(Why) Are Internal Labor Markets Active in French Business Groups? *

Giacinta Cestone[†] Chiara Fumagalli[‡] Francis Kramarz[§] Giovanni Pica[¶]

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Abstract

Exploiting matched employer-employee data allowing us to follow individual job-to-job transitions, merged with information on the ownership structure of business groups, we document that French groups actively operate Internal Labor Markets (ILMs). For the average group-affiliated firm, the probability to absorb a worker from the group's internal labor market exceeds by 9 percentage points the probability to hire a worker employed outside the group. This average figure hides substantial heterogeneity: ILM activity is higher in more diversified groups, in groups experiencing plant/firm closures and is highest for high-skill occupations. We also find that closure events boost the proportion of separating workers redeployed to group affiliated partners (as opposed to external labor market partners) relative to normal times, spurring ILM activity mainly for blue collar occupations. Overall, these findings suggest that groups respond to idiosyncratic shocks disproportionately relying on ILMs because they allow to save on search costs for human capital intensive occupations, while reducing firing costs for the more unionized occupational categories. Finally, we find that upon closure events the ILM reallocates displaced employees more intensely to larger and healthier groups units, and less intensely to highly levered and financially distressed units.

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[†]Cass Business School (City University London), CSEF, and ECGI
[‡]Università Bocconi (Department of Economics), CSEF and CEPR
[§]Crest, ENSAE and CEPR
[¶]Università di Milano, Centro Luca D'Agliano, CSEF, Paolo Baffi Centre

1 Introduction

Business groups are collections of legally independent firms that are partly or wholly owned by a single family or firm that controls the member firms' assets. They are a widespread organizational form in both developed and developing economies, and typically account for a large fraction of the economic activity in many of the countries where they are active.[1] An established view in the economic literature is that corporate groups fill an institutional void in countries and periods where external labor and financial markets display frictions (Khanna and Palepu (1997), Khanna and Yafeh (2007)). While a large body of work has analyzed groups' internal capital markets, little attention has been devoted to understand how groups use their internal labor markets (ILMs) to make up for dysfunctional external labor markets.[2] Our paper contributes to fill this gap by providing direct evidence on the activity of internal labor markets in French business groups.[3]

There are several reasons why internal labor markets may have an advantage over external labor markets. First, redeploying workers across affiliated firms allows to incur lower dismissal penalties: internal coordination of labor adjustments often allows to avoid altogether costly dismissals; employee transfers within groups are also penalty-free in many labor protection systems.[4]. Second, the internal labor market is likely to suffer less from informational asymmetries concerning workers' characteristics, and thus may perform better than the external market in matching a vacancy with the worker endowed with the specific skills required. Finally, the ILM may allow to better exploit costly training, and may spur workers to develop group-specific human capital. All these factors are likely to play a role in the French economy, where the costs of separations are high and the costs of hiring highly skilled workers are non negligible (Abowd and Kramarz (2003)).

Our first aim is to document whether French groups actually operate internal labor markets, ac-

[1] See La Porta, Lopez-de Silanes, and Shleifer (1999) and Faccio and Lang (2002), who document that in Germany, the top 15 family groups control 25% of listed corporate assets (22% in Italy); in India, affiliated firms account for 80% of total assets of the top 100 firms, while in Turkey affiliated firms account for 57% of employment of the top 50 firms.

[2] A large body of work has examined internal capital markets in conglomerates (see Stein (2003) and Maksimovic and Phillips (2013) for two ample surveys), while several recent papers have focused on groups, showing that internal capital markets make affiliated firms more resilient to shocks and stronger product market players (see Gopalan, Nanda, and Seru (2007), Almeida and Kim (2013), and Boutin, Cestone, Fumagalli, Pica, and Serrano-Velarde (2013)). The results in our paper suggest that the possibility to adjust labor internally may be another factor explaining groups' resilience.

[3] France represents and interesting case study for investigating corporate groups. From 1999 to 2010, firms affiliated with groups accounted for around 40% of total employment, with substantial variability observed across sectors: in the financial sector affiliated firms account for more than 80% of total employment, whereas in agriculture the percentage is below 10%. Within manufacturing, on average affiliated firms account for almost 70% of total employment, but such share can be as high as 90% in automotive and energy.

[4] The EU Directive 96/71/EC facilitates unilateral transfers of employees among group-affiliated firms, because intra-group transfers do not require each worker to be dismissed and rehired.

counting for the endogeneity of group structure. For instance, high intra-group mobility may be observed because group-affiliated firms are intensive in occupations (or disproportionately present in sectors, geographical locations, etc.) among which workers mobility is intrinsically high. Thus intense within-group mobility may not be *per se* evidence that ILMs function more smoothly than external labor markets. To be concrete, let us focus on occupations, arguably the major source of concern. In order to isolate the contribution of the ILM channel to the probability that a worker is hired by a group-affiliated firm, we need to account for the time-varying firm-specific "natural propensity" to hire workers who make job-to-job transitions between any two given occupations. The availability of detailed matched employer-employee panel data allows us to include a finely disaggregated firm of destination effect – namely, a firm-of-destination×occupation-of-origin×occupation-of-destination×year effect – to control for such a time-varying propensity. Thus, we estimate our parameter of interest – the *excess probability* that a worker is hired by a given firm if she was originally employed in the same group (over the probability to be hired by that firm if she was originally employed outside the group) – exploiting only variation across individuals who make job-to-job transitions between two given occupations and are hired by a given group-affiliated firm in a given year.

In order to implement this methodology, we rely upon particularly rich data spanning the period 2002-2010. We not only need matched employer-employee data that allow us to identify job-to-job transitions but, for each affiliated firm, we also need information on the entire structure of the business group it belongs to, so as to separate job-to-job transitions originating from the group from those that do not originate from the group. To obtain this information we merge two data sets from the INSEE (Institut National de la Statistique et des Études Économiques). The first is the Déclarations Annuelles des Données Sociales (DADS), a matched employer-employee dataset with detailed individual-level and firm-level information. The second is the yearly survey run by the INSEE called LIFI (Enquête sur les Liaisons Financières entre sociétés). For each firm in the French economy, the LIFI allows us to assess whether the firm is group-affiliated or not and, for group firms, to identify the head of the group and all the other affiliated firms.

We find that French business groups actively run internal labor markets: for the average group-affiliated firm the probability to absorb a worker previously employed in the same group exceeds by 9 percentage points the probability to absorb a worker not previously employed in its group. Group-affiliated firms in France are thus prone to draw upon their group labor force rather than the external labor market: why is this the case? While the personnel economics literature has emphasized the

role of *vertical ILMs* in designing employee careers, our evidence suggests that internal promotions explain only in part why groups operate ILMs. Indeed, we find that *excess* probabilities computed focusing only on horizontal job changes remain as high as 7 percentage points. This motivates us to explore the role of *horizontal ILMs*, whereby groups adjust their labor force internally in response to idiosyncratic shocks hitting their units.

Our finding that the ILM is more active in groups that are more diversified (both in terms of sectors where affiliated firms operate and in terms of geographical location) is in line with the view that groups rely on the ILM to coordinate the employment response of affiliated firms to idiosyncratic shocks.[5] To further support this view, we investigate whether ILM activity reacts to firm/plant closures, an occurrence that signals a shock hitting part of the group. We find that when at least one firm/plant in the group closes, affiliated firms are even more prone to absorb workers from the ILM rather than the external labor market.

French groups are thus particularly prone to adjust their labor force internally in response to shocks, which suggests that ILMs exhibit less severe frictions than the external labor market. As mentioned earlier, ILMs may allow group firms to save on hiring costs, that are likely to be particularly high in the case of human capital intensive occupations. At the same time, labor adjustments internal to a group can help limit firing costs, that may be higher for employees in more unionized occupational categories. It is then natural to ask whether internal labor markets operate differently for high versus low skill occupations. To this aim, we investigate the functioning of ILMs across different occupational categories.[6] We find that on average, the activity of ILMs is most intense for high skill occupations; for instance, the *excess probability* of absorbing an employee (undergoing a horizontal job change) from the ILM rather than the external labor market is 0.7 percentage points higher for Managers/High-Skilled workers than for Blue Collars. This seems to confirm that lower search costs and informational frictions play an important role in explaining groups' reliance on internal labor markets. We then investigate whether the ILM for managers and other high-skill employees reacts differently – with respect to the ILM for other occupational categories – to plant and firm closures occurring within the group. We find that closures spur ILM activity for more unionized occupational categories (namely,

[5]Sectoral and geographical diversification make it more likely that group units are exposed to unrelated shocks. However, diversification might also hinder ILM activity: it is more difficult to redeploy workers across group units operating in different sectors because they may require sector-specific skills; similarly, it is more difficult to move workers across units that are geographically dispersed because of trade unions resistance and employment protection regulation. Our results suggest that the former effect of diversification on ILM activity prevails.

[6]We focus on four broad occupational categories: Managers/High-Skill employees (including doctors, engineers and researchers), Intermediate (technicians and other intermediate administrative jobs), Clerical Support and Blue Collars.

Clerical Support workers and Blue Collars), but reduce ILM intensity for high-skill occupations. This is in line with the idea that group firms rely on the ILM in response to unions' pressure to limit large-scale dismissals.

We next move to a different identification strategy of the ILM effect, based on firm closure. For each group-affiliated closing firm, we identify the set of all the actual and potential destinations of the displaced workers. Our unit of observation is a pair – firm of origin/firm of destination – in a given year, in which the firm of origin eventually closes within our sample period. We implement a simple diff-in-diff strategy, looking at the evolution of bilateral employment flows at closure relative to normal times (i.e. at least four years before closure) in pairs affiliated with the same corporate group as opposed to pairs that do not belong to the same group. Following a closure shock that raises the outflow of workers from the closing firm, the time dimension - i.e. the comparison between the flows at closure time relative to normal times - allows us to control for all the time-invariant pair-specific determinants of the bilateral flow. In other words, we take into account that two specific firms may experience intense flows of workers even in normal times. The second difference, i.e. the comparison between pairs affiliated with the same group and pairs *not* affiliated with the same group, identifies the ILM effect. This approach confirms our earlier results: firm closure intensifies the ILM activity. At closure (relative to normal times), the fraction of displaced workers redeployed to a group-affiliated partner increases by at least 11 percentage points more than the fraction redeployed to an external labor market partner.

