bae, Kang, and Kim (2002) and Baek, Kang, and Lee (2006) on Korean *chaebols*; see also Claessens, Djankov, and Lang (2000) for a cross-country study and the survey by Khanna and Yafeh (2007).

this literature.

In addition, we contribute to the literature on how firms choose their locations, and why the choice of location matters. Most closely related to our studies are those on the heterogeneity of labor regulation across locations. John, Knyazeva, and Knyazeva (2015) show that the announcement returns to acquisitions are lower if targets are in locations with stronger employment protection, and Dessaint, Golubov, and Volpin (2017) show similar results in a cross-country study. Relatedly, Bai, Fairhurst, and Serfling (2019) show that stronger state-level labor protection lead to lower investment rates and lower sales growth. The effects shown in these studies are not present in our sample, in which the same labor regulations apply across the entire country.

There is a large and diverse literature on how firms choose their locations, often in an international context with an emphasis on foreign direct investment and the location choices of multinational enterprises, which cannot be surveyed here. Some contributors to this literature have emphasized labor costs (among other factors, see Carlton, 1983) and the proximity to a pool of skilled employees as important factors for location choice (e.g., Porter, 1994; see also the survey of Dunning, 2009). This literature has also emphasized a range of other factors for location choice, such as taxes (e.g., Giroud and Rauh, 2019), subsidies (e.g., Basile, Castellani, and Zanfei, 2008), infrastructure and proximity to consumers (Dudey, 1990; Fontagne and Mayer, 2005), and to firms operating related technologies (e.g., Chung and Alcacer, 2002), or more generally agglomeration benefits (e.g., Glaeser and Kerr, 2009; Alcacer and Chung, 2014) which are not the focus of our analyses, in which they are reflected through control variables and fixed effects. These studies are all different from ours by analyzing the choice of location for new establishments, which is what we refer to as the extensive margin, whereas our core results focus on the intensive margin. Moreover, while there are many cross-country studies, there are only few cross-regional studies within the same country that would hold many other factors of location choice constant; the few within-country studies focus on whether factor-price equalization obtains within countries (e.g., Hanson and Slaughter, 1999, on the U.S.; Bernard et al., 2003 on the United Kingdom; Tomiura, 2005, on Japan), which is a different question from ours.

2 Data and methodology

2.1 Sample construction

We draw financial, ownership, and other descriptive information of all medium-sized and large German firms within the sample period 2005 through 2017 from the Orbis database.[7] We define a business group (BG) as a collection of at least two firms under common ownership. A firm is classified as a member firm of a BG if the ultimate owner of the BG holds more than 50% of the firm's voting shares, directly or indirectly.[8] Specially, we require the ultimate owner to also be a firm, as in Belenzon and Berkovitz (2010) and Belenzon and Tsolmon (2016). Furthermore, we drop all BGs with state-controlled entities and those ultimately controlled by a foreign owner. This leaves us with 482,909 firm-year observations involving 74,765 distinct firms and 20,466 distinct BGs.

Next, we draw administrative data from the IAB (Institute for Employment Research) for our sample firms. We mainly use of their Integrated Employment Biographies (IEB) data set and draw the career biographies of all employees who were ever employed by any sample firm at some date during the sample period. The IEB data set provides detailed demographic information and career history of all employees who are employed by establishments residing in Germany and pay German social insurance taxes. After aggregating the employee-level data to the firm level, we adopt the so-called Orbis-ADIAB record linkage key developed by Antoni et al. (2018) to merge the two data sets. We successfully merge 23,001 firms affiliated to 7,105 distinct BGs, totaling 149,117 BG-firm-year observations.

To investigate decision-making on the business group level, we further aggregate the firm-level sample to the business group level. For each BG-year, we either sum up the firm-level variables (e.g., for total assets), or we take labor-weighted averages of firm-level variables (e.g., for education scores). This process results in 46,925 BG-year observations involving 7,105 BGs.

To characterize local labor markets within German counties, we draw employment information of all German establishments within the sample period from IAB's Establishment History Panel ("Betriebshistorisches Panel," BHP).[9] We then aggregate the data to the county

[7] We define medium-sized and large firms in a similar manner to the European Commission in Directive 2013/34/EU. More specifically, a firm is included in our sample if it satisfies at least two of the three conditions simultaneously in at least one year throughout the sample period: 1) Total assets larger than 20 MEUR, 2) total revenue larger than 40 MEUR and 3) employee count larger than 250.

[8] Papers adopting the same definition include Altomonte, Ottaviano, and Rungi (2021), Boutin et al. (2013) and Cestone et al. (2020). Belenzon and Tsolmon (2016), and Belenzon and Berkovitz (2010) adopt the same definition for private firms but lower the voting share threshold to 20% for public firms. Given that private firms predominate in our sample - representing 99.78% of all observations, we apply the same definition to all firms.

[9] The BHP is aggregated from the IEB to the establishment level. We use the IEB to infer firm-level

level. Finally, we complement the sample with county-level economic and demographic data collected from the Federal Statistical Office (Statistisches Bundesamt).

2.2 Research design

The main methodological challenge for investigating the location decisions of business groups is that the decision of BG b to enter, exit, or grow in county c at time t leads to a very large number of possible BG-county-year combinations. However, most BGs are not present in most counties most of the time, so for most of the BG-county-year combinations the activity levels are zero. We address this issue by using two different strategies, each of which has different advantages and limitations. In the first step, we use the panel of German business group firms from 2005 to 2017 and analyze which business group, firm, and county characteristics influence labor growth. The unit of observation in this analysis is a BG-firm-year. We only consider the county-level data from the county where a firm's headquarter is located. Since 80% of the BG firms in the sample are active in only one county, such a simplification should not have material effects on our results. If a particular business group does not have a group firm in a particular county c in year $t-1$, then the growth rate between $t-1$ and t for this BG is not defined, and this BG-county-year combination does not contribute an observation to the sample. Put differently, we do not include observations in year t if the activity level in year $t-1$ is zero, which eliminates all the zero observations from the analysis. Hence, we cannot analyze BG's decisions to grow at the extensive margin by entering new locations at the BG-county-year level; accordingly, we refer to this strategy as the "intensive margin" analysis. However, we can analyze exit decisions at this level, which represent only a case of shrinkage, and for which the activity level in year $t-1$ is positive. The strength of this analysis is that it allows us to cover the decisions of incumbent BG firms to expand, shrink in, or exit from a certain location, and consider BG characteristics and location characteristics in such an analysis. The limitation of this analysis is that we cannot analyze the decision to enter a certain location, which requires aggregation to the BG level..

Accordingly, we construct a BG-year panel to also study entry. For this sample, we can define entry and exit dummies for each BG-year and look at growth at the intensive as well as the extensive margin. The strength of this analysis is that it allows for a detailed analysis of how time-varying firm (and BG) characteristics influence the decisions of BGs to expand geographically.

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employment on a more granular basis for our sample firms. We cannot infer county-level employment from the IEB due to technical limitations and data protection regulations.

2.2.1 Dependent variables

We are interested in characterizing the outcome of BG location decisions and therefore want to measure the labor growth of the firm (or BG) as well as entry and exit into/from counties.

Labor growth is defined as the one-year growth rate of employment E of firm i:

$$g_{it} = \frac{E_{it} - E_{it-1}}{0.5\,(E_{it} + E_{it-1})}, \tag{1}$$

following an established practice in the literature (see Davis et al., 2014; Antoni, Maug, and Obernberger, 2019). We separate *Labor growth* further into *Internal labor growth* and *External labor growth*. The former only considering the relocation of employees within the business group and the latter only considering external hiring and firing (see A.1).

2.2.2 Independent variables

The independent variables describe the characteristics that are likely to influence BGs decisions to expand, shrink, enter or exit certain locations. These variables can be separated into two groups. The first group of absolute measures characterizes local labor markets (described here). The second set of variables characterizes these markets in relation to the requirements and structure of a particular BG (described in Section 3.1 and 3.2).

Characteristics of local labor markets. We define three measures to characterize local labor markets: labor costs, labor supply, and labor fit. All of the three measures might be outcomes of spatial agglomeration of industries. Therefore, we also define a measure to characterize the degree of industrial agglomeration in local labor markets.

Labor costs. We only observe average wages and job composition at the establishment-level, which means we need to estimate average wages by job categories on the county level (local labor market). Therefore, we run the following regression with w_{et}, the establishment total daily wage sum, as dependent variable:

$$w_{et} = \alpha + \sum_{l=1}^{12} \beta_{clt} k_{elt} + \epsilon_{et}$$

We use c to index German counties, e to index establishments, i to index firms, l to index the 12 Blossfeld (1987) job categories, and t to index calendar years.[10] Let k_{elt} be the

[10] Blossfeld (1987) classifies jobs into 12 distinct major occupations based on the German Classification of Occupations 1988 (KldB 1988). Table 1 on page 99 in Blossfeld (1987) provides a detailed overview on those 12 occupations and related ISCO codes.

number of establishment workers employed in occupation l. This regression is run for each county-year cross-section. Establishments with more than 10% of employees unclassified for any job category are excluded from the sample. Hence, β_{clt} provides an estimate for w_{clt}.

With these provisions, the expected labor cost of a firm that is active in industry s and located in county c in year t is calculated as $LC_{sct} = \sum_l w_{clt} \times p_{sl}$, where p_{sl} is the average fraction of occupation l in industry s across all sample years.

Labor shortage. The measure for labor shortage builds on the idea that, within a labor market, past labor growth should predict future labor supply. Therefore, any positive demand shock that is not expected by the market will lead to a shortage, and any negative demand shock would lead to a surplus. Hence, we regress county-level employment growth rates per job category on their own lags over the past three years:

$$g_{clt} = \eta_c + \lambda_1 g_{cl,t-1} + \lambda_2 g_{cl,t-2} + \lambda_3 g_{cl,t-3} + \mu_{ct}$$

The residual $\hat{\mu}_{ct}$ is then taken as a demand shock for county c in year t. The labor shortage in year t is calculated as an equally-weighted average, $s_{clt} = (\hat{\mu}_{clt} + \hat{\mu}_{cl,t-1} + \hat{\mu}_{cl,t-2})/3$. For each firm i in county c, the labor shortage measure is calculated as $LS_{ict} = \sum_l s_{clt} \times p_{sl}$.