The difference in difference methodology also allows us to study whether the direction of ILM flows depends on the size, health and financial status of the potential destination firms. We find that the ILM effect is larger for larger destination firms (firms whose assets are above the median of the distribution), and larger for firms experiencing a sectoral boom. We also find that our difference in difference effect is significantly smaller for destination firms that are highly levered (i.e. whose leverage falls in the top decile of the distribution) or technically close to default (i.e. whose coverage ratio falls in the bottom decile). In other words, while upon closure of a group-affiliated firm, the fraction of displaced workers redeployed to ILM partners increases more than the fraction redeployed to external labor market partners, potential ILM partners with limited debt capacity or close to default are less likely to account for this intensification of ILM activity.

By investigating the existence and the functions performed by internal labor markets in groups, where labor is actively reallocated across affiliated firms, this paper builds a bridge across the labor and

personnel economics literature and the finance literature. The labor/personnel literature has studied the functioning of internal labor markets *within firms*. Focusing on internal careers, a large body of work has shown how implicit insurance mechanisms and incentives to accumulate human capital can be provided through internal promotions.[7] Our evidence demonstrates that *vertical careers* explain only in part why groups operate internal labor markets, which spurs us to investigate how groups rely on *horizontal ILMs* to respond to idiosyncratic shocks.

Within the finance literature, many authors have claimed that internal labor markets in business groups operate alongside internal capital markets to make up for underdeveloped external markets (see Khanna and Palepu (1997); Khanna and Yafeh (2007)). However, little empirical work has investigated the functioning of ILMs in groups. In a small sample of large business groups in Chile and India, Khanna and Palepu (1999) find that intra-group mobility is high for managerial occupations. In a recent paper, Faccio and O'Brien (2015) present evidence from a sample of publicly traded companies in 56 countries, consistent with the hypothesis that business groups operate internal labor markets.[8] We support this hypothesis with direct evidence: by tracking individual employee movements across group-affiliated firms, we find that French business groups respond to idiosyncratic shocks by reallocating labor internally. Our paper is also close to Tate and Yang (2014), who study internal labor markets in US diversified conglomerates rather than groups. In their paper, they find that workers separating from diversified firms that experience plant closures are more likely to move to industries with better prospects (whether through the internal or the external labor market), as opposed to workers displaced from single-plant firms. The former also suffer smaller wage losses than the latter, even when they leave their original firm. This suggests that employment within a diversified firm makes workers more "redeployable" across industries, possibly thanks to internal job rotation programs within the firm.[9]

The paper proceeds as follows. Section 2 illustrates our empirical approach. In Section 3 we describe the data, and in Section 4 and 5 we discuss our results. Section 6 concludes.

[7] See Gibbons and Waldman (1999), Lazear (1999), and Waldman (2012) for comprehensive surveys. For more recent contributions to this literature, see Friebel and Raith (2013) and Ke, Li, and Powell (2014).

[8] Belenzon and Tsomolon (2013) provide evidence that corporate groups prevail in Western European countries where employment protection regulation is stricter; they interpret this as evidence that groups benefit from ILMs allowing them to bypass regulation constraining the external labor market.

[9] While this points to a bright side of internal labor markets, Silva (2013) unveils their inefficiencies. He documents wage convergence within diversified firms, whereby conglomerate plants in low-wage sectors overpay workers as compared to stand-alone firms when the conglomerate is also present in high-wage industries.

2 The empirical model

If labor markets internal to groups suffer from the same amount of frictions as the external labor markets, we should observe that a group-affiliated firm with the same probability hires a worker from the internal and the external labor market. Instead, if internal labor markets are characterized by less severe frictions than external labor markets, groups may disproportionately rely on the ILM in order to adjust their labor force. In other words, group-affiliated firms should be more likely to absorb workers originating from their own group rather than from other firms in the economy; at the same time, workers who find a job in a group should be more likely - as compared to workers who find a job outside that group - to originate from an affiliated firm.

Our first aim is to verify which of the above hypotheses is confirmed by the data. However, in assessing whether internal labor markets facilitate within-group job-to-job mobility we face a major identification challenge, in that group structure (in terms of sectors, regions, occupations) is endogenous and may affect within-group mobility patterns. In fact, documenting that a large proportions of the workers hired by an affiliated firm were previously employed in the same group is not *per se* evidence that internal labor markets function more smoothly than external labor markets: intra-group mobility may be high because groups are composed of different firms that are intensive in occupations among which mobility is naturally high, perhaps for technological reasons.

In order to isolate the contribution of the internal labor market channel to the probability that a worker is hired by a firm affiliated with the same group as the originating firm, we need to control for the firm-specific – possibly time-varying – "natural" propensity to absorb workers transiting between two given occupations, i.e. we need to properly build the counterfactual probability to hire workers, making a job-to-job transition between two given occupations, if they originally worked in a non-affiliated firm. To do so, we apply the methodology described in sections 2.1 and 2.2.

2.1 Affiliated Firms Hiring Workers

Consider the triplet $\{o, z, j\}$, where o is the occupation in the firm of origin, z the occupation in the firm of destination, and j a group-affiliated firm. Denote as c the set of workers in occupation o at $t-1$ who move to occupation z in any firm at time t. We model the probability that worker i, moving from occupation o to occupation z, finds a job in the group-affiliated firm j at time t as follows:

$$E_{i,c,j,t} = \beta_{c,j,t} + \gamma_{c,j,t} BG_{i,j,t} + \varepsilon_{i,j,t} \tag{1}$$

where $E_{i,c,j,t}$ takes value one if worker i moving from occupation o to occupation z finds a job in firm j at time t and zero otherwise. $BG_{i,j,t}$ takes value one if worker i's firm of origin belongs to the same group as the firm of destination j at time t, and zero otherwise.

The term $\beta_{c,j,t}$ is a firm-occupation pair specific effect that captures the time-varying natural propensity of firm j to absorb workers transiting from occupation o to occupation z. This natural tendency measures the fact that occupation o may allow a worker to develop those skills that are particularly suitable to perform occupation z in firm j. Our parameter of interest is $\gamma_{c,j,t}$, that measures the *excess* probability of a worker moving from o to z to be absorbed by firm j at time t if she comes from a firm affiliated with the same group as j, over the probability to be absorbed by firm j if the worker comes from a firm not affiliated with j's group. The error term $\varepsilon_{i,j,t}$ captures all other factors that affect the probability that worker i moving from occupation o to occupation z finds a job in firm j. We assume that $E(\varepsilon_{i,j,t}|BG_{i,j,t}, c \times j \times t) = 0$: conditional on observables, namely group affiliation and the firm-of-destination×occupation-of-origin×occupation-of-destination time-varying effect, the error has zero mean.

Direct estimation of equation (1) would require a data set with one observation for each job mover and potential firm of destination for each year. As our data set contains about 1,574,000 job-to-job transitions and approximately 40,000 group-affiliated firms per year, direct estimation of the model would require the construction of a data set with as many as 62 billion observations per year. In order to estimate the parameters of equation (1) while keeping the dimensionality of the problem reasonable, we follow Kramarz and Thesmar (2013) and Kramarz and Nordström Skans (2013),[10] and define

$$R^{BG}_{c,j,t} \equiv \frac{\sum_{i \in c} E_{i,c,j,t} BG_{i,j,t}}{\sum_{i \in c} BG_{i,j,t}} = \beta_{c,j,t} + \gamma_{c,j,t} + \widetilde{u}^{BG}_{c,j,t}. \tag{2}$$

In words, $R^{BG}_{c,j,t}$ is the fraction of workers that, in year t, are hired by firm j among all workers moving from occupation o to z and that originate from a firm belonging to the same group as firm j. Note that this fraction might be high because firm j tends – for some reason – to overhire workers moving between occupations o and z and it happens to be part of a group intensive in occupation o. In this

[10] Kramarz and Thesmar (2013) assess whether the probability of being hired in a given firm is larger when the individual and the firm's CEO belong to the same network, while Kramarz and Nordström Skans (2013) find that graduates from a given class whose fathers are employed in a firm are more likely to be hired by that firm.

case, one observes many transitions from occupation o to occupation z in firm j originating from the group, but this cannot be ascribed to the internal labor market channel.

We then compute the fraction of workers that are hired by firm j among all workers moving from occupation o to z and whose firm of origin does not belong to the same group as firm j:

$$R_{c,j,t}^{-BG} \equiv \frac{\sum_{i \in c} E_{i,c,j,t}(1 - BG_{i,j,t})}{\sum_{i \in c}(1 - BG_{i,j,t})} = \beta_{c,j,t} + \widetilde{u}_{c,j,t}^{-BG} \tag{3}$$

Taking the difference between the two ratios eliminates the firm-class fixed effect $\beta_{c,j,t}$:

$$G_{cj,t} \equiv R_{c,j,t}^{BG} - R_{c,j,t}^{-BG} = \gamma_{c,j,t} + u_{i,j,t}^{G}. \tag{4}$$

We estimate the parameter $\gamma_{c,j,t}$ for each occupation pair-firm as the difference between two probabilities: that of a given firm j absorbing workers (transiting between two occupations o and z) who are separating from an affiliated firm, and that of a given firm j absorbing workers (transiting between two occupations o and z) who are separating from a non-affiliated firm.

We show in the Appendix that the sample analog of the $\gamma_{c,j,t}$'s estimated in equation (4) is the OLS estimate of equation (1).

2.2 Workers Originating from Affiliated Firms

We now turn to a related albeit not identical question. Does reliance on internal labor markets make it more likely that a worker who finds a job in a group originates from an affiliated firm as compared to workers who find a job outside that group? To answer this question, we estimate the excess probability that a worker (transiting between two occupations) originates from firm j if she lands to an affiliated firm, over the probability that the worker originates from firm j while landing to a non-affiliated firm.

As earlier, we denote as c the set of workers in occupation o at $t-1$ who move to occupation z in any firm at time t. We model the probability that worker i moving from occupation o to occupation z separates from firm j as follows:

$$E_{i,c,j,t}^{O} = \beta_{c,j,t}^{O} + \gamma_{c,j,t}^{O} BG_{i,j,t}^{O} + \varepsilon_{i,j,t}^{O} \tag{5}$$

where $E_{i,c,j,t}^{O}$ takes value one if worker i moving from occupation o to occupation z separates from firm j at time t and zero otherwise. $BG_{i,j,t}^{O}$ takes value one if worker i's firm of destination belongs to

the same group as the firm of origin j at time t and zero otherwise.

The term $\beta^O_{c,j,t}$ is a firm-occupation pair specific effect that captures the time-varying natural tendency of workers moving from occupation o to occupation z to originate from firm j. This may be high due to the fact that carrying out occupation o in firm j endows a worker with the skills that facilitate moving to occupation z in any other firm. Our parameter of interest is $\gamma^O_{c,j,t}$, that measures the *excess* probability of a worker moving from o to z to originate from firm j if she lands at time t to a firm affiliated with the same group as j, over the probability to originate from firm j if the worker lands to a firm not affiliated with j's group. The error term $\varepsilon^O_{i,j,t}$ captures all other factors that affect the probability that worker i moving from occupation o to occupation z originates from firm j.

Again, for computational purposes, we define:

$$R^{BG,O}_{c,j,t} = \frac{\sum_{i \in c} E^O_{i,c,j,t} BG^O_{i,j,t}}{\sum_{i \in c} BG^O_{i,j,t}} = \beta^O_{c,j,t} + \gamma^O_{c,j,t} + \widetilde{u}^{BG,O}_{c,j,t} \tag{6}$$

as the fraction of workers that originate from firm j among all workers moving from occupation o to z whose firm of destination belongs to the same group as firm j. As discussed earlier, this fraction may be high because workers performing occupation o in firm j have a high propensity to move to occupation z in other firms, and the group includes firms intensive in occupation z. Hence, the observation of many transitions from occupation o in firm j to occupation z within the group cannot necessarily be ascribed to the ILM activity.

We then compute the fraction of workers that originate from firm j among all workers moving from occupation o to z and whose firm of destination does not belong to the same group as firm j:

$$R^{-BG,O}_{c,j,t} = \frac{\sum_{i \in c} E^O_{i,c,j,t} (1 - BG^O_{i,j,t})}{\sum_{i \in c} (1 - BG^O_{i,j,t})} = \beta^O_{c,j,t} + \widetilde{u}^{-BG,O}_{c,j,t} \tag{7}$$

Taking the difference between the two ratios eliminates the firm-occupation pair fixed effect $\beta^O_{c,j,t}$:

$$G^O_{cj,t} = R^{BG,O}_{c,j,t} - R^{-BG,O}_{c,j,t} = \gamma^O_{c,j,t} + u^{G,O}_{i,j,t} \tag{8}$$

We estimate the parameter $\gamma^O_{c,j,t}$ for each occupation pair-firm as the difference between two probabilities: that of originating from firm j for workers (transiting between two occupations o and z) who land to an affiliated firm, and that of originating from firm j for workers (transiting between two occupations o and z) who land to a non-affiliated firm. As in the previous case, the sample analog of

the $\gamma^O_{c,j,t}$'s estimated in equation (8) is the OLS estimate of equation (5).

In section 4.1 and 4.2 we will analyze whether the extent of ILM activity depends on firm- and group-level characteristics. To this purpose, we will compute – both for inflows and outflows – firm-level measures of ILM intensity averaging the estimated $\gamma_{c,j,t}$'s over the different pairs of occupations c, for each firm j and year t. Section 4.3 will instead rely directly on the estimated $\gamma_{c,j,t}$'s to study whether the extent of ILM activity is different across occupations.

3 The data

The implementation of the methodology described in Sections 2.1 and 2.2 requires reliable information allowing us to follow employees from firm to firm and year to year. Moreover, for each firm, we need to identify the entire structure of the group that firm is affiliated with so as to distinguish transitions originating from (landing to) the firm's group and transitions that do not originate from (land to) the group. To obtain this information we have merged two data sets made available to us by the INSEE (Institut National de la Statistique et des Études Économiques).

Our main data source is the Déclarations Annuelles des Données Sociales (DADS), a large-scale administrative database of matched employer-employee information collected by INSEE. The data are based upon mandatory employer reports of the earnings of each employee subject to French payroll taxes. These taxes essentially apply to *all* employed persons in the economy (including self-employed). Each observation in DADS corresponds to a unique individual-plant combination in a given year, with detailed information about the plant-individual relationship. The data set includes the number of days during the calendar year that individual worked in that plant, the (gross and net) wage, the type of occupation (classified according to the socio-professional categories described in Table 1), the full time/part time status of the employee. Moreover, the data set provides the identifier of the firm that owns that plant, the geographical location of both the employing plant and firm, as well as the industry classification of the activity undertaken by the plant/firm. The special feature of DADS Postes, the version of DADS we have been given access to, is that it allows us to follow a worker along two consecutive years. More precisely, the DADS Postes referring to year t not only include detailed information regarding all the individual-plant relationships observed in year t, but for each individual they also provide detailed information concerning the plant relationships observed for that individual in year *t-1*. This structure allows us to identify workers transiting from one firm to another along two

TABLE 1. Socio-professional categories

CODE	CATEGORY
10	Farmers
2	**Top manager/Chief of firms**
21	Top managers/chiefs of handicraft firms
22	Top managers/chiefs of industrial/commercial firms with less than 10 employees
23	Top managers of industrial/commercial firms with more than 10 employees
3	**Management and superior intellectual occupations**
31	Healthcare professionals, legal professionals and other professionals
33	Managers of the Public Administration
34	Professors, researchers, scientific occupations
35	Journalists, media, arts and entertainment occupations
37	Administrative and commercial managers
38	Engineers and technical managers
4	**Intermediate occupations**
42	Teachers and other education, training and library occupations
43	Healthcare support occupations and social services occupations
44	Clergy and religious occupations
45	Intermediate administrative occupations in the Public Administration
46	Intermediate administrative and commercial occupations in firms
47	Technicians
48	Supervisors and 'agents de maitrise'
5	**Clerical Support and Sales occupations**
52	Clerical support occupations in the Public Administration
53	Surveillance and security occupations
54	Clerical support in firms
55	Sales and related occupations
56	Personal service occupations
6	**Blue collar occupations**
62	Industrial qualified workers
63	Handicraft qualified workers
64	Drivers
65	Maintenance, repair and transport qualified workers
67	Industrial non qualified workers
68	Handicraft non qualified workers
69	Agricultural worker

Source: INSEE.

consecutive years.[11,12]

The identification of group structure is based on the yearly survey run by the INSEE called LIFI (Enquête sur les Liaisons Financières entre sociétés). The LIFI contains information which makes it a unique data set for the study of business group activity. It collects information on direct financial links between firms, but it also accounts for indirect stakes and cross-ownerships. This is very important, as it allows INSEE to precisely identify the group structure even in the presence of pyramids. More precisely, LIFI defines a group as a set of firms controlled, directly or indirectly, by the same entity

[11]We cannot follow a given individual any longer because each yearly edition of DADS Postes randomly re-assignes individual identifiers.

[12]If an individual exhibits multiple firm relationships in a given year, we identify his/her main job by considering the relationship with the longest duration and for equal durations we consider the relationship with the highest qualification.

(the head of the group). The survey relies on a formal definition of *direct* control, requiring that a firm hold at least 50% of the voting rights in another firm's general assembly. This is in principle a very tight threshold, as in the presence of dispersed minority shareholders real control can be achieved with substantially lower equity stakes. However, we do not expect this to be a major source of bias in our sample, as most French firms are private and in France ownership concentration is strong even among listed firms.[13] Moreover, let us stress again that because both *indirect* control and cross-ownerships are accounted for in the LIFI, a group firm need not be directly controlled with a majority stake by the head of the group. For each firm in the French economy, the LIFI allows us to assess whether such firm is group-affiliated or not and, for affiliated firms, to identify the head of the group and all the other firms affiliated with the same group.

The merge of DADS Postes with LIFI allows us to distinguish between those transitions that originate from (lend to) the group a given firm is affiliated with and those transitions that do not. Moreover, we can build a number of variables measuring the characteristics of the group that the firm is affiliated with, such as the total number of affiliated firms, total (full-time equivalent) employment and the geographical and sectoral diversification of the group activities.

The merged data span the period 2002-2010. We remove from our samples the occupations of the Public Administration (33, 45 and 52 in Table 1) because the determinants of the labor market dynamics in the public sector are likely to be different from those of the private sector. Moreover, as we focus on job-to-job transitions, we disregard transitions originating from (or flowing to) unemployment. We also remove temporary agencies and observations with missing wages. Finally, we also remove from the data set those employers classified as 'particulier employeur': they are individuals employing workers that provide services in support of the family, such as cleaners, nannies and caregivers for elderly people.[14,15] These restrictions leave us with, on average, 1,574,000 job-to-job transitions per year during the sample period.

[13] In their overview of ownership structures and voting power in France, Bloch and Kremp (1999) show that ownership concentration is pervasive. For non listed companies with more that five hundreds employees, the main shareholder's stake is 88%. The degree of ownership concentration is slightly lower for listed companies, but still above 50% in most cases.

[14] From 2008 the mandatory report has been extended also to these employers.

[15] We remove also those employers classified as 'fictitious' because the code identifying either the firm or the plant communicated by the employer to the French authority does not belong to the existing ones and is, therefore, incorrect.

3.1 Identification of the set of workers transiting between occupations

Our data sources allow us to identify those workers that change job from one year to the other, with detailed information regarding the occupation of origin and of destination. Based on this, for each occupation pair $\{o, z\}$, we identify the set of workers $c(i)$ moving from occupation o to occupation z between year $t-1$ and year t. Then, we associate each occupation pair $\{o, z\}$ with a firm j. This means that, for each firm j, we have as many triplets $\{o, z, j\}$ as the total number of occupation pairs, i.e. 625. For each triplet $\{o, z, j\}$, we separate those transitions that originate from (land to) the same group as firm j from those transitions that do not. This allows us to compute the denominators of the ratios $R^{BG}_{c,j,t}$ and $R^{-BG}_{c,j,t}$ indicated in (2) and (3) for inflows. (Similarly for outflows). We then drop the triplets in which this distinction cannot be drawn because either all the transitions originate from (land to) j's group or all the transitions originate from (land to) the external labor market. Trivially, on those sets of workers it is not possible to estimate the excess probabilities. This restriction is without loss of identifying variation since the discarded observations are uninformative conditional on the fixed effects.