Labor fit. We follow the prior literature on agglomeration economies (e.g., Glaeser and Kerr, 2009; Alcacer and Chung, 2014) to measure how well a county's labor force fits a firm's skill demand by the distance between the long-term job mix of the firm's industry and the current job mix of the county:

$$LF_{sct} = -\sum_l |p_{sl} - p_{clt}|,$$

where p_{sl} is the average fraction of occupation l in industry s across all sample years and p_{clt} is the fraction of occupation l in county c in year t. LF_{sct} equals zero when the supply and demand of skills perfectly match.

Agglomeration. We measure AG_{sct}, which denotes the level of spatial agglomeration of industry s in county c in year t as the number of firms that are active in industry s and headquartered in county c.

2.3 Descriptive statistics

Table 1 provides descriptive statistics for our BG firm sample. The average BG firm in our data set is 26 years old and has 8.3 million euro of assets. The mean (median) Industry Q is

1.8 (1.6). On average 0.8% of BG firms are divested per year. Similar to Gehrke et al. (2023), we observe that the internal labor market (ILM) of BGs is much less active than compared to the external labor markets (ELM). On average there is a factor of 45 between the *Internal labor growth* and *External labor growth*. We also observe that increased activity in the ILM is positively correlated (0.083, p<0.01) with increased activity in the ELM.[11] The average BG in our sample is 30 years old, has 3.3 member firms with a total of 977 employees. These numbers are broadly comparable to Belenzon and Tsolmon (2016), who report that BGs in their sample from 15 European countries have on average 4 member firms and 973 employees. The average BG firm in our sample is 26 years old and has 271 employees. The BG firms in Belenzon and Tsolmon (2016) are somewhat younger (17 years) and smaller (92 employees) on average. Belenzon, Berkovitz, and Rios (2013) use a similar sample of European BGs but require than BG firms have at least \$10 million in sales. They report that an average BG firm is 25 years old and has 392 employees, which is very similar to our numbers. According to Cestone et al. (2020) French BG firms are somewhat smaller on average (158 employees).[12] The probability of a BG to enter (exit) a new location is 3.6% (2.1%) per year. In general, we observe that BGs (Panel B) have somewhat different variable means than BG firms (Panel A) which stems from the fact that larger BG firms are on average older, grow less, employ less educated and qualified employees, which are in turn cheaper and operate in more mature industries (lower Tobin's Q) and counties with lower economic growth.

Figure 1 Panel A shows the geographical distribution of BG firms relative to all firms in our sample. Figure 1 Panel B (Panel C) provides the ratio of BG firm assets (employees) to assets (employees) of all firms in our sample. Across all three maps we observe substantial variation across German counties but no particular geographical patterns in the distribution of BG firms, assets or number of employees. Meaning that BG firms are generally not more or less likely in South or East Germany, for example. However, we observe a clustering of BG firms in metropolitan areas. We conclude that BG firms prefer agglomeration centers.

3 Analysis

The analysis proceeds in four steps. We begin by analyzing growth at the intensive margin at the firm-year-county level and distinguish two perspectives. To begin, we ask if the focal firm

[11] In Table OA1 in the Online Appendix we provide the correlations between all main variables of our analysis.

[12] We use the terms affiliating and disaffiliating instead of acquiring and divesting BG firms, as we want to highlight the difference between an acquisition (divestiture) and affiliation (disaffiliation). An affiliation (disaffiliation) means that an acquired (divested) company remains (was) an legally independent entity after (before) the acquisition (divestiture). That means we treat firms that are acquired (divested) and then (were) completely integrated by one of the business group firms as organic labor growth.

may benefit from opportunities to relocate production to other firms within the same business group; we refer to this analysis as the "donor" perspective (Section 3.1). Then we ask if the focal firm provides such opportunities for reallocation to the other group firms; we refer to this analysis as the "recipient" perspective (Section 3.2). In the next step, we decompose growth at the intensive margin into growth from labor flows internal to the BG and the external labor market (Section 3.4). Finally, we analyze growth at the extensive margin by moving the analysis to the BG-county-year level looking at entry and exit decisions of BGs (Section 3.6).

3.1 Using opportunities within groups: the donor perspective

In this section, we ask whether business group firms can improve their operations by moving them to another group firm in a different location. Put differently, we analyze whether BG firms can benefit from reducing their labor costs, better access to labor supply, improving the skill match between the the local workforce and the requirements of the firm, or agglomeration economies, by relocating their own operations to another county in which another firm of the same group is already present. (In Section 3.6, we ask whether group firms would benefit from relocating operations to counties in which the group is not yet present.) We label this perspective the donor perspective, because the focal firm is considered to be a potential donor of operations and jobs (and also employees, see Section 3.4) to other firms in the same group. Our hypothesis implies that firms should grow less if the business group would benefit from relocating their operations to other firms within the same group.

Hence, for each business group b at time t, we define the set of all firms that belong to that business group as $BG_b(t)$. We index counties by $c \in C$, where C is the set of all German counties. Let $C_b(t)$ be the set of all counties in which business group b has at least one member firm at time t. Hence, $C_b(t) \subseteq C$. We define the internal opportunities of a BG firm from reallocating jobs to other firms $j \neq i \in BG_b(t)$ from the same BG as the upside potential offered by the other group firms to the focal firm i in question. The rationale for this analysis is that firms can arguably move some or all of their operations at a lower cost to a county where the BG is already present, compared to a county in which the BG is not (yet) present.

Measuring internal opportunities for reallocation. We define three variables to measure opportunities from reallocating operations to another county, which measure, respectively, opportunities from reducing labor costs ($IOLC$), opportunities from moving operations to a local labor market with less labor shortage ($IOLS$), from moving to a local labor market that offers a better labor fit to the firm ($IOLF$), and from moving to a local market

that offers more agglomeration economies ($IOAG$).

Recall that LC_{ict} represents the expected labor costs of firm i if it produces in county c at time t. We define the internal opportunity for saving labor costs, $IOLC_{it}$, as the hypothetical percentage reduction in the wage bill of firm i at time t from relocating all its operations from county c, where it is currently located, to the county that minimizes its wage costs. Here, the minimum is calculated across all counties in which the business group to which i belongs is already present at time t. Given our definitions above, the lowest possible wage bill can be calculated as $min\{LC_{int}\}_{n \in C_b(t)}$, and $IOLC_{it}$ is defined as

$$IOLC_{it} = max \left\{ \frac{LC_{ict} - LC_{int}}{LC_{ict}}, 0 \right\}_{n \in C_b(t)}.$$

Hence, $IOLC_{it}$ is the hypothetical percentage reduction in the wage bill if firm i were to relocate all its operations to the county that minimizes its overall wage bill, while holding the proportions of its labor force constant. Note that this definition does not describe the further reduction of labor costs that firm i could achieve from moving to counties without presence of the BG so far, adjusting its production technology and changing the proportions between different categories of workers. Similarly, a firm may relocate only a part of its production or it may divide its operations between multiple counties. These additional margins of improvement are not captured here.

We construct analogous estimates for the other two characteristics of local labor markets, namely, labor shortage and labor fit. In particular, we define the internal opportunity from relieving labor shortages based on our measure of labor shortage, LS_{ict}, as

$$IOLS_{it} = max\{LS_{ict} - LS_{int}, 0\}_{n \in C_b(t)}.$$

Similarly, we define the internal opportunity from improving the labor fit based on our measure of the quality of labor fit, LF_{ict}, as

$$IOLF_{it} = max\{LF_{int} - LF_{ict}, 0\}_{n \in C_b(t)}.$$

Similar to $IOLC$, these measures are both constructed on the hypothetical scenario that the focal firm relocates its entire operations to one other county without changing the proportions in its labor force. All internal opportunity variables are normalized (zero mean and unit std).

Finally, we define the internal opportunity from relocating employees to regions with a higher level of industrial agglomeration as

$$IOAG_{it} = max\{\frac{AG_{int} - AG_{ict}}{AG_{ict}}, 0\}_{n \in C_b(t)}$$

We regress the labor growth of all firms in the sample, g_{it} (see equation (1)), on these measures of opportunities for reallocation, control variables, and fixed effects. The results are presented in Table 2, column 1.

Results on internal opportunities for reallocation. To begin, we note that all four internal opportunity variables reduce *Labor growth* at the focal firm as predicted. Only the result for labor fit, $IOLF$, is not statistically significant. However, this result changes as we add more control variables below.

The coefficient estimate for $IOLC$, our measure for saving labor costs, is negative and significant at the 10% level. A one-standard deviation increase in $IOLC$ reduces *Labor growth* by 22 bp. This impact is economically meaningful and represents about 11% of the mean (1.936%, see Table 1) and 20% of the median (1.096%) of *Labor growth*. This result obtains after controlling for time varying economic conditions in the focal firm's industry and county as well as firm characteristics. Hence, BGs move operations away from locations characterized by higher labor costs compared to other counties where the same group is active in.

Similarly, the coefficient estimates for $IOLS$, our measure of reallocation opportunities from labor shortages, has a significantly negative impact, as predicted. The size of the effect is similar to that of $IOLC$ and economically meaningful: A one-standard deviation increase in $IOLS$ reduces *Labor growth* by 24 bp. Hence, BGs move operations away from locations that are characterized by more stringent labor shortages compared to other counties where the same group is active in.

Finally, opportunities from agglomeration economies, $IOAG$, also reduce *Labor growth* by 38 bp. As predicted BGs make relocation decision not only based on labor considerations but take into account other factors important for their respective industry.

Overall, we conclude that BG firms grow less in locations that are disadvantageous in terms of local labor costs, labor supply, and agglomeration economies to other counties, where the same group is active in. By contrast, opportunities to improve the labor fit do not have a measurable impact.