This leaves us with approximately one million occupation pair-firm triplets per year. For each triplet $\{o, z, j\}$, we then compute the number of workers transiting from occupation o to occupation z that are hired by firm j, distinguishing between those that originate from the same group as firm j and those that do not. This allows us to compute the numerator of the ratios $R^{BG}_{c,j,t}$ and $R^{-BG}_{c,j,t}$ indicated in (2) and (3) for inflows, and ultimately to estimate our parameter of interest $\gamma_{c,j,t}$ for each triplet. A similar procedure applies to outflows. The next Section illustrates the results of our estimation procedure.

4 Internal labor markets at work

We address first the fundamental question of whether firms affiliated with French business groups actually operate internal labor markets. To this aim, we rely on the empirical model laid out in Section 2 to ask whether group-affiliated firms are *more likely* to absorb labor from the internal pool of workers in transition within their group, rather than from the external labor market. To do so, for each year t, we aggregate at the firm level the parameters estimated from equations (1) and (5), taking both simple and weighted averages of the estimated $\widehat{\gamma}_{c,j,t}$ ($\widehat{\gamma}^{O}_{c,j,t}$). The weights are given by the importance of the transitions from occupation o to occupation z for the group firm j is affiliated

with.[16] This allows us to estimate a firm-level *average excess probability* $\gamma_{j,t}$ for each group-affiliated firm in our sample.

To ensure that the internal and external labour markets are as homogeneous as possible, when implementing the empirical model we restrict to all transitions occurring between occupation o and occupation z that originate from (land to) the same geographical areas (French departments) where firm j's group is active.[17,18]

Table 2 and 4 show the firm-level average excess probability, referred to as inflows and outflows respectively. The upper panel of the Tables shows simple averages. Focusing on inflows (Table 2), we find that for the average firm the probability to absorb a worker previously employed in the same group exceeds by 9 percentage points the probability to absorb a worker not previously employed in the group. Table 4 complements Table 2 by considering outflows: on average, the probability that a worker separates from a firm if she is moving to an affiliated firm exceeds by about 9 percentage points the probability that the worker separates from that firm if she is moving to a non-affiliated firm. The bottom panel of the tables shows weighted averages: the results are very similar to unweighted averages.

Group-affiliated firms are thus particularly prone to draw upon their group labor force rather than the external labor market: why is this the case? As pointed out by the personnel economics literature, corporate groups and diversified firms may rely on their *vertical ILM* to shape employees' careers. However, groups may as well operate an *horizontal ILM* as a way to adjust their labor force in response to idiosyncratic shocks hitting some of their productive units, thus overcoming external labor market frictions. In the next two tables, we focus on the subset of excess probabilities computed for job-to-job transitions between identical occupations of origin and destination. Insofar as a promotion often

[16] In other words, the weight is the ratio of the number of transitions from occupation o to occupation z that originate from (land to) firm j's group to the total number of transitions (for all the occupation pairs associated with firm j) that originate from (land to) firm j's group.

[17] In the administrative division of France, *departments* represent one of the three levels of government below the national level, between the region and the commune. There are 96 departments in mainland France and 5 overseas departments. We focus on mainland France.

[18] A broader definition of c is the set of workers moving within a given occupation pair in the *whole French economy*. This definition may raise the concern that the subset of workers originating from firm j's group and the subset originating from any other firm in France are not homogeneous. This is particularly relevant if a group's units are all located within the same department: then, all the transitions originating from the group will also originate from that particular department, whereas the transitions originating from outside the group may come from any department in France. In this respect, the two pools of workers firm j can draw upon are not fully comparable. Excess probabilities $\gamma_{c,j,t}$ ($\gamma^{O}_{c,j,t}$) computed using this broader definition of c turn out to be slightly higher than the ones obtained imposing the department restriction. The same holds when we compute excess probabilities imposing a region restriction, i.e. define c as the set of workers moving within an occupation pair in the same *regions* where firm j's group operates. The corresponding tables are available upon request.

results in a move across different occupational categories (e.g. a non-qualified blue collar promoted to qualified blue collar), this should rule out many job transitions up the career ladder. The results in Table 3 show that even when focusing on *same-occupation* transitions, average excess probabilities remain high: for a group-affiliated firm, the probability to absorb a worker previously employed in the same group exceeds by 7 percentage points the probability to absorb a worker not previously employed in the group. Similar results hold for outflows (Table 5).

This evidence suggests that the design of employee careers explains only in part why French groups operate internal labor markets, and motivates us to investigate instead the determinants of *horizontal* internal labor markets. Another feature of Tables 2-5 that calls for further investigation is the enormous amount of heterogeneity hiding behind the average figures. Many affiliated firms do not use the ILM at all. Some, about one fourth, use it a lot. Which firm and group characteristics help explain this pattern?

In section 4.1 we ask whether firms in more diversified groups operate more active ILMs: this prediction is in line with the view that ILMs allow firms hit by idiosyncratic shocks to redeploy labor towards their healthier group affiliates. In section 4.2 we ask whether an increase in ILM activity is spurred by plant or firm closures within the group, an occurrence that signals an exogenous shock hitting part of the group. Overall, we find evidence supporting the idea that French corporate groups do adjust their labor force *internally* in response to shocks. We then proceed to investigate what makes ILMs special: in section 4.3 we analyze ILM activity for different occupational categories, and find indirect evidence that lower hiring and firing costs play an important role in explaining the functioning of internal labor markets.

4.1 ILMs and group diversification

An interesting feature emerges from tables 2 to 4: the estimated ILM parameter $\widehat{\gamma}_{j,t}$ is positive only for firms belonging to the top quartile of the distribution and is negative for firms in the bottom decile: clearly, not all group-affiliated firms rely on the internal labor market. Now, the population of French groups is highly heterogeneous: there exist few large groups, with many large affiliates that are diversified both from a sectoral and geographical perspective; and many small groups, with few small affiliates, that are hardly diversified.[19] If there are benefits from adjusting a group's labor

[19]Looking at the distribution of group size in France, measured by group total employment, one finds out that groups belonging to the top decile on average have 20 affiliates, employ 800 workers per unit, operate in 7 different four-digit industries and in 4 different regions. Instead, groups in the rest of the population have less than 5 units, employ less

force internally in response to shocks, then group diversification must be a major determinant of ILM activity: firms in more diversified groups are more likely to be exposed to unrelated shocks, which creates more scope to exploit the horizontal ILM.

To explore the role of diversification in favoring ILM activity, we estimate the following model (where we make explicit which variables vary at the group- versus firm-level adding the subscript $g(j)$ which denotes the group g firm j is affiliated with):

$$\widehat{\gamma}_{j,g(j),t} = \delta Div_{g(j),t} + \zeta gsize_{g(j),t} + \theta Div_{g(j),t} \times gsize_{g(j),t} + \beta X_{j,g(j),t} + a_{j,g(j)} + b_t + \varepsilon_{j,g(j),t} \qquad (9)$$

where $\widehat{\gamma}_{j,g(j),t}$ is our estimated measure of ILM activity for firm j affiliated with group g at time t: the *excess* probability that firm j hires a worker originating from group g rather than hiring a worker on the external labor market.[20] $Div_{g(j),t}$ is a time-varying measure of (sectoral and geographical) diversification of the group g firm j is affiliated with; $gsize_{g(j),t}$ is the number of employees of (the rest of) the group at time t; the matrix $X_{j,g(j),t}$ includes additional firm- and group-level controls. The descriptive statistics of our control variables are shown in Table 6.[21] Finally, the model includes firm×group fixed effects to account for unobserved heterogeneity at the firm×group-level and year dummies to control for macroeconomic shocks common to all firms. The parameter θ, in this context, measures the differential impact of diversification for groups of different size on our measure of ILM activity. Tables 7 and 9 show the results.

Table 7 focuses on sectoral diversification. We compute a measure of group diversification by calculating the share of the group total employment that is accounted for by units active in each macro-sector/4-digit sector; then we take the (opposite of the) sum of the squared values of these shares.[22] Column 2 and 3 show that while for large groups diversification across macro sectors (agriculture, service, finance, manufacturing, automotive and energy) is associated with a more intense ILM activity, this is not the case for average-sized groups. This is in line with the intuition that labor is less redeployable across very distant sectors (that require different sector-specific skills), which in turn may hinder ILM activity. Conversely, and as expected, diversification across 4-digit sectors boosts

than 50 workers per-unit, operate in less than 3 different four-digit sectors and mostly in the same region.

[20] All our regressions have been run as well using the "outflow" measure of ILM activity. Results are very similar, and are relegated to an online Appendix.

[21] Note that descriptive statistics are computed at the *firm level*. Hence, large groups are over-represented and the average group characteristics turn out to be larger as compared to the ones computed at the group level and mentioned at the beginning of this Section.

[22] Essentially, we compute an Herfindahl-Hirshman Index based on the employment shares of the group in the different macro-sectors/4-digit sectors.

ILM activity irrespective of group size (column 4). In general, the effect of diversification is stronger in larger groups, where the internal labor market is thicker.

Table 9 focuses instead on geographical diversification. We first compute the share of total employment of the group that is accounted for by units located within the Paris area and outside the Paris area, respectively. Our measure of diversification is the (opposite of the) sum of the squared values of these shares. Then we perform the same exercise by computing employment shares referred to regions, i.e. the share of total employment of the group accounted for by units located in each region in France. As shown by columns 1 and 3, firms rely more on the ILM when they are affiliated with a more geographically diversified group. This effect is stronger in larger groups (columns 2 and 4). A priori, geographical dispersion allows group units to be exposed to unrelated regional shocks, thus creating more scope for horizontal ILMs. On the other hand, moving workers across more distant geographical areas might be difficult, due to trade union resistance and employment protection regulation. Our results suggest that the former effect prevails.[23,24]

4.2 Horizontal ILM as a response to shocks

In this section we investigate whether groups intensify their ILM activity in response to idiosyncratic shocks leading to a firm or plant closure. We denote as firm/plant closure a situation in which a firm/plant sees its employment drop by more than 90% from one year to the next or disappears altogether. In order to avoid denoting as a closure a situation in which a firm/plant simply changes identifier, we remove all the cases in which more than 70% of the lost employment ends up in the same firm/plant.