3.2 Offering potentials within groups: the recipient perspective

In this section, we ask the same question as in the previous section, but now we take the perspective of a recipient firm. These are the firms that offer opportunities to *other* firms in the same business group for improving with respect to labor costs, labor shortages, labor fit,

and agglomeration economies. We refer to these improvements that BG firms offer as their *internal potential*. Thus, internal potential is the flip-side of internal opportunity. Whereas internal opportunity is defined from the perspective of one donor firm in relation to multiple potential recipients, internal potential is defined from the perspective of a recipient firm in relation to multiple potential donors. Our hypothesis implies that firms should grow more if the BG would benefit from relocating operations to them from other firms within the same group.

Measuring the internal potential from reallocation. We have to compare the potential improvement a firm can offer to the improvements other member firms could offer to the same candidate donor firm. Specifically, consider any firm i that offers an internal opportunity to relocate jobs from another member firm j (donor firm). While this opportunity may be attractive, there could be a third member firm k, such that the opportunity offered by k is even more attractive. We begin by assuming that business groups resolve this issue by simply choosing the best relocation opportunity within the group. Hence, our measures implicitly assume a "winner takes it all" contest in the internal competition for attractive locations within the BG.

To begin, we ask by how much the labor costs (labor shortage, labor fit, agglomeration economies) of BG firm $j \in BG_b(t)$ in county n would improve if it were to relocate its operations to the county c in which the focal firm $i \in BG_b(t)$, which belongs to the same BG, is located. We obtain four measures of internal potential:

$$IPLC_{ict} = \sum_{j \in BG(t)} max_{j \in BG(t)} \left\{ \frac{LC_{jnt} - LC_{jct}}{LC_{jnt}}, 0 \right\} \frac{E_{jnt}}{E_{ict}},$$

$$IPLS_{ict} = \sum_{j \in BG(t)} max_{j \in BG(t)} \left\{ LS_{jnt} - LS_{jct}, 0 \right\} \frac{E_{jnt}}{E_{ict}},$$

$$IPLF_{ict} = \sum_{j \in BG(t)} max_{j \in BG(t)} \left\{ LF_{jct} - LF_{jnt}, 0 \right\} \frac{E_{jnt}}{E_{ict}},$$

$$IPAG_{ict} = \sum_{j \in BG(t)} max_{j \in BG(t)} \left\{ \frac{AG_{jct} - AG_{jnt}}{AG_{jnt}}, 0 \right\} \frac{E_{jnt}}{E_{ict}}$$

The rationale for all four measures is the same, and we discuss that for the $IPLC$ measure in more detail, which proxies for the potential of BG firm i in offering lower labor costs to other BG firms $j \neq i$ of the same business group. For each of these firms, relocation to county c presents an opportunity if two conditions are satisfied: (1) the hypothetical costs firm j would have in county c, LC_{jct}, are lower than its expected costs in county n, LC_{jnt}; (2) there is no other firm k in the group, $k \neq j$ and $k \neq i$, which provides even lower labor costs to

firm j than firm i, so that firm i offers the best opportunity within the same group to firm j. The first condition is expressed in the term $max\left\{\frac{LC_{jnt}-LC_{jct}}{LC_{jnt}}, 0\right\}$, which is positive if and only if firm j in county n can reduce its labor costs by relocating to county c, in which firm i is located. The second condition is expressed by taking the maximum of the ratio $\frac{LC_{jnt}-LC_{jct}}{LC_{jnt}}$ over all firms $j \neq i$ of the same business group. If the focal firm cannot offer a reduction in labor costs, $\frac{LC_{jnt}-LC_{jct}}{LC_{jnt}} < 0$ and $IPLC_{ict} = 0$. If the focal firm offers the lowest labor costs, $IPLC_{ict} > 0$. Note that labor costs (labor shortages, labor fit, agglomeration economies) of firm j in county c, LC_{jct} are calculated with respect to the proportions of the labor force of firm j, not with respect to those of firm i. However, the opportunity is offered by firm i, since it is already located in county c. Finally, we multiply by $\frac{E_{jnt}}{E_{ict}}$, because the potential growth of a candidate recipient firm depends on its size relative to that of the potential donor firms in the same group. The larger the size of the donor relative to the recipient, the more the recipient could potentially grow. Therefore, we weight the potential cost reduction by the relative employment size of the donor (E_{jnt}) to the recipient firm (E_{ict}). All internal potential variables are normalized (zero mean and unit std).

The definitions introduced above all rely on the assumption that BGs relocate always to their best opportunity, and that the size of all other opportunities does not play a role. We believe this is the most plausible assumption, however it is possible that other considerations play a role as well, and there may well be trade-offs between the four dimensions considered here.

Results on internal growth potential from reallocation. Table 2 column 2 includes the four proxies for internal potentials described above, along with the same control variables discussed before. It turns out that the potential from offering lower labor costs to other group firms, $IPLC$, is not significant, which means we do not find evidence that BGs move jobs to the cheapest BG location with respect to labor costs. By contrast, the measure for the potential from increased labor supply, $IPLS$, is always highly significant and positive at 1% level. A one-standard deviation increase in $IPLS$ increases the growth rate of the firm by 45 bp, about one-quarter of the mean of *Labor growth*, and almost half of its median growth rate. The estimates for the proxy for improved matching quality, $IPLF$, are also significant and even slightly larger than those for $IPLS$. A one-standard deviation increase in $IPLF$ increases *Labor growth* by 47 bp. Again, agglomeration economies have the strongest impact on relocation decisions: A one-standard deviation increase in $IPAG$ increases *Labor growth* by 78 bp.

3.3 Combined analysis

The analyses in Table 2 columns 1 and 2 enter variables for reallocation opportunities and for reallocation potentials separately. In columns 3 to 5, we enter them jointly in the same regression to analyze each firm simultaneously as a potential donor and as a potential recipient of jobs that may be transferred to or from other group firms to the focal firm.

The most important insight from columns 3 to 5 of Table 2 is that the results for the variables of interest that proxy for reallocation opportunities ($IOLC$, $IOLS$, $IOAG$) and for potentials ($IPLS$, $IPLF$, $IPAG$) remain similar to those found in columns 1 and 2. In fact, all coefficient estimates become statistically and economically larger if we enter both sets of variables simultaneously and combine the donor perspective with the recipient perspective. This is unsurprising, once we observe that the pairwise correlations between variables in the former group and those in the latter group are always positive but never large, with the highest value being 30%; see Table OA1 in the Online Appendix for correlations.) Hence, it appears that entering the effects from opportunities and potentials separately in Table 2 creates a small bias in absolute value. The largest increase in the size of the effects is for the variables that measure the quality of the skill match, *IOLF* and *IPLF*. *IOLF* increases about nine-fold in absolute value in column 4 relative to the corresponding estimates in column 1 and becomes highly significant.

Control variables. The size and statistical significance of the coefficients for the control variables remain more or less unchanged across the different specifications in Table 2. In general, larger and older firms grow slower in line with the prior literature (e.g., Mansfield, 1962; Harhoff, Stahl, and Woywode, 1998). *Age* and *Size* have both have a negative impact on growth: A one-standard deviation in *Size* (*Age*) reduces *Labor growth* by 119-192 bps (87-109 bps), with the coefficient on *Size* increasing toward the upper end of its range in those specifications that control for the quality of the work force. Since larger firms have a more educated and qualified workforce, adding these controls removes the confounding positive influence of these variables on growth from *Size*.[13]

We control for the importance of a firm for the entire group by using the variable *Fraction BG*, which is the percentage of the focal firm's assets in the assets of the entire group. Firms with a higher value of *Fraction BG* are more likely part of the core segments of the group and thus more important for the group than peripheral firms with a lower *Fraction BG* (see Maksimovic and Phillips (2002) for a related notion and results that support this assumption).

[13]From Table 1, one standard deviation of *Size* is 1.85 and its inter-quartile range is 2.04. *Size* is defined as the logarithm of total assets. Hence, a one-standard deviation increase in *Size* corresponds to an increase of total assets by a factor of 6.3.

This variable has the strongest impact if we enter it along measures of reallocation potentials (columns 2 to 5): A one-standard deviation increase in *Fraction BG* (33%) increases *Labor growth* by 0.13 (column 1) to 65 pp (column 2). Hence, core BG firms grow faster than peripheral firms. In this regard, we also control for very small firm by introducing the indicator variable *Small firm*, which equals one for firms with less than ten employees, which are also subject to more lenient labor regulation in Germany. At the same time, these firms are necessarily on the periphery of BGs, and firms in this category grow significantly less, their *Labor growth* is lower by about 11 to 14 percentage points.

Labor cost and *Labor shortage* itself have no significant impact on *Labor growth*. Surprisingly, *Labor fit* and *Agglomeration* have a negative impact on *Labor growth*. *Education* and *Qualification* both have a strong and positive impact on *Labor growth*. We hypothesize that firms in knowledge-intensive industries and with more knowledge-intensive and skill-intensive technologies grow faster. However, we note that all regressions already control for industry-year fixed effects. Hence, the effects of *Education* and *Qualification* describe within-industry-year variation and are thus surprisingly strong. A one-standard deviation increase in the scores for *Education* (*Qualification*) is associated with about 2.7 (0.9) percentage point higher *Labor growth*.

Summary. Our focal question is how BGs move jobs between firms in different locations as a function of the variation in labor market conditions. We find that BGs move jobs across counties if the destination county has lower labor costs, higher labor supply, and if it has more employees with skills that match the requirements of the firm. Also agglomeration economies are important to explain job flows. Note that our opportunity and potential variables measure opportunities for donor firms in BGs to move production to destination firms in the same group, in addition to any time-varying industry or county characteristics. Hence, the incremental influence of labor costs, labor shortages, and labor fit *in addition* to these controls is significant.