Columns (1), (2), (5) and (6) in Table 11 show that the ILM activity increases in the year following the closure of at least one firm in the group. More precisely, as we denote "year of closure" the last year of activity of a given firm (before it loses at least 90% of its workforce), our results show that in

[23]Note that the negative correlation between the number of affiliated firms and the excess probability displayed in the Tables is driven by a mechanical effect. Firms affiliated with larger groups are likely to have a higher number of triplets $\{o, z, j\}$ associated with them. Remember that, in order to compute our parameter of interest $\gamma_{c,j,t}$ we disregard all the triplets in which *all* the transitions from occupation o to occupation z originate from outside the group firm j is affiliated with. Now, groups composed by larger units or by a higher number of units have a more heterogeneous workforce, hence we observe transitions originating from firm j's group for a higher number of occupation pairs. This implies that we disregard fewer triplets when firm j is affiliated with a larger group. *Ceteris paribus*, the higher number of triplets over which it is possible to compute our parameter of interest $\gamma_{c,j,t}$ disproportionately generates a higher number of $\gamma_{c,j,t} = 0$, which decreases the average γ of firm j.

[24]Tables 8 and 10 show that similar qualitative results are obtained when we focus on outflows, i.e. on the excess probability of a worker that find a job in a group to originate from an affiliated firm over the probability of a worker who fidns a job outside the group.

year t a firm has a more pronounced tendency to hire workers who in year t-1 were employed by firms affiliated with the same group, when *at least one* of these firms closes (i.e. undertakes its last year of activity) in year t-1. Our results also show that closure is partially anticipated: the ILM activity also increases the year before closure, though to a smaller extent. Column (3), (4), (7) and (8) show that in year t a firm has a more pronounced tendency to hire workers who in t-1 were employed by its group affiliates, when at least one of these firms closes in year t, and thus in year t-1 was one year away from closure. Column 9 focuses instead on outflows of workers from group-affiliated firms: we find that the excess probability to originate from an affiliated firm for a worker who finds a job in a group, as opposed to a worker who finds a job outside the group, increases by 8.6 percentage points at the time when her/his firm of origin closes down. Figure 1 displays the evolution of this excess probability for closing firms as time to closure approaches and shows that it starts increasing two years before closure.

In sum, we observe that a plant or a firm closure "activates" the internal labor market. This suggests that groups rely on the ILM to coordinate the employment response of affiliated firms to idiosyncratic shocks. The benefits of such coordination are likely to be high *if internal labor markets display less severe frictions than the external labor market.* The ILM may for instance allow labor hoarding to take place at the group rather than the individual firm level: when a firm is hit by a negative shock, its healthy group affiliates can absorb its labor force, thus retaining the accumulated human capital and the valuable information acquired on its workers.[25] Labor adjustments internal to a group can also allow to save on firing costs, that may be particularly high for unionized workers, and provide employment insurance to those workers who value it most.[26] Finally, the ILM may activate in the presence of positive shocks: drawing on the group's human capital may allow affiliated firms to exploit profitable growth opportunities that call for a large investment in skilled labor and are thus constrained by hiring costs. In section 4.3 we proceed to investigate what makes ILMs "special" with respect to external labor markets. We provide indirect evidence that ILMs allow group firms to reduce search and screening costs for human capital intensive occupations, while saving on firing costs for

[25] As documented in early work (Oi (1962), and Fay and Medoff (1985)), both firing and hiring (search and training) costs induce firms to hoard labor when hit by a negative shock; yet, labor hoarding is per se costly and not necessarily a feasible option for financially weak firms (see Sharpe (1994)). In Cestone, Fumagalli, Kramarz, and Pica (2014), we show that with ILMs bearing less frictions than the external labor market, wealthy group firms use their financial slack to absorb workers from their liquidity-constrained group affiliates.

[26] Ellul, Pagano, and Schivardi (2014) find that family firms around the world provide employment insurance to their workers, the more so in countries and periods where the public sector insurance provision is lower, and when labor market conditions are tighter. Our paper suggests that corporate groups may as well provide employment insurance to their workers.

more unionized low-skill occupations.

4.3 ILMs and human capital: high-skill versus low-skill occupations

Prior work has documented that external labor markets are characterized by non negligible search and training costs that are particularly high in the case of skilled workers (see Abowd and Kramarz (2003), Blatter, Muehlemann, and Schenker (2012)).[27] This evidence is in line with the fact that high-skill occupations are usually information-intensive: in other words, it is particularly difficult to assess the *quality* of the worker being hired, her fit with the corporate culture, and her suitability for a specific task, without previous direct observation of the worker's performance. Search and screening costs may thus be substantially reduced when group-affiliated firms draw human capital from the internal labor market. At the same time, group-affiliated firms may be able to slash firing costs when workers organized in more effective unions are redeployed internally through the group's ILM. It is then natural to ask whether internal labor markets operate differently for high-skill occupations.

To this aim, in this section we turn to the estimated parameters $\widehat{\gamma}_{c,j,t}$ at the triplet level $\{o, z, j\}$ for each year t. Our dependent variable is now the excess probability $\widehat{\gamma}_{c,j,g(j),t}$ defined for a given occupational pair $\{o, z\}$, firm j and group g in year t. The occupational categories listed in Table 1 can be associated to decreasing degrees of human capital and skill. Based on these, we build four broad categories: *Managers/High-Skill* (Managerial and superior intellectual occupations), *Intermediate* (technicians and other intermediate administrative jobs), *Clerical Support*, and *Blue Collar* occupations.

Given that the dependent variable now varies also by occupation of origin and occupation of destination, we are able to augment the specification laid out in equation (9) adding dummies for each category of both; by further interacting the occupational dummies with the *Same Occupation* dummy, we then check whether the horizontal ILM works more or less intensely for different occupational categories. Finally, we interact our time-varying measure of sectoral diversification with the different occupation categories.

Results in Table 12 indicate that the activity of internal labor markets varies significantly across occupational categories, and is most intense for high-skill occupations. Columns 1 and 2 show that the *excess* probability to hire an employee from the group's ILM rather than from the external labor

[27] Recent evidence that firms engage in acquisitions (Ouimet and Zarutskie (2012)) and vertical integration (Atalay, Hortacsu, and Syverson (2014)) mainly to secure scarce human capital also suggests that skilled labor comes with large hiring costs.

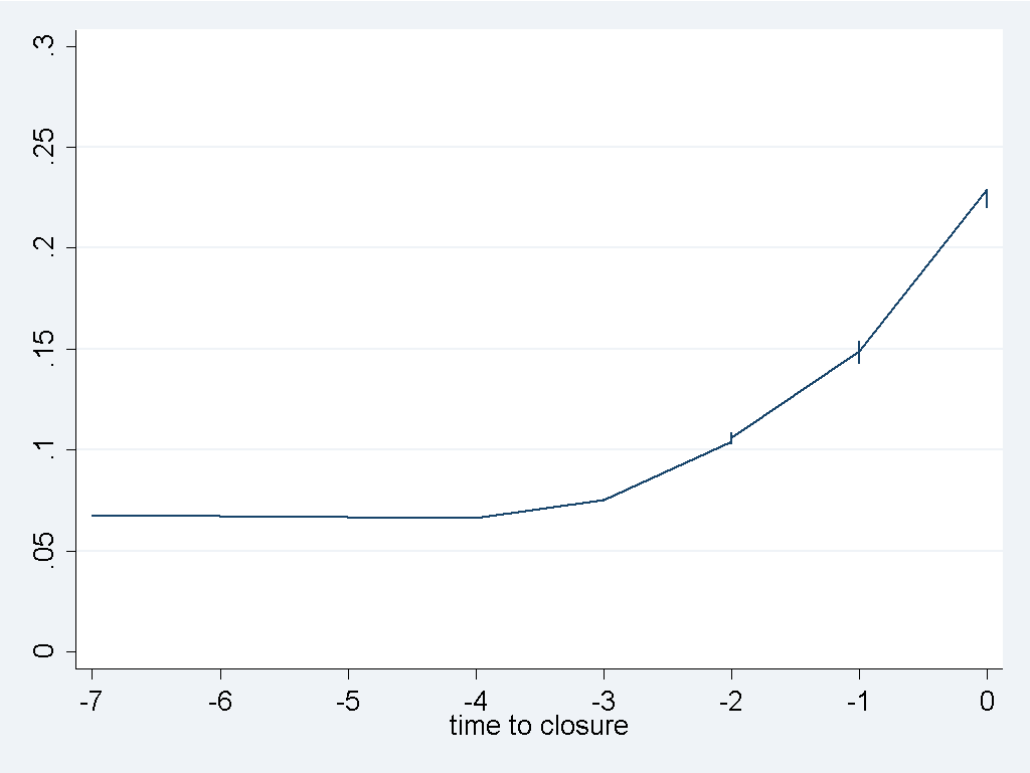
market is significantly higher in the case of managers and other high-skill employees, as compared to Intermediate Occupations, Clerical Support workers and Blue Collars (both for the occupation of origin and destination).[28] Consistently with results in Table 3, we also observe that the excess probability is lower when the occupation of origin coincides with the occupation of destination, suggesting that ILM activity can be *in part* ascribed to vertical career moves. Note also that even when focusing on *horizontal* job moves, we observe a more intense ILM activity for high-skill versus low-skill occupations (column 3).

In columns 4 to 7 we explore more in depth the role of sectoral diversification. In column 6 we document that diversification only boosts *horizontal* ILM activity, as captured by the *Same Occupation* dummy interacted with *Diversification*. Columns 5 and 7 suggest that the positive effect of diversification on ILM intensity is concentrated in lower-ranked occupations (mostly Blue Collars and Clerical Support workers); conversely, firms affiliated with *more* diversified groups are *less* prone to hire managers and other high-skill professionals previously employed in their own group. This seems to be in line with the idea that skilled human capital is industry-specific and thus difficult to redeploy across sectors (see Neal (1995) for evidence on this). Similar results hold when we look at the differential role of geographical diversification (results are available upon request).

In Table 13 (columns 3 to 7) we investigate whether the internal labor market for managers and other high-skilled employees reacts differently to firm and plant closures occurring within the group, with respect to the ILM for other occupational categories. Interestingly, closures spur ILM activity for lower-ranked categories – mostly for Clerical Support workers and Blue Collars – but reduce ILM intensity for the Managerial/High-Skilled labor force (column 4). This may be because managers and other high-skilled employees find outside options on the external labor market ahead of the closure occurring, while low-skill employees have less outside options available. Furthermore, firing costs in the presence of large layoffs may be particularly high for the more unionized occupational categories. Finally, we also observe that plant and firm closures within a group have a stronger positive effect on *horizontal* ILM activity (column 6), particularly so in the case of lower-skilled occupations (column 6).

[28] In the Appendix we present rankings of the disaggregated parameters $\gamma_{c,j,t}$ estimated for the triplets $\{o, z, j\}$, and the same clear pattern emerges: ILM activity is strong for high-skill occupations (such as top managers, engineers, high-level technicians, doctors and lawyers) and weak for unskilled occupations (blue collars, drivers and shop assistants).

FIGURE 1. Evolution of the excess probability (outflows) as closure approaches.



5 Flows of displaced workers from closing group units

We now move to a different identification strategy of the ILM effect, based on firm closure. For each group-affiliated firm i in our sample that closed during the period 2002-2010, we identify the set of all the actual and potential destinations of the displaced workers. We consider as potential destinations (a) all firms affiliated with the same group as i that have absorbed employees from i at least once in the sample period (the "ILM partners"); (b) all other firms that have absorbed employees from i at least once in the sample period (and thus deemed as potential external labor market partners for i). Thus, our unit of observation is a pair – firm of origin/firm of destination – in a given year, in which the firm of origin is a group-affiliated firm that eventually closes within our sample period.

We implement a simple diff-in-diff strategy, looking at the evolution of bilateral employment flows at closure relative to normal times (i.e. at least four years before closure) in pairs that belong to the same group as opposed to pairs that do not belong to the same group.[29] Following a closure shock that raises the outflow of workers from the closing firm, the time dimension - i.e. the comparison between the flows at closure time relative to normal times - allows us to control for all the time-invariant

[29]The evidence in Figure 1 supports this definition of "normal times," to the extent that ILM activity seems to pick up three years ahead of the actual firm closure.

pair-specific determinants of the bilateral flow. In other words, we take into account that two specific firms may experience intense flows of workers even in normal times. The second difference, i.e. the comparison between pairs affiliated with the same group and pairs not affiliated with the same group, identifies the ILM effect. In this exercise, the counterfactual is the employment flow that would have occurred between the closing firm and a destination firm not affiliated with the same group, holding constant the intensity of the bilateral flow.

We estimate the following model:

$$f_{ijt} = \alpha_t + \phi_{ij} + \phi_0 BG_{jt} + \phi_1 SameBG_{ijt} + \phi_2 d_{it} + \phi_3 c_{it} \times BG_{jt} + \phi_4 c_{it} \times SameBG_{ijt} + \varepsilon_{ijt} \quad (10)$$

where f_{ijt} is the ratio of employees moving from an affiliated firm i to a firm j in year t to the total number of employees that leave firm i in year t; the term α_t and ϕ_{ij} represent a set of year dummies and a firm pair fixed effect, respectively; BG_{jt} is a dummy that takes value 1 if the firm of destination is affiliated with any group in year t; $SameBG_{ijt}$ takes value 1 if the firm of destination is affiliated with the same group as firm i, in year t. The term d_{it} indicates a set of dummies capturing the distance to closure (measured in years) of firm i. The dummy c_{it} takes the value 1 in the last two years of firm i's activity and is interacted with both BG_{jt} and $SameBG_{ijt}$. The variable of interest is the interaction between $SameBG_{ijt}$ and c_{it}. Its coefficient ϕ_4 captures the differential effect of closures on employment flows (relative to normal times, i.e. at least four years before closure) between pairs of firms that belong to the same group relative to pairs that do not.

This approach confirms our earlier results. Table 16, column (2) presents our baseline results which are obtained by estimating equation 10. In column (1) we also present results obtained from an alternative specification which includes only firm-of-origin fixed effect. Our results show that firm closure intensifies the ILM activity. At closure (relative to normal times), the fraction of displaced workers redeployed to a firm affiliated with the same group increases by 11 to 14 percentage points more than the fraction redeployed to a non affiliated firm.

By comparing column (1) and column (2) in Table 16 one can also observe that, controlling for the firm of origin time-invariant characteristics, in normal times the fraction of workers flowing to a destination firm affiliated to the same group is larger than the fraction of workers flowing to a non-affiliated destination firm, as indicated by the positive sign of the dummy variable *Same Group* in the specification with the firm-of-origin fixed effect (column 1). The sign of the dummy variable Same

Group becomes negative in our baseline specification with pair fixed effects. In this case the effect of being in the same group is identified only on the subset of pairs in which the firm of destination changes status in normal times, i.e. becomes (or stops being) affiliated with the same group as the firm of origin. At face value, this result tells us that, in normal times, controlling for the time-invariant non-observable characteristics of the pair, *becoming* part of the same group does not increase the flow of workers. The combination of these results suggests that, in normal times, it is not group affiliation per se, but the specific characteristics of the firms that are (self-)selected within the same group that makes the fraction of workers flowing to a destination firm larger.

However, in both specifications our variable of interest, namely the interaction between the Closure dummy and the Same Group dummy, is positive: even accounting for the time-invariant unobservables of the pair (firm of origin - firm of destination), the closure shock increases the fraction of workers flowing to an affiliated firm *more* than the fraction of workers flowing to a non-affiliated destination firm. Moreover, columns (3) and (4) of Table 16 show that the "ILM effect" is more pronounced if the destination firm experiences a sectoral boom, confirming that the ILM allows the group to coordinate labor adjustments following shocks.

Table 17, columns (1) and (2), shows that the closure shock has heterogeneous effects across different occupational categories, confirming the results obtained in Section 4.3. In this case the dependent variable f_{ijtk} is the proportion of employees of occupational category k (in the firm of origin) moving from firm i to firm j in year t relative to the total number of workers that leave firm i in year t. As in Section 4.3, we consider four occupational categories: managers, intermediate occupation, clerical support and blue collars, with blue collars being the excluded category. We estimate two specifications, in which we allow for the time-invariant characteristics of each occupation of origin to differ across firms of origin (i.e. we include firm-of-origin×occupation-of-origin fixed effects) and across pairs of firms (i.e. we include pair×occupation-of-origin fixed effects).

Results are similar across the two specifications and show that firm closure intensifies ILM activity more for blue collar workers and to a lesser extent for the other categories of workers. More precisely, at closure the fraction of blue collar workers redeployed to an affiliated firm increases more than the fraction redeployed to a non-affiliated firm, as indicated by the positive and significant coefficient of *Closure* × *Same Group* which measures the impact of the closure shock on the excluded category, namely blue collar workers. The triple interactions of *Closure* × *Same Group* with the other occupational categories are all negative, showing that the stronger effect of the closure shock on internal

flows as compared to external flows is less pronounced for the other types of workers. Interestingly, the effect is monotonically decreasing, being the smallest for managers.[30] Note also that, in normal times, the opposite pattern emerges: the difference between the fraction of workers redeployed to a firm affiliated with the same group with respect to the fraction redeployed to a non-affiliated firm increases along the occupational ladder, and is largest for managers as indicated by the coefficient of *Same Group* interacted with the different occupational categories.[31] This set of results is consistent with those presented in Section 4.3.

In Columns (3) and (4) of Table 17 we move to wages and examine the wage changes of workers transiting from firm i to firm j at time t: thus, the unit of observation is now the worker.[32] Column (3) shows that blue collar workers do not enjoy any wage premium (or penalty) when moving within the same group, neither in normal times nor upon closure, as indicated by the non-significant coefficients of *Same Group* and *Same Group* $\times$ *closure*. The only action concerns managers that seem to enjoy a premium in normal times of about 11.75 percentage points (*Same Group* $\times$ *Managers*), almost completely dissipated upon closure (*Same Group* $\times$ *Closure* $\times$ *Managers*). Those effects vanish in column (4) in which we control for the pair fixed effect (interacted with the occupation of origin fixed effect): this suggests that the wage premium (penalty) in normal times (closure time) are due to the managers (self)selecting into high-(low-)wage firms.

The difference-in-difference methodology also allows us to study whether this effect is heterogeneous depending on the characteristics of the absorbing firms.[33] In particular, a natural question arises as to whether the reallocation of labor within groups depends on the financial status of the group-affiliated units. This is addressed is section 5.1 below.

5.1 Employment flows and destination firms' financial status

In this subsection we investigate whether the flow of employees redeployed to ILM versus ELM partner firms upon closure is affected by the firm of destination's size and financial status. For this purpose we merge our data with balance sheet data from the FICUS. This is a dataset constructed from

[30] In column (1), the coefficients of the triple interactions are significantly different from each other at least at 5%. In column (2) the coefficient of *Closure*$\times$*Same Group*$\times$*Managers* is significantly different from the coefficient of *Closure*$\times$*Same Group*$\times$*Clerical Support* at 5%.

[31] In column (1), the coefficients of the double interactions are significantly different from each other at 0.1%.

[32] Notice that, in this case, the (potential) wage gains/losses associated with a move between firms exhibiting zero worker flows cannot be observed.