3.4 External and internal growth

In this section, we break down labor growth into one component that captures the labor flows between firms that belong to the same business group, and a second component that captures the labor flows between BG firms and the outside labor external component. Specifically, we define *Internal labor growth*, g_{it}^{I}, as the growth rate that results only from those changes in employment that involve firms of the same group, i.e., separations from firm i when its employees are hired by another group firm, and hirings of firm i of employees from other group firms. Similarly, *External labor growth*, g_{it}^{X}, is the growth rate from changes in employment

that involve flows between group firm i and the external labor market, which includes flows to and from domestic firms that do not belong to the same group, foreign firms, training, retirement, or unemployment. We provide more precise definitions in Appendix A.1 and show that these growth rates decompose *Labor growth* such that

$$g_{it} = g_{it}^{I} + g_{it}^{X}. \tag{2}$$

We now use the same regression specification as before, but use *Internal labor growth* and *External labor growth* separately as dependent variables. We now always include variables that measure opportunities and potentials simultaneously. (Hence, the specifications here correspond to columns 3 to 5 of Table 2.) The results are reported in Table 3. Columns 1 to 3 report the estimates with *Internal labor growth* as the dependent variable, whereas columns 4 to 6 contain those for *External labor growth*. To gauge the relative importance of internal growth and external growth, column 7 reports the ratio of the coefficient estimates in column 6 to the sum of the coefficients of columns 3 and 6. Since the internal and external growth add up as in equation (2), the sum of the coefficient estimates in columns 3 and 6 of Table 3 have to add up to those in column 5 of Table 2 by construction. Hence, we treat the ratios reported in column 7 as a measure of the relative importance of internal labor markets to the overall *Labor growth* of firms.

Results. Before discussing the individual coefficients in Table 3, note that the unconditional means of Internal labor growth and External labor growth are very different: On average, *Labor growth* is 1.936%, of which 1.893 percentage points (98%) are external, and the remaining 0.042 percentage points (2%) are internal. Hence, we expect the coefficients with *External labor growth* as the dependent variable to be larger than those for *Internal labor growth* by a factor of about 50. This is qualitatively in line with what we find, although the results are not quite as extreme. Column 7 shows that for most independent variables, about 75% to 95% of the overall impact can be attributed to the association with *External labor growth*; only 5% to 25% can be attributed to the association with *Internal labor growth.* In all cases in which the coefficient in column 5 of Table 2 is statistically significant, the corresponding coefficient for external flows in column 6 of Table 3 is also significant, whereas the coefficients for internal flows in column 3 are often insignificant. Hence, the corresponding independent variable is associated with significant changes in *External labor growth*, but not with corresponding changes in *Internal labor growth*.

There is one noteworthy exception from this pattern. In particular, for *Fraction BG*, the coefficients on *External labor growth* and *Internal labor growth* have opposite signs, and both have a meaningful economic magnitude: A one-standard deviation increase in *Fraction BG*

increases *External labor growth* by 40-50 bps, whereas it decreases *Internal labor growth* by 10 to 11 bps. Firms' reliance on internal and external labor markets switches with their size relative to the BG: relatively larger firms grow less through internal labor markets and more through external labor markets. This result makes intuitive sense as the potential to grow through internal labor market decreases the larger a firm becomes within a BG.

3.5 When do business groups exit?

The analysis so far is focused entirely on the intensive margin of job flows between locations and takes the membership of the business group at each point in time as given. In the next step, we analyze decisions in which business groups exit or enter certain locations. In this section, we analyze exits. Note that in our context, an exit refers to a BGs decision to divest or dissolve an existing firm meaning leaving a location in which it has been present so far. We analyze exit decisions on the firm-level with two different dependent variables: (1) using an exit dummy variable and perform linear probability regressions, (2) using the fraction of employees leaving the BG and perform OLS regressions. The dummy variable *Exit* equals one if firm i in county c is disaffiliated from a BG in year t and consequently the BG loses its presence in county c and zero otherwise. Please note that the opportunity and potential variables are by construction non-decreasing in the number of counties where a BG is present. That means, there exists a mechanically positive correlation between the IO/IP variables and geographical reach. At the same time it is easier for BGs with wider geographical reach to exit local markets because exiting one county has less disruptive impact on the overall operations. Consequently, there exists a mechanically positive correlation between exits and IO/IP variables. This positive correlation is emphasized when treating all exits equally like in a linear probability model with an exit dummy as dependent variable. In other words, the dummy indicator over weighs economically insignificant exits by BGs with a wide geographical reach. Therefore, we define a second exit variable that weights the exit decision with its economic importance (i.e., fraction of employees affected) for the BG. *Exit LW* is the fraction of employees leaving the BG if firm i in county c is disaffiliated from a BG in year t (i.e., *Exit* equals one) and zero otherwise.

The results are presented in Table 4. Since a complete exit from a location is an extreme form of shrinking the operations in that location, our baseline assumption is that the coefficients with *Exit* as the dependent variable are significant whenever those with *Labor growth* are significant, albeit with opposite signs. With a few exceptions, this prediction is supported for most independent variables. In particular, the estimates for opportunities, *IOLC*, *IOAG*, (potentials, *IPLC*, *IPAG*) always have the predicted positive (negative) sign in the exit-regressions in Table 4; they also have the corresponding negative (positive) signs

in the intensive-margin regressions in Table 2.

Two important deviations from this pattern are *IPLS*, the measure of potentials from shifting jobs to other locations with more labor supply, and *IPLF*, the measure of potentials from shifting jobs to other locations with better labor fit. Both are highly significant and positive in columns 1 to 3, which is puzzling. We would expect a negative coefficient here. However, once we use the fraction of BG employees that leave the BG after an exit (*Exit LW*) we obtain the predicted sign across all opportunity and potential variables.

Age, and *Fraction BG* both reduce the probability of exit, in line with the notion that BGs are unlikely to divest mature or core businesses. Hence, larger firms grow less at the intensive margin, but they are also less likely to be divested. Different from the intensive-margin analyses, *Education* (*Qualification*) has no (only marginal) impact.

3.6 Entry: Growth at the extensive margin

We continue with the discussion of entry decisions. In our context, entry refers to a BGs decision to acquire an existing firm or a green field investment in a location in which it has not been present so far, and we refer to BG growth through acquisitions as growth at the extensive margin. As mentioned above, while we can analyze exit decisions at the firm level, we cannot do the same for entry decisions, since firm-level analyses presume that a firm already is a member of a BG. Accordingly, we perform analysis of entry decisions at the group level and define three different group-level variables that measure extensive growth: (1) *Entry* (*Exit*) dummy, which equal one if a BG enters at least one new county (exits from at least one county) in year t, *Entry* (*Exit*) count, which is the number of counties a BG enters (exits) in year t, and (3) *Entry LW* (*Exit LW*), which is the fraction of employees joining (leaving) the BG by entering (exiting) counties in year t.

Our hypothesis does not distinguish between growth at the extensive and at the intensive margin. In particular, BGs may enter a new location that promises better conditions, i.e., lower labor costs, fewer shortages, and a better labor fit, just as much as it can transfer operations to an existing location. The main difference between entering new locations through an acquisition compared to using already existing locations is that the former requires the group to identify a target and invest the additional time and fixed costs for completing an additional acquisition. If these costs are significant, the hurdle for entry is accordingly higher, and we would expect entries into new locations only if the prospects of the new location are significantly better than those of all existing locations.

Table 5 presents the results for the group-level analyses. Columns 1 to 3 (4 to 6) show results for the three exit (entry) variables as the dependent variable. All columns include year and BG-level fixed effects, thus rely only on the within-group variation. As a baseline,

we expect that the results for *Exit* are similar to those in Table 4, whereas those for *Entry* have the opposite signs.

To begin, we focus on the results for *Exit* . These results fully conform to our expectations. All three labor variables (*IOLC*, *IOLS*, *IOLF*) as well as agglomeration (*IOAG*) have the predicted positive signs in line with our results from Table 4. Most importantly, opportunities from saving labor costs through moving across locations, *IOLC*, now turn out to be statistically and economically significant and of first-order importance: The probability of exiting a county increases by 1.8% for a one-standard deviation increase in *IOLC*. In relation to the unconditional sample means of *Exit* (2.1%) (see Panel B of Table 1), this effects represents about 85% of the unconditional sample mean. These results affirm our prior conclusion that labor costs are highly relevant for location decisions of BG. The results for opportunities from improved labor fit are of comparable magnitude: A one-standard deviation increase in *IOLF* increases the likelihood of exit by 2.3% (109% of the sample mean). In contrast, the results for labor shortage are economically somewhat weaker: A one-standard deviation increase in *IOLS* increases the likelihood of exit by 0.6% and reduces the likelihood of entry by 1.2%.

The results for the internal opportunity variables in the *Entry* regressions have the opposite sign of those found in the *Exit* regressions and the magnitudes are comparable. For BG with larger internal opportunities we find lower probabilities to enter new locations. The economic significance is again large, in particular with respect to labor costs and labor fit. A one-standard deviation increase in *IOLC* (*IOLF*) decreases the likelihood of entry by 2.5% (2.2%), which is 70% (61%) of the sample mean.

4 Conclusion

This paper studies the intensive and extensive employment growth of business groups and of firms that are affiliated with business groups. We explore a specific hypothesis about how business groups may add value: By operating firms in multiple locations, they can move operations and jobs between affiliated firms, thus avoiding the fixed costs of greenfield investments and setting up new firms. Incentives to move operations may arise if critical resources are available more abundantly and more cheaply in some locations than others. Specifically, we explore how firms move jobs across local labor markets and measure the attractiveness of local labor markets along three dimensions: the costs of labor, the tightness of the labor market, and the labor fit of BG firms to the local labor market. We find that all three dimensions are of first order importance for growth at the intensive and extensive margins. We find that labor conditions are of similar importance for location decisions of

BG firms as agglomeration economies.

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A Appendix

A.1 Growth rates

We use the following definitions:

Symbol	Definition
E_{ict}	Number of all employees employed in firm i located in county c at the end of year t.
H_{ict}	Number of employees who enter firm i located in county c in period t, i.e. between the end of year $t-1$ and the end of year t.
S_{ict}	Number of employees who are separated from firm i located in county c in period t, i.e. between the end of year $t-1$ and the end of year t.