[33] We can control for firm-level characteristics, to the extent that we investigate the activity of ILMs within *groups* of affiliated firms. This is in contrast to work focusing on diversified firms, where ILMs reallocate workers across firm segments (see e.g. Tate and Yang (2014)).

administrative fiscal data, and covers the universe of French firms. The administrative unit in FICUS is the firm ("entreprise"); hence, for each firm of destination in our dataset we construct a measure of size (book value of total assets), and two measures of financial health: leverage (book value of debt over total assets) and coverage (EBITDA over interest expense).[34] Very high levels of financial leverage may imply that a firm has limited debt capacity and thus does not enjoy the financial flexibility necessary to expand its workforce.[35] A very low interest coverage ratio signals that the firm is at risk of default in the near future and possibly subject to the formal or real control of debtholders.[36]

We study whether our difference in difference "ILM effect" ($SameBG \times Closure$) varies for firms of destination at different percentiles of the distribution of assets, leverage and coverage: we expect the effect of financial health to kick in at very high (low) levels of leverage (coverage). Our dependent variable is the ratio of employees moving in year t from a group-affiliated firm i to any ILM or ELM partner j *not* operating in the financial sector, over the total number of employees displaced by firm i in that year.

Table 18 reports the results. Our first finding is that the ILM effect is larger for larger firms. At closure, the fraction of displaced workers redeployed to a firm affiliated with the same group – and whose assets are between the 10th and 50th percentile of the distribution – increases by 7.5 (5.6) percentage percentage points more than the fraction redeployed to a non-affiliated firm of similar size; however, this effect is 5 to 6 percentage points larger for absorbing firms whose assets are above the median, and even larger for absorbing firms with assets in the top decile of the distribution. We also find that our difference in difference effect is significantly smaller for highly levered firms (firms whose leverage falls in the top decile of the distribution) and for firms that are close to default (firms whose coverage ratio falls in the bottom decile). Overall, columns 5 to 8 suggest that while upon closure of a group-affiliated firm, ILM activity picks up with respect to normal times (with more displaced workers redeployed within the group as opposed to outside the group), highly levered and distressed group affiliates are less likely to account for this intensification of ILM activity.

[34] For every firm pair, the destination firm's size and financial status are measured in "normal times", i.e. by averaging, respectively, total assets, leverage and coverage over the period that dates at least four years before the firm of origin's closure. Indeed, a firm's closure is likely to affect the size and financial status of both its ELM and ILM partners.

[35] An affiliated firm's closure may generate an expansion opportunity for group units as high-skilled employees can be absorbed from the ILM incurring low hiring costs. However, debt overhang may prevent highly levered units to seize this opportunity.

[36] The violation of financial covenants imposing a minimal coverage ratio often boosts debtholders' control rights, which may limit the group's ability to reallocate workers towards distressed units.

6 Conclusions

In this paper, we exploited a matched employer-employee data set merged with information on firms' group affiliation, to investigate whether and why French business groups operate internal labor markets. Even after accounting for the endogeneity of group structure, we find that group-affiliated firms are particularly prone to draw employees from the ILM, rather than from the external labor market. Our evidence suggests that while vertical careers explain in part why groups operate internal labor markets, *horizontal* ILMs are the predominant phenomenon, with groups reallocating labor internally in response to idiosyncratic shocks. To support this view, we also find that more (geographically and sectorally) diversified groups – whose units are more likely to be exposed to unrelated shocks - display a more intense ILM activity. Internal labor market activity also picks up when part of the group is hit by a shock leading to firm or plant closures.

Our findings suggest that internal labor markets suffer from less severe frictions than the external labor market. To investigate this further, we study whether groups' ILMs operate differently for different occupational categories. We observe that in "normal times" group-affiliated firms rely on ILMs mainly to adjust their *skilled* labor force, which suggests that ILMs allow groups to slash search and training costs for the most human capital-intensive occupations. However, when major shocks hit part of the group, leading to plant or firm closures, ILM activity picks up for the lower-skilled occupations: then, firms affiliated with closing units become significantly more likely to absorb lower-skilled employees from their group rather than the external labor market. We interpret this as evidence that the ILM is also used to limit large-scale involuntary dismissals for the more unionized workers.

Finally, we exploit our data to study the bilateral flows of workers from group firms towards their affiliated units versus non-affiliated firms. Differently from previous studies that have focused on ILMs within diversified firms, we are able to control for the characteristics of firm of origin and firm of destination. Relying on a difference in difference strategy, we find that for any group firm that experiences a closure at some point in the sample period, the fraction of separating workers moving to any affiliated firm increases *more* upon closure than the fraction of separating workers moving to any external labor market partner. This diff-in-diff effect is more pronounced for larger absorbing firms and less pronounced for absorbing firms with a very high (low) leverage (coverage) ratio. This suggests that potential ILM partners with limited debt capacity and/or close to default are less likely to account for the intensification of ILM activity observed upon closure of group units.

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TABLE 2. Inflows - CS Classification

			Percentiles			
Year	Mean	St.Dev.	10	50	75	N
	Unweighted firm-level aggregation					
2003	0.089	0.231	-0.001	0.000	0.010	37475
2004	0.093	0.237	-0.001	0.000	0.012	36691
2005	0.093	0.237	-0.001	0.000	0.012	38870
2006	0.093	0.237	-0.001	0.000	0.011	41868
2007	0.087	0.229	-0.001	0.000	0.007	44362
2008	0.084	0.226	-0.001	0.000	0.006	47356
2009	0.096	0.242	-0.001	0.000	0.012	40736
2010	0.095	0.244	-0.001	0.000	0.009	42045
	Weighted firm-level aggregation					
2003	0.083	0.227	-0.001	0.000	0.010	37475
2004	0.087	0.233	-0.001	0.000	0.011	36691
2005	0.087	0.232	-0.001	0.000	0.011	38870
2006	0.086	0.232	-0.001	0.000	0.011	41868
2007	0.081	0.224	-0.001	0.000	0.008	44362
2008	0.078	0.221	-0.001	0.000	0.007	47356
2009	0.090	0.238	-0.001	0.000	0.013	40736
2010	0.090	0.240	-0.001	0.000	0.010	42045

The year appearing in the first column indicates the year in which workers transiting from one job the other were hired by the affiliated firm j. In this table we restrict to set c to be the set of all transitions occurring between occupation o and occupation z that originate from the same departments in France where firm j's group is active. The upper panel of the table presents simple averages. The bottom panel shows weighted averages where the weight associated to each $\gamma_{c,j}$ is the ratio of the number of transitions from occupation o to occupation z that originate from fim j's group to the total number of transitions (for all the occupation pairs associated with firm j) that originate from j's group.

TABLE 3. Inflows - 2-digit Same Occupation

			Percentiles			
Year	Mean	St.Dev.	10	50	75	N
	Unweighted firm-level aggregation					
2003	0.066	0.202	-0.001	0.000	0.000	34971
2004	0.069	0.209	-0.001	0.000	0.001	34103
2005	0.070	0.210	-0.001	0.000	0.000	36134
2006	0.070	0.210	-0.001	0.000	0.000	39069
2007	0.065	0.201	-0.001	0.000	0.000	41403
2008	0.065	0.202	-0.001	0.000	0.000	44542
2009	0.075	0.218	-0.001	0.000	0.001	38213
2010	0.073	0.217	-0.001	0.000	0.000	39329
	Weighted firm-level aggregation					
2003	0.062	0.198	-0.001	0.000	0.001	34971
2004	0.065	0.205	-0.001	0.000	0.001	34103
2005	0.065	0.205	-0.001	0.000	0.001	36134
2006	0.065	0.204	-0.001	0.000	0.001	39069
2007	0.061	0.196	-0.001	0.000	0.000	41403
2008	0.061	0.197	-0.001	0.000	0.000	44542
2009	0.070	0.213	-0.001	0.000	0.001	38213
2010	0.068	0.212	-0.001	0.000	0.001	39329

The year appearing in the first column indicates the year in which workers transiting from one job the other were hired by the affiliated firm j. In this table we restrict to set c to be the set of all transitions occurring between occupation o and occupation z in which occupation o is equal to occupation z. Moreover, we consider all the transitions that originate from the same departments in France where firm j's group is active. The upper panel of the table presents simple firm-level averages. The bottom panel shows weighted averages where the weight associated to each $\gamma_{c,j}$ is the ratio of the number of transitions from occupation o to occupation z, with $o = z$, that originate from fim j's group to the total number of transitions (for all the occupation pairs associated with firm j) that originate from j's group.

TABLE 4. Outflows - CS Classification

			Percentiles			
Year	Mean	St.Dev.	10	50	75	N
	Unweighted firm-level aggregation					
2002	0.090	0.232	-0.001	0.000	0.013	36555
2003	0.095	0.240	-0.001	0.000	0.016	35343
2004	0.098	0.243	-0.001	0.000	0.018	36707
2005	0.095	0.239	-0.001	0.000	0.015	40517
2006	0.090	0.234	-0.001	0.000	0.013	42203
2007	0.087	0.228	-0.001	0.000	0.010	45709
2008	0.095	0.242	-0.001	0.000	0.013	40695
2009	0.100	0.248	-0.001	0.000	0.016	39549
	Weighted firm-level aggregation					
2002	0.083	0.226	-0.001	0.000	0.012	36555
2003	0.088	0.235	-0.001	0.000	0.015	35343
2004	0.091	0.237	-0.001	0.000	0.016	36707
2005	0.088	0.233	-0.001	0.000	0.014	40517
2006	0.084	0.228	-0.001	0.000	0.013	42203
2007	0.080	0.222	-0.001	0.000	0.009	45709
2008	0.089	0.237	-0.001	0.000	0.013	40695
2009	0.093	0.243	-0.001	0.000	0.016	39549

The year appearing in the first column indicates the year in which workers transiting from one job the other left the affiliated firm j. In this table we restrict to set c to be the set of all transitions occurring between occupation o and occupation z that land to the same departments in France where firm j's group is active. The upper panel of the table presents simple averages. The bottom panel shows weighted averages where the weight associated to each $\gamma^{O}_{c,j}$ is the ratio of the number of transitions from occupation o to occupation z that land to fim j's group to the total number of transitions (for all the occupation pairs associated with firm j) that land to j's group.