A.1.1 Internal and external growth rates

From our definitions above, we obtain

$$\Delta E_{ict} \equiv E_{ict} - E_{ic,t-1} = H_{ict} - S_{ict}. \tag{3}$$

Hence, we can rewrite the growth rate (1) as:

$$g_{ict} = \frac{H_{ict} - S_{ict}}{0.5\left(E_{it} + E_{i,t-1}\right)}. \tag{4}$$

We define one-year hiring rates and separation rates as

$$h_{ict} = \frac{H_{ict}}{0.5\left(E_{ict} + E_{ic,t-1}\right)},\ s_{jt} = \frac{S_{ict}}{0.5\left(E_{ict} + E_{ic,t-1}\right)}. \tag{5}$$

From (3), (4), and ((5)), we have

$$g_{ict} = h_{ict} - s_{ict}. \tag{6}$$

Next, we decompose hirings and separations into an internal component and an external component:

$$\begin{aligned} H_{it} =& H_{it}^{I} + H_{it}^{X} \\ S_{it} =& S_{it}^{I} + S_{it}^{X}, \end{aligned} \tag{7}$$

where the superscript "I" refers to internal flows and the superscript "X" refers to external flows. We define a flow as internal whenever an employee moves jobs between two firms that belong to the same BG at the time of the move. Accordingly, we define *Internal labor growth*

as

$$g_{it}^{I} = \frac{H_{it}^{I} - S_{i,t-1}^{I}}{0.5\left(E_{it} + E_{i,t-1}\right)}, \tag{8}$$

and *External labor growth* as

$$g_{it}^{X} = \frac{H_{it}^{X} - S_{i,t-1}^{X}}{0.5\left(E_{it} + E_{i,t-1}\right)}. \tag{9}$$

With these definitions, we obtain equation (2) in the text from (4) and (7).

A.2 Variable definitions

Table A1: Description of variables. The table defines the main numerical variables used in the paper. All other variables are defined in the respective captions of the tables using them.

Table A1: Description of variables (continued).

Variable	Definition
Panel A: Firm-level variables	
Labor growth	Employment growth rate from t-1 to t as defined in Section 2.2.1 and Appendix A.1
Internal labor growth	Internal employment growth rate from t-1 to t as defined in Appendix A.1
External labor growth	External employment growth rate from t-1 to t as defined in Appendix A.1
Exit	Dummy. Equals one if a BG firm is no longer affiliated to a BG and, consequently, the BG loses its presence in the BG firm's county of residence and remains absent for the rest of the sample period. Equals zero otherwise.
Exit LW	Equals the ratio of employee count of the exitting firm to the employee count of the BG if Exit equals one. Equals zero otherwise.
Labor cost	A firm's expected labor cost in a county given its job profile, calculated as the job-weighted average of county-level average wages across 12 Blossfeld job categories. See Section 2.2.2.
Labor shortage	A firm's expected labor shortage in a county given its average industry job profile, calculated as the job-weighted average of county-level unexpected labor demand rise across 12 Blossfeld job categories. See Section 2.2.2.
Labor fit	A firm's expected labor fit in a county given its average industry job profile, calculated as the Manhattan distance between the job profile demanded by the industry and the job profile supplied by a county across 12 Blossfeld job categories. See Section 2.2.2.
Agglomeration	The level of spatial agglomeration for an industry in a county, proxied by the number of firms affiliated to a given industry and headquartered in a given county. See Section 2.2.2.
IOLC	Internal opportunity with respect to labor cost. The maximum cut in labor cost a BG firm could achieve if it hires all of ist employees in another county where the BG is present. See Section 3.1.
IOLS	Internal opportunity with respect to labor supply. The maximum relief in labor shortage a BG firm could achieve if it hires all of ist employees in another county where the BG is present. See Section 3.1.
IOLF	Internal opportunity with respect to labor fit. The maximum improvement of labor fit a BG firm could achieve if it hires all of its employees in another county where the BG is present. See Section 3.1.
IOAG	Internal opportunity with respect to agglomeration. The largest extent to get closer to competitors a BG firm could achieve if it hires all of its employees in another county where the BG is present. See Section 3.1.
IPLC	Internal potential with respect to labor cost. The maximum labor cost cut a BG firm could contribute by allowing affiliated firms to relocate their employees towards it. See Section 3.2.
IPLS	Internal potential with respect to labor supply. The maximum labor shortage relief a BG firm could contribute by allowing affiliated firms to relocate their employees towards it. See Section 3.2.
IPLF	Internal potential with respect to labor fit. The maximum labor fit improvement a BG firm could contribute by allowing affiliated firms to relocate their employees towards it. See Section 3.2.
IPAG	Internal potential with respect to agglomeration. The largest extent to get closer to competitors a BG firm could contribute by allowing affiliated firms to relocate their employees towards it. See Section 3.2.
Size	Total assets in logarithm.
Age	Firm age.
Fraction BG	Firm asset divided by BG asset.
Small firm	Dummy. Equals one if a firm has fewer than 10 employees, and zero otherwise.
Education	A firm's weighted average of employee education ranks (4 categories).
Qualification	A firm's weighted average of employee qualification ranks (4 categories).

Table A1: Description of variables (continued).

Variable	Definition
Panel B: BG-level variables	
Entry	Dummy. Equals one if a BG gains its presence in a county for the first time in the sample period. Equals zero otherwise.
Entry count	Number of counties a BG enters.
Entry LW	Equals the fraction of workers added by entering counties.
Exit	Dummy. Equals one if a BG loses its presence in a county. Equals zero otherwise.
Exit count	Number of counties a BG exits from.
Exit LW	Equals the fraction of workers lost by exiting from counties.
Labor cost	Labor-weighted average of the firm-level version.
Labor supply	Labor-weighted average of the firm-level version.
HCR	Labor-weighted average of the firm-level version.
IOLC	Labor-weighted average of the firm-level version.
IOLS	Labor-weighted average of the firm-level version.
IOLF	Labor-weighted average of the firm-level version.
IOAG	Labor-weighted average of the firm-level version.
Size	Total assets of all firms with a BG in logarithm.
Age	Labor-weighted average of the firm-level version.
Education	Labor-weighted average of the firm-level version.
Qualification	Labor-weighted average of the firm-level version.

B Figures

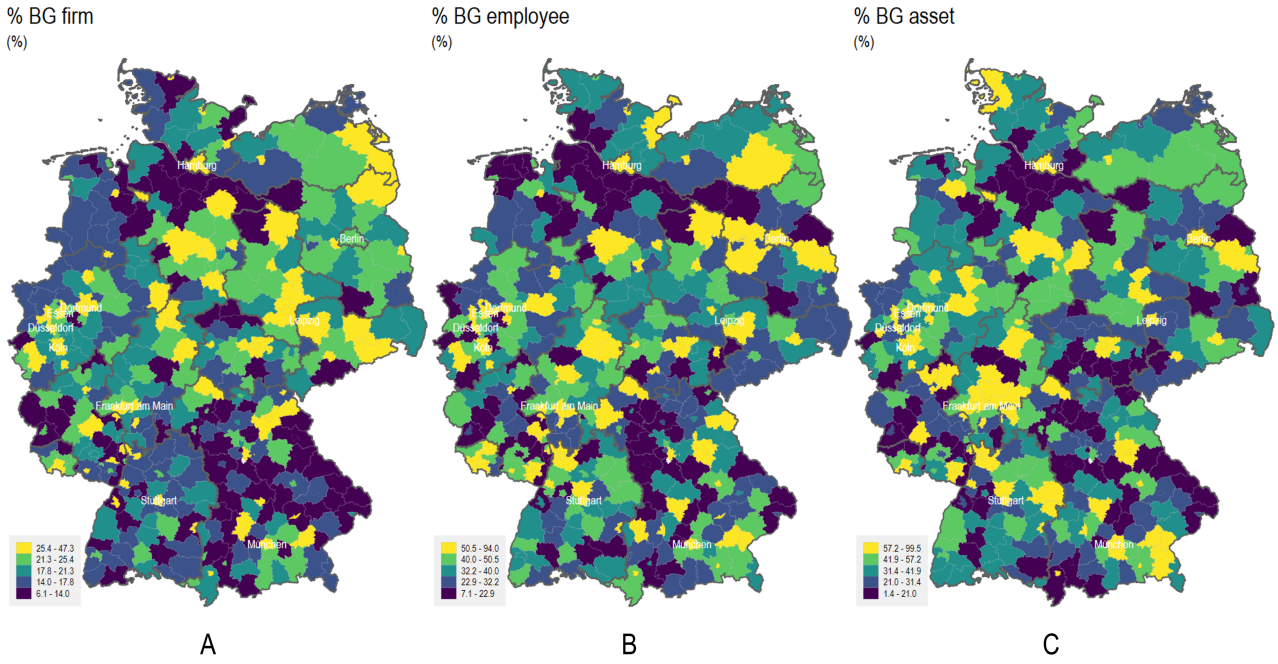

Figure 1: Geographical distribution of BG firms across Germany. This figure plots the distribution of business group firms across 400 German counties 2005 through 2017. Each variable plotted are calculated on the county-year level, averaged across all sample years, sorted into quintiles and marked with different colors. The range of each quintiles is given in the legend of reach panel. Panel A plots the number of BG firms as a percentage of all firms. Panel B plots the total number of employees of BG firms as a percentage of the total number of employees of all firms. Panel C plots the total amount of asset owned by BG firms as a percentage of total assets of all firms.

C Tables

Table 1: Summary statistics. This table provides descriptive statistics for all numerical variables. All variables are defined in Table A1.

Table 1: Summary statistics (continued).

	N	Mean	SD	P1	P25	P50	P75	P99
Panel A: Firm-level variables								
Labor growth	97,390	1.936	24.224	-83.974	-4.138	1.096	8.418	78.594
Internal labor growth	97,390	0.042	8.948	-21.818	-0.989	0.000	0.962	23.077
External labor growth	97,390	1.893	21.781	-68.182	-3.802	0.976	7.947	66.667
Exit	97,390	0.008	0.090	0.000	0.000	0.000	0.000	0.000
Exit LW	97,390	0.001	0.024	0.000	0.000	0.000	0.000	0.000
Labor cost	97,390	122.908	33.662	62.692	100.255	117.487	140.266	225.316
Labor shortage	97,390	0.000	0.019	-0.053	-0.009	0.000	0.009	0.056
Labor fit	97,390	-0.869	0.233	-1.409	-1.033	-0.879	-0.700	-0.388
Agglomeration	97,390	16.572	31.087	1.000	3.000	6.000	16.000	129.000
IOLC	97,390	0.000	1.000	-0.617	-0.617	-0.617	0.345	3.862
IOLS	97,390	0.000	1.000	-0.580	-0.580	-0.580	0.264	4.311
IOLF	97,390	0.000	1.000	-0.608	-0.608	-0.608	0.332	3.678
IOAG	97,390	0.000	1.000	-0.376	-0.376	-0.376	-0.166	5.825
IPLC	97,390	0.000	1.000	-0.199	-0.199	-0.199	-0.181	8.130
IPLS	97,390	0.000	1.000	-0.229	-0.229	-0.229	-0.192	7.278
IPLF	97,390	0.000	1.000	-0.228	-0.228	-0.228	-0.184	7.288
IPAG	97,390	0.000	1.000	-0.223	-0.223	-0.223	-0.198	6.928
Size	97,390	15.936	1.847	11.894	14.879	15.859	16.916	21.126
Age	97,390	25.711	30.159	2.000	9.000	17.000	28.000	146.000
Fraction BG	97,390	0.363	0.331	0.000	0.055	0.265	0.631	1.000
Small firm	97,390	0.100	0.300	0.000	0.000	0.000	0.000	1.000
Education	97,390	2.057	0.306	1.353	1.882	2.000	2.197	3.000
Qualification	97,390	1.820	0.444	1.000	1.480	1.880	2.090	3.000
Panel B: BG-level variables								
Entry	35,893	3.558	18.524	0.000	0.000	0.000	0.000	100.000
Entry count	35,893	0.052	0.350	0.000	0.000	0.000	0.000	1.000
Entry LW	35,893	0.783	5.987	0.000	0.000	0.000	0.000	29.245
Exit	35,893	2.067	14.229	0.000	0.000	0.000	0.000	100.000
Exit count	35,893	0.034	0.335	0.000	0.000	0.000	0.000	1.000
Exit LW	35,893	0.514	5.061	0.000	0.000	0.000	0.000	17.413
Labor cost	35,893	122.494	29.845	64.766	102.877	118.541	137.685	214.416
Labor shortage	35,893	0.000	0.018	-0.052	-0.008	0.000	0.008	0.055
Labor fit	35,893	-0.862	0.200	-1.352	-1.006	-0.856	-0.725	-0.429
Agglomeration	35,893	15.441	26.742	0.978	3.595	7.099	15.799	118.448
IOLC	35,893	0.014	1.016	-0.605	-0.605	-0.545	0.270	3.858
IOLS	35,893	0.023	1.011	-0.559	-0.559	-0.504	0.229	4.277
IOLF	35,893	0.008	1.004	-0.604	-0.604	-0.573	0.254	3.733
IOAG	35,893	0.008	1.004	-0.384	-0.384	-0.384	-0.103	4.764
Size	35,893	17.258	1.731	13.530	16.206	17.062	18.174	22.349
Age	35,893	30.067	30.712	2.090	12.500	20.676	36.369	137.634
Education	35,893	2.023	0.244	1.424	1.888	2.000	2.134	2.735
Qualification	35,893	1.786	0.355	1.032	1.536	1.813	2.021	2.714

Table 2: Firm growth and opportunities for reallocation. This table reports panel regressions of firm-level labor growth against internal opportunity measures, internal potential measures, other control variables and fixed effects under various specifications. Labor growth is calculated as the net rate of hiring and separation. All independent variables are lagged by one year and all coefficients are multiplied by 100. $IOLC$, $IOLS$, $IOLF$ and $IOAG$ measure the opportunity for a BG firm to reduce labor cost, relieve labor shortage, improve labor fit, and exploit industrial agglomeration by hiring its employees in another county where the BG is present. $IPLC$, $IPLS$, $IPLF$ and $IPAG$ measure the potential for a BG firm to contribute to reducing labor cost, relieving labor shortage, improving labor fit, and exploiting industrial agglomeration by allowing affiliated firms to relocate their employees towards it. The previous eight variables are normalized to zero mean and unit standard deviation. *Labor cost*,*Labor shortage*, and *Labor fit* measure a firm's expected labor cost, labor shortage and labor fit in a county given its average industry job profile. *Agglomeration* measures the level of agglomeration of the industry to which a firm is affiliated in a county. *Size* is firm total asset in logarithm. *Age* is calculated as years since incorporation. *Fraction BG* is the fraction of total BG asset accounted for by a firm. *Small firm* indicates firms with fewer than 10 employees. *Education* and *Qualification* measure the education level and professional qualification level of a firm's employees. All variables are defined in Table A1 in the Appendix. Standard errors are clustered at the firm-level and t-statistics are presented in parentheses below the coefficients. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 2: Firm growth and opportunities for reallocation (continued).

Dep. var.	Labor growth(%)				
	(1)	(2)	(3)	(4)	(5)
$IOLC_{t-1}$	-0.222*		-0.604***	-0.560***	-0.444***
	(-1.70)		(-4.54)	(-4.11)	(-3.29)
$IOLS_{t-1}$	-0.239**		-0.379***	-0.364***	-0.342***
	(-2.18)		(-3.45)	(-3.14)	(-2.96)
$IOLF_{t-1}$	-0.047		-0.154	-0.400***	-0.386***
	(-0.41)		(-1.34)	(-2.98)	(-2.90)
$IOAG_{t-1}$	-0.379***		-0.421***	-0.390***	-0.361***
	(-3.43)		(-3.68)	(-3.40)	(-3.17)
$IPLC_{t-1}$		-0.050	0.123	0.142	0.151
		(-0.37)	(0.88)	(1.02)	(1.09)
$IPLS_{t-1}$		0.445***	0.498***	0.501***	0.412***
		(3.30)	(3.67)	(3.69)	(3.07)
$IPLF_{t-1}$		0.474***	0.564***	0.569***	0.445***
		(2.97)	(3.51)	(3.54)	(2.74)
$IPAG_{t-1}$		0.777***	0.863***	0.888***	0.790***
		(5.02)	(5.46)	(5.59)	(5.01)
$Size_{t-1}$	-0.645***	-0.805***	-0.665***	-0.647***	-1.038***
	(-8.49)	(-10.86)	(-8.75)	(-8.51)	(-13.31)
Age_{t-1}	-0.035***	-0.036***	-0.035***	-0.035***	-0.029***
	(-8.20)	(-8.29)	(-8.13)	(-8.26)	(-7.36)
Fraction BG_{t-1}	0.393	1.958***	0.977***	0.875**	1.209***
	(1.15)	(5.98)	(2.84)	(2.54)	(3.50)
Small $firm_{t-1}$	-10.657***	-11.516***	-11.804***	-11.876***	-13.638***
	(-21.32)	(-22.10)	(-22.56)	(-22.63)	(-25.28)
Labor $cost_{t-1}$				-0.005	-0.013
				(-0.41)	(-1.17)
Labor $shortage_{t-1}$				10.150	10.141
				(1.07)	(1.08)
Labor fit_{t-1}				-3.783***	-4.123***
				(-3.09)	(-3.37)
$Agglomeration_{t-1}$				-0.009*	-0.009*
				(-1.91)	(-1.76)
$Education_{t-1}$					8.702***
					(15.47)
$Qualification_{t-1}$					2.1114***
					(5.68)
Industry × year FE	Yes	Yes	Yes	Yes	Yes
County × year FE	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.030	0.032	0.033	0.033	0.044
N	97,389	97,389	97,389	97,389	97,389

Table 3: Movements of jobs and movements of employees. This table reports panel regressions of firm-level internal and external labor growth against internal opportunity measures, internal potential measures, other control variables and fixed effects under various specifications. Internal labor growth is calculated as the net rate of hiring and separation from/to affiliated firms. External labor growth is calculated as the net rate of hiring and separation from/to outside the BG. All independent variables are lagged by one year and all coefficients are multiplied by 100. $IOLC$, $IOLS$, $IOLF$ and $IOAG$ measure the opportunity for a BG firm to reduce labor cost, relieve labor shortage, improve labor fit, and exploit industrial agglomeration by hiring its employees in another county where the BG is present. $IPLC$, $IPLS$, $IPLF$ and $IPAG$ measure the potential for a BG firm to contribute to reducing labor cost, relieving labor shortage, improving labor fit, and exploiting industrial agglomeration by allowing affiliated firms to relocate their employees towards it. The previous eight variables are normalized to zero mean and unit standard deviation. *Labor cost*,*Labor shortage*, and *Labor fit* measure a firm's expected labor cost, labor shortage and labor fit in a county given its average industry job profile. *Agglomeration* measures the level of agglomeration of the industry to which a firm is affiliated in a county. *Size* is firm total asset in logarithm. *Age* is calculated as years since incorporation. *Fraction BG* is the fraction of total BG asset accounted for by a firm. *Small firm* indicates firms with fewer than 10 employees. *Education* and *Qualification* measure the education level and professional qualification level of a firm's employees. All variables are defined in Table A1 in the Appendix. Standard errors are clustered at the firm-level and t-statistics are presented in parentheses below the coefficients. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 3: Movements of jobs and movements of employees (continued).

	Dependent variable						% Ext.
	Internal labor growth(%)			External labor growth(%)			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)
$IOLC_{t-1}$	-0.109**	-0.088*	-0.069	-0.494***	-0.473***	-0.375***	84.4%
	(-2.54)	(-1.96)	(-1.55)	(-4.09)	(-3.81)	(-3.04)	
$IOLS_{t-1}$	-0.128***	-0.127***	-0.124***	-0.251**	-0.237**	-0.218**	63.7%
	(-3.49)	(-3.36)	(-3.28)	(-2.49)	(-2.22)	(-2.05)	
$IOLF_{t-1}$	0.029	-0.034	-0.032	-0.183*	-0.366***	-0.354***	91.7%
	(0.76)	(-0.75)	(-0.72)	(-1.73)	(-2.98)	(-2.89)	
$IOAG_{t-1}$	-0.064*	-0.054	-0.050	-0.356***	-0.336***	-0.311***	86.2%
	(-1.83)	(-1.54)	(-1.42)	(-3.38)	(-3.16)	(-2.95)	
$IPLC_{t-1}$	-0.058	-0.053	-0.051	0.181	0.195	0.202	-
	(-1.04)	(-0.95)	(-0.92)	(1.43)	(1.55)	(1.61)	
$IPLS_{t-1}$	0.118**	0.118**	0.104*	0.381***	0.383***	0.308**	74.8%
	(2.07)	(2.07)	(1.83)	(3.14)	(3.16)	(2.57)	
$IPLF_{t-1}$	0.137**	0.140**	0.120*	0.428***	0.429***	0.325**	73.0%
	(2.06)	(2.10)	(1.82)	(3.06)	(3.08)	(2.29)	
$IPAG_{t-1}$	0.169***	0.172***	0.156***	0.694***	0.716***	0.634***	80.2%
	(3.05)	(3.07)	(2.80)	(4.90)	(5.04)	(4.49)	
$Size_{t-1}$	-0.023	-0.019	-0.079***	-0.642***	-0.628***	-0.958***	92.3%
	(-0.90)	(-0.75)	(-3.00)	(-9.29)	(-9.07)	(-13.47)	
Age_{t-1}	-0.005***	-0.005***	-0.004***	-0.031***	-0.031***	-0.026***	87.4%
	(-4.01)	(-4.04)	(-3.26)	(-7.89)	(-7.99)	(-7.16)	
Fraction BG_{t-1}	-0.325***	-0.345***	-0.291**	1.302***	1.220***	1.500***	124.1%
	(-2.83)	(-2.98)	(-2.50)	(4.11)	(3.84)	(4.72)	
Small $firm_{t-1}$	-1.457***	-1.476***	-1.749***	-10.347***	-10.400***	-11.889***	87.2%
	(-7.02)	(-7.10)	(-8.26)	(-21.99)	(-22.03)	(-24.46)	
Labor $cost_{t-1}$		-0.005	-0.007*		0.001	-0.006	-
		(-1.50)	(-1.86)		(0.09)	(-0.61)	
Labor $supply_{t-1}$		2.332	2.313		7.818	7.828	-
		(0.71)	(0.71)		(0.91)	(0.91)	
Labor fit_{t-1}		-0.978**	-1.041**		-2.805**	-3.082***	74.8%
		(-2.38)	(-2.53)		(-2.51)	(-2.76)	
$Agglomeration_{t-1}$		-0.001	-0.001		-0.009*	-0.008*	94.3%
		(-0.32)	(-0.24)		(-1.91)	(-1.80)	
$Education_{t-1}$			1.457***			7.245***	83.3%
			(7.11)			(14.11)	
$Qualification_{t-1}$			0.243*			1.868***	88.5%
			(1.81)			(5.48)	
Industry × year FE	Yes	Yes	Yes	Yes	Yes	Yes	
County × year FE	Yes	Yes	Yes	Yes	Yes	Yes	
Adj. R^2	-0.001	-0.001	0.001	0.040	0.040	0.050	
N	97,389	97,389	97,389	97,389	97,389	97,389	

Table 4: Firm-level analysis of exits. This table reports panel regressions of firm-level exiting decision variables against internal opportunity measures, internal potential measures, other control variables and fixed effects under various specifications. *Exit* is a dummy that equals one of a firm is no long affiliated and, consequently, the BG loses its presence in a county. *Laborweighted exit* is calculated as the fraction of BG employees lost after exiting a county. All independent variables are lagged by one year multiplied by 100. $IOLC$, $IOLS$, $IOLF$ and $IOAG$ measure the opportunity for a BG firm to reduce labor cost, relieve labor shortage, improve labor fit, and exploit industrial agglomeration by hiring its employees in another county where the BG is present. $IPLC$, $IPLS$, $IPLF$ and $IPAG$ measure the potential for a BG firm to contribute to reducing labor cost, relieving labor shortage, improving labor fit, and exploiting industrial agglomeration by allowing affiliated firms to relocate their employees towards it. The previous eight variables are normalized to zero mean and unit standard deviation. *Labor cost*,*Labor shortage*, and *Labor fit* measure a firm's expected labor cost, labor shortage and labor fit in a county given its average industry job profile. *Agglomeration* measures the level of agglomeration of the industry to which a firm is affiliated in a county. *Size* is firm total asset in logarithm. *Age* is calculated as years since incorporation. *Fraction BG* is the fraction of total BG asset accounted for by a firm. *Small firm* indicates firms with fewer than 10 employees. *Education* and *Qualification* measure the education level and professional qualification level of a firm's employees. All variables are defined in Table A1 in the Appendix. Standard errors are clustered at the firm-level and t-statistics are presented in parentheses below the coefficients. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 4: Firm-level analysis of exits (continued).

Dep. var.	Exit(%)			Exit LW(%)		
	(1)	(2)	(3)	(4)	(5)	(6)
$IOLC_{t-1}$	0.135***	0.115**	0.117**	0.024*	0.020	0.020
	(2.65)	(2.22)	(2.27)	(1.88)	(1.57)	(1.54)
$IOLS_{t-1}$	0.231***	0.256***	0.257***	0.026**	0.026**	0.026**
	(4.56)	(5.01)	(5.03)	(2.00)	(1.98)	(1.97)
$IOLF_{t-1}$	0.299***	0.351***	0.352***	0.040***	0.058***	0.057***
	(5.82)	(6.40)	(6.41)	(3.17)	(3.88)	(3.88)
$IOAG_{t-1}$	0.249***	0.244***	0.245***	0.029**	0.026*	0.026*
	(4.55)	(4.44)	(4.45)	(2.13)	(1.95)	(1.94)
$IPLC_{t-1}$	-0.145***	-0.153***	-0.154***	-0.038***	-0.040***	-0.040***
	(-2.60)	(-2.74)	(-2.74)	(-4.66)	(-4.89)	(-4.89)
$IPLS_{t-1}$	0.133**	0.133**	0.131**	-0.014*	-0.014*	-0.014*
	(2.33)	(2.34)	(2.30)	(-1.81)	(-1.84)	(-1.80)
$IPLF_{t-1}$	0.173***	0.174***	0.172***	-0.014**	-0.014**	-0.014**
	(2.74)	(2.76)	(2.72)	(-2.46)	(-2.49)	(-2.43)
$IPAG_{t-1}$	-0.082	-0.093*	-0.094*	-0.013***	-0.015***	-0.015***
	(-1.54)	(-1.75)	(-1.78)	(-3.02)	(-3.44)	(-3.38)
$Size_{t-1}$	0.050**	0.045*	0.034	0.011*	0.009	0.011*
	(2.10)	(1.87)	(1.42)	(1.74)	(1.51)	(1.69)
Age_{t-1}	-0.003***	-0.003**	-0.002**	0.000	0.000	0.000
	(-2.59)	(-2.57)	(-2.45)	(-1.12)	(-1.10)	(-1.16)
Fraction BG_{t-1}	-1.016***	-0.981***	-0.977***	-0.087**	-0.079**	-0.080**
	(-9.16)	(-8.85)	(-8.80)	(-2.52)	(-2.26)	(-2.28)
Small $firm_{t-1}$	-0.105	-0.090	-0.133	-0.048**	-0.042**	-0.036*
	(-1.10)	(-0.94)	(-1.34)	(-2.55)	(-2.30)	(-1.88)
Labor $cost_{t-1}$		0.003	0.003		0.000	0.000
		(0.90)	(0.86)		(0.25)	(0.28)
Labor $shortage_{t-1}$		-10.753***	-10.736***		-1.229	-1.231
		(-3.10)	(-3.09)		(-1.24)	(-1.24)
Labor fit_{t-1}		0.724**	0.733**		0.275***	0.274***
		(2.08)	(2.10)		(2.72)	(2.71)
$Agglomeration_{t-1}$		0.005***	0.005***		0.001	0.001
		(2.94)	(2.91)		(1.55)	(1.56)
$Education_{t-1}$			0.017			-0.011
			(0.12)			(-0.29)
$Qualification_{t-1}$			0.198*			-0.022
			(1.92)			(-0.89)
Industry × year FE	Yes	Yes	Yes	Yes	Yes	Yes
County × year FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.030	0.030	0.030	0.013	0.013	0.013
N	97,389	97,389	97,389	97,389	97,389	97,389

Table 5: Group-level analysis. This table reports panel regressions of BG-level exiting decision variables against internal opportunity measures, other control variables and fixed effects. $Exit/Entry$ is a dummy that equals one if a BG loses/gains its presence in a county. $Exit\,count/Entry\,count$ is the number of counties a BG leaves/enters. $Laborweighted\,exit/Laborweighted\,entry$ is calculated as the fraction of BG employees lost/gained after exiting/entering counties. All independent variables are lagged by one year and coefficients of model (1) (3) (4) (6) are multiplied by 100. $IOLC$, $IOLS$, $IOLF$ and $IOAG$ measure the opportunity for a BG to reduce labor cost, relieve labor shortage, improve labor fit, and exploit industrial agglomeration by relocating employees across counties where the BG is present. The four variables are normalized to zero mean and unit standard deviation. $Labor\,cost$,$Labor\,shortage$, and $Labor\,fit$ measure a BG's overall expected labor cost, labor shortage and labor fit given its member firms' industry job profile. $Agglomeration$ measures the average level of agglomeration across counties where a BG is presents. $Size$ is a BG's total asset in logarithm. Age is calculated as the average years since incorporation across BG member firms. $Education$ and $Qualification$ measure the education level and professional qualification level of a BG's employees. All variables are defined in Table A1 in the Appendix. Standard errors are clustered at the firm-level and t-statistics are presented in parentheses below the coefficients. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Table 5: Group-level analysis (continued).

Dep. var.	Exit			Entry		
	Dummy(%) (1)	Count (2)	LW(%) (3)	Dummy(%) (4)	Count (5)	LW(%) (6)
$IOLC_{t-1}$	1.734***	0.039***	0.390***	-2.506***	-0.044***	-0.603***
	(4.68)	(4.55)	(2.73)	(-5.59)	(-4.46)	(-3.31)
$IOLS_{t-1}$	0.576***	0.017***	0.221***	-1.324***	-0.022***	-0.333***
	(3.87)	(2.91)	(3.85)	(-6.49)	(-4.61)	(-4.61)
$IOLF_{t-1}$	2.246***	0.047***	0.579***	-2.144***	-0.035***	-0.930***
	(4.91)	(4.54)	(3.23)	(-4.20)	(-3.26)	(-4.17)
$IOAG_{t-1}$	1.428***	0.041***	0.429*	-0.825*	-0.015	-0.440***
	(2.94)	(3.23)	(1.88)	(-1.73)	(-1.46)	(-2.60)
$Size_{t-1}$	0.991***	0.031***	0.277**	-0.402	-0.022*	-0.694***
	(3.41)	(3.14)	(2.00)	(-1.27)	(-1.88)	(-4.60)
Age_{t-1}	-0.019	-0.001	-0.007	-0.029	0.000	0.006
	(-1.28)	(-1.26)	(-0.79)	(-1.46)	(0.23)	(0.70)
Labor $cost_{t-1}$	-0.058***	-0.002***	-0.018*	0.040**	0.001***	0.024***
	(-3.10)	(-3.03)	(-1.93)	(2.07)	(2.62)	(2.82)
Labor $supply_{t-1}$	-2.762	-0.068	-0.569	11.397**	0.075	3.867**
	(-0.81)	(-0.95)	(-0.41)	(2.33)	(0.91)	(2.28)
Labor fit_{t-1}	4.014	0.074	0.755	-0.259	0.028	0.614
	(1.55)	(1.18)	(0.61)	(-0.09)	(0.31)	(0.44)
$Agglomeration_{t-1}$	-0.003	0.000	-0.006	0.001	0.000	0.002
	(-0.16)	(-0.51)	(-0.48)	(0.07)	(-0.48)	(0.27)
$Education_{t-1}$	-1.203	-0.073*	-1.364*	-0.728	0.098*	2.398***
	(-0.75)	(-1.90)	(-1.73)	(-0.43)	(1.76)	(3.01)
$Qualification_{t-1}$	-0.586	0.011	-0.553	-0.525	0.010	0.600
	(-0.59)	(0.47)	(-1.13)	(-0.46)	(0.44)	(1.10)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
BG FE	Yes	Yes	Yes	Yes	Yes	Yes
Adj. R^2	0.148	0.114	0.117	0.163	0.174	0.110
N	35,893	35,893	35,893	35,893	35,893	35,893

D Online Appendix

Table OA1: Correlations. This table provides correlation coefficients for all numerical variables. Panel A provides correlations for the firm-level data set and Panel B for the BG-level data set. All variables are defined in Table A1. *, **, *** indicate significance at the 10%, 5%, and 1% level, respectively.

Panel A: Firm-level variables

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	Labor growth	1.00											
(2)	Internal labor growth	0.44***	1.00										
(3)	External labor growth	0.93***	0.08***	1.00									
(4)	Exit	-0.01	0.01	-0.01**	1.00								
(5)	Exit LW	0.00	0.00	0.00	0.64***	1.00							
(6)	Labor cost	0.00	0.02***	0.00	0.00	0.00	1.00						
(7)	Labor shortage	0.00	0.00	0.00	0.00	0.00	-0.01***	1.00					
(8)	Labor fit	-0.02***	0.00	-0.03***	0.00	0.00	0.14***	0.01	1.00				
(9)	Agglomeration	0.00	0.00	-0.01	-0.01	0.00	0.14***	0.02***	0.21***	1.00			
(10)	IOLC	-0.02***	-0.01	-0.02***	0.04***	0.02***	0.32***	0.00	0.00	0.09***	1.00		
(11)	IOLS	-0.02***	-0.01***	-0.02***	0.05***	0.02***	0.01***	0.35***	-0.03***	0.00	0.42***	1.00	
(12)	IOLF	-0.02***	0.00	-0.02***	0.07***	0.03***	0.04***	-0.02***	-0.14***	-0.08***	0.38***	0.35***	1.00
(13)	IOAG	-0.02***	-0.01**	-0.02***	0.05***	0.02***	-0.08***	-0.02***	-0.06***	-0.13***	0.17***	0.27***	0.38***
(14)	IPLC	-0.05***	-0.03***	-0.05***	0.02***	-0.01***	-0.07***	-0.01***	0.00	-0.01***	0.15***	0.26***	0.26***
(15)	IPLS	-0.07***	-0.03***	-0.07***	0.03***	-0.01***	0.03***	-0.12***	0.01**	0.02***	0.23***	0.11***	0.19***
(16)	IPLF	-0.07***	-0.03***	-0.07***	0.04***	-0.01***	0.06***	0.00	0.04***	0.00	0.22***	0.20***	0.18***
(17)	IPAG	-0.06***	-0.03***	-0.06***	0.01***	-0.01***	0.11***	0.00	0.02***	0.19***	0.30***	0.17***	0.13***
(18)	Size	-0.01**	0.01***	-0.01***	0.00	0.00	0.22***	0.00	0.14***	0.02***	0.13***	0.06***	0.07***
(19)	Age	-0.06***	-0.01***	-0.06***	-0.01***	0.00	0.05***	-0.01***	0.10***	-0.01***	0.02***	-0.01***	0.00
(20)	Fraction BG	0.00	0.00	0.00	-0.06***	-0.01***	0.08***	0.00	0.05***	0.00	-0.21***	-0.23***	-0.20***
(21)	Small firm	-0.12***	-0.03***	-0.12***	-0.01***	-0.02***	0.08***	0.00	0.05***	0.07***	-0.03***	-0.06***	-0.05***
(22)	Education	0.02***	0.03***	0.01***	0.00	-0.01	0.39***	0.01***	0.09***	0.09***	0.05***	-0.01***	0.01***
(23)	Qualification	0.02***	0.02***	0.02***	0.01***	0.00	0.40***	0.00	0.02***	0.05***	0.02***	-0.05***	-0.01***

		(13)	(14)	(15)	(16)	(17)	(18)	(19)	(20)	(21)	(22)	(23)	
(13)	IOAG	1.00											
(14)	IPLC	0.30***	1.00										
(15)	IPLS	0.18***	0.50***	1.00									
(16)	IPLF	0.17***	0.51***	0.50***	1.00								
(17)	IPAG	0.00	0.25***	0.42***	0.45***	1.00							
(18)	Size	-0.01***	0.00	0.02***	0.02***	0.02***	1.00						
(19)	Age	-0.04***	-0.04***	-0.02***	-0.02***	-0.03***	0.33***	1.00					
(20)	Fraction BG	-0.19***	-0.18***	-0.17***	-0.17***	-0.14***	0.44***	0.25***	1.00				
(21)	Small firm	-0.02***	0.09***	0.17***	0.19***	0.18***	0.03***	-0.02***	0.03***	1.00			
(22)	Education	-0.02***	0.03***	0.09***	0.11***	0.12***	0.28***	-0.01***	0.09***	0.25***	1.00		
(23)	Qualification	-0.04***	-0.01***	0.05***	0.07***	0.08***	0.28***	0.01*	0.12***	0.22***	0.67***	1.00	

Table OA1: Correlations (continued).

Panel B: BG-level variables

		(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
(1)	Entry	1.00											
(2)	Entry count	0.77***	1.00										
(3)	Entry LW	0.68***	0.63***	1.00									
(4)	Exit	0.18***	0.18***	0.12***	1.00								
(5)	Exit count	0.17***	0.21***	0.10***	0.69***	1.00							
(6)	Exit LW	0.11***	0.11***	0.12***	0.70***	0.62***	1.00						
(7)	Labor cost	0.02***	0.02***	0.01	0.03***	0.02***	0.01	1.00					
(8)	Labor shortage	-0.01	-0.01	-0.01	0.00	0.00	0.00	-0.01	1.00				
(9)	Labor fit	0.00	0.00	-0.01	0.00	0.00	0.00	0.18***	0.00	1.00			
(10)	Agglomeration	-0.01	-0.01	0.00	0.00	0.00	0.01	0.14***	0.01**	0.18***	1.00		
(11)	IOLC	0.21***	0.19***	0.12***	0.17***	0.13***	0.09***	0.19***	-0.01	0.01	0.02***	1.00	
(12)	IOLS	0.19***	0.18***	0.11***	0.14***	0.12***	0.09***	0.05***	0.19***	-0.01***	-0.04***	0.42***	1.00
(13)	IOLF	0.19***	0.17***	0.12***	0.16***	0.13***	0.09***	0.10***	-0.01**	-0.07***	-0.06***	0.47***	0.38***
(14)	IOAG	0.15***	0.14***	0.10***	0.13***	0.11***	0.10***	0.02***	-0.01**	-0.03***	0.02***	0.25***	0.26***
(15)	Size	0.18***	0.17***	0.07***	0.15***	0.13***	0.06***	0.19***	0.00	0.10***	0.01**	0.32***	0.24***
(16)	Age	0.00	0.00	-0.02***	-0.01	-0.01	-0.01**	0.06***	-0.01	0.13***	-0.02***	0.10***	0.06***
(17)	Education	0.02***	0.01**	0.01**	0.03***	0.02***	0.02***	0.46***	0.01**	0.09***	0.12***	0.05***	0.03***
(18)	Qualification	0.01	0.01	0.01	0.02***	0.02***	0.01	0.44***	0.00	0.00	0.06***	0.03***	0.00

		(13)	(14)	(15)	(16)	(17)	(18)
(13)	IOLF	1.00					
(14)	IOAG	0.38***	1.00				
(15)	Size	0.26***	0.15***	1.00			
(16)	Age	0.08***	-0.02***	0.23***	1.00		
(17)	Education	0.03***	0.04***	0.22***	-0.05***	1.00	
(18)	Qualification	0.01**	0.01*	0.21***	-0.05***	0.68***	1.00