TABLE 5. Outflows - 2-digit Same Occupation

			Percentiles			
Year	Mean	St.Dev.	10	50	75	N
	Unweighted firm-level aggregation					
2002	0.066	0.201	-0.001	0.000	0.001	34140
2003	0.071	0.211	-0.001	0.000	0.001	32966
2004	0.072	0.213	-0.001	0.000	0.001	34139
2005	0.071	0.210	-0.001	0.000	0.001	37950
2006	0.067	0.204	-0.001	0.000	0.001	39441
2007	0.659	0.202	-0.001	0.000	0.000	43033
2008	0.073	0.216	-0.001	0.000	0.001	38265
2009	0.075	0.217	-0.001	0.000	0.002	37070
	Weighted firm-level aggregation					
2002	0.061	0.197	-0.001	0.000	0.001	34110
2003	0.066	0.206	-0.001	0.000	0.002	32966
2004	0.067	0.208	-0.001	0.000	0.002	34139
2005	0.066	0.204	-0.001	0.000	0.001	37950
2006	0.063	0.198	-0.001	0.000	0.001	39441
2007	0.061	0.197	-0.001	0.000	0.001	43033
2008	0.069	0.211	-0.001	0.000	0.001	38265
2009	0.070	0.212	-0.001	0.000	0.002	37070

The year appearing in the first column indicates the year in which workers transiting from one job the other left the affiliated firm j. In this table we restrict to set c to be the set of all transitions occurring between occupation o and occupation z in which occupation o is equal to occupation z. Moreover, we consider all the transitions that land to the same departments in France where firm j's group is active. The upper panel of the table presents simple averages. The bottom panel shows weighted averages where the weight associated to each $\gamma^{O}_{c,j}$ is the ratio of the number of transitions from occupation o to occupation z, with $o = z$, that land to fim j's group to the total number of transitions (for all the occupation pairs associated with firm j) that land to j's group.

TABLE 6. Descriptive Statistics

	Mean	**St.dev.**	**Min**	**Max**	**N**
$\overline{\gamma}_{jt}$	0.091	0.23	-0.63	1	289,689
Firm size (empl.)	157.83	1468.45	0.005	217640	289,689
Rest of the group size (empl.)	10955	29375.43	0.001	349038	289,689
Number of 4 digit sectors	11.52	18.57	1	92	289,689
Number of macrosectors	1.88	0.99	1	6	289,689
Number of regions	5.4	6.45	1	22	289,689
Diversification (macro sectors)	-0.87	0.18	-1	-0.26	289,689
Diversification (4-digit sectors)	-0.58	0.27	-1	-0.08	289,689
Diversification (Paris)	-0.85	0.19	-1	-0.5	289,689
Diversification (Regions)	-0.71	0.30	-1	-0.08	289,689
% of firms that close	0.015	0.12	0	1	289,689
# of firm closures in the rest of the group (in year t)	1.76	5.45	0	68	289,689
# of firm closures in the rest of the group (in year t-1)	1.98	5.75	0	68	289,689
% of firms affiliated with groups in which at least one (other) firm closes down (in year t)	0.28	0.45	0	1	289,689
% of firms affiliated with groups in which at least one (other) firm closed down (in year t-1)	0.32	0.46	0	1	289,689
# of plant closures in the group (in year t)	16.23	92.27	0	2149	289,689
# of plant closures in the group (in year t-1)	18.9	101.92	0	2149	289,689
% of firms affiliated with groups in which at least one (other) plant closes down (in yeat t)	0.45	0.50	0	1	289,689
% of firms affiliated with groups in which at least one (other) plant closed down (in yeat t-1)	0.50	0.50	0	1	289,689

Note: *Firm size* is measured by (full time equivalent) total employment; *Rest of the group size* is measured by the (full time equivalent) total employment of all the other firms that are affiliated to the same group as firm j. *Diversification (macrosectors)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given macrosectors over the total employment of the group. Macrosectors are agriculture, service, finance, manifacturing, energy, automotive. *Diversification (4-digit)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given 4-digit sector to the total employment of the group. *Diversification (Paris Area)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in the Paris Area/outside the Paris Area over the total employment of the group. *Diversification (Region)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given region over the total employment of the group. We denote as firm/plant closure a situation in which a firm/plant sees its employment drop by more than 90% from one year to the other. We do not consider as closures all the cases in wihch more than 70% of the lost employment ends up in the same firm/plant. We consider as year of the closure the last year of activity of a given firm/plant, before it loses at least 90% of its workforce. For a given affiliated firm j, *# of firm closures in the rest of the group (in year t)* measures the number of firms in the rest of the group that close in year t, i.e. that are in their last year of activity in year t. *# of firm closures in the rest of the group (in year t-1)* measures the number of firms in the rest of the group that closed in year $t-1$, i.e. that were in their last year of activity in year $t-1$.

TABLE 7. **ILM activity and group sectoral diversification (Inflows)**

Variables	(1)	(2)	(3)	(4)	(5)
(Log) Firm size	0.009***	0.009***	0.009***	0.009***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(Log) Rest of the group size	0.001	0.001	0.000	0.001	0.004*
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
(Log) Number of affiliated firms	-0.084***	-0.084***	-0.085***	-0.085***	-0.088***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
State Control	-0.025	-0.025	-0.020	-0.024	-0.009
	(0.024)	(0.024)	(0.022)	(0.023)	(0.017)
Foreign control	-0.043	-0.043	-0.038	-0.042	-0.029
	(0.026)	(0.026)	(0.026)	(0.026)	(0.021)
Diversification (Macrosectors)		-0.006	-0.009		
		(0.007)	(0.007)		
Diversification × Rest of the group size			0.012***		
			(0.003)		
Diversification (4 digit)				0.014*	0.030***
				(0.006)	(0.006)
Diversification (4d) × Rest of the group size					0.022***
					(0.003)
N	289,689	289,689	289,689	289,689	289,689
Firm × Group and year fixed effect	Yes	Yes	Yes	Yes	Yes

Note: Dependent variable: Excess probability of hiring a worker if she originates from the same group. *Firm size* is measured by (full time equivalent) total employment; *Rest of the group size* is measured by the (full time equivalent) total employment of all the other firms that are affiliated to the same group as firm j. *State Control* is a dummy variable taking the value 1 if the head of the group is state-owned. *Foreign Control* is a dummy variable taking the value 1 if the head of the group is foreign. *Diversification (macrosectors)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given macrosectors over the total employment of the group. Macrosectors are agriculture, service, finance, manifacturing, energy, automotive. *Diversification (4-digit)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given 4-digit sector to the total employment of the group. The variables *Rest of the group size*, *Number of firms in the group*, *Diversification* is normalised to have zero mean. One star denotes significance at the 5% level, two stars denote significance at the 1% level, and three stars denote significance at the 0.1% level.

TABLE 8. **ILM activity and group sectoral diversification (Outflows)**

Variables	(1)	(2)	(3)	(4)
(Log) Firm size	0.006***	0.006***	0.006***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
(Log) Rest of the group size	0.002	0.003*	0.002	0.007***
	(0.001)	(0.002)	(0.001)	(0.002)
(Log) Number of affiliated firms	-0.082***	-0.082***	-0.082***	-0.086***
	(0.003)	(0.003)	(0.003)	(0.003)
State Control	-0.006	-0.003	-0.006	0.009
	(0.021)	(0.019)	(0.021)	(0.016)
Foreign control	-0.001	0.001	-0.001	0.012
	(0.050)	(0.050)	(0.049)	(0.048)
Diversification (Macrosectors)	0.015*	0.013		
	(0.007)	(0.007)		
Diversification × Rest of the group size		0.011***		
		(0.003)		
Diversification (4 digit)			0.012*	0.030***
			(0.006)	(0.006)
Diversification (4d) × Rest of the group size				0.023***
				(0.003)
N	279,433	279,433	279,433	279,433
Firm × Group and year fixed effect	Yes	Yes	Yes	Yes

Note: Dependent variable: Excess probability of originating from affiliated firm j for workers landing into the same group as compared to workers landing outside the group. *Firm size* is measured by (full time equivalent) total employment; *Rest of the group size* is measured by the (full time equivalent) total employment of all the other firms that are affiliated to the same group as firm j. *State Control* is a dummy variable taking the value 1 if the head of the group is state-owned. *Foreign Control* is a dummy variable taking the value 1 if the head of the group is foreign. *Diversification (macrosectors)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given macrosectors over the total employment of the group. Macrosectors are agriculture, service, finance, manifacturing, energy, automotive. *Diversification (4-digit)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given 4-digit sector to the total employment of the group. The variables *Rest of the group size*, *Number of firms in the group*, *Diversification* are normalised to have zero mean. One star denotes significance at the 5% level, two stars denote significance at the 1% level, and three stars denote significance at the 0.1% level.

TABLE 9. **ILM activity and group geographical diversification (Inflows)**

Variables	(1)	(2)	(3)	(4)
(Log) Firm size	0.009***	0.009***	0.009***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)
(Log) Rest of the group size	0.001	0.001	0.002	0.004*
	(0.001)	(0.001)	(0.001)	(0.002)
(Log) Number of affiliated firms	-0.085***	-0.087***	-0.087***	-0.090***
	(0.003)	(0.003)	(0.003)	(0.003)
State Control	-0.024	-0.016	-0.025	-0.013
	(0.023)	(0.021)	(0.022)	(0.018)
Foreign control	-0.044	-0.039	-0.043	-0.035
	(0.026)	(0.023)	(0.025)	(0.021)
Diversification (Paris Area)	0.039***	0.022*		
	(0.008)	(0.009)		
Diversification × Rest of the group size		0.024***		
		(0.004)		
Diversification (Region)			0.043***	0.040***
			(0.007)	(0.007)
Diversification (Reg.) × Rest of the group size				0.027***
				(0.004)
N	289,689	289,689	289,689	289,689
Firm × Group and year fixed effect	Yes	Yes	Yes	Yes

Note: Dependent variable: Excess probability of hiring a worker if she originates from the same group. *Firm size* is measured by (full time equivalent) total employment; *Rest of the group size* is measured by the (full time equivalent) total employment of all the other firms that are affiliated to the same group as firm j. *State Control* is a dummy variable taking the value 1 if the head of the group is state-owned. *Foreign Control* is a dummy variable taking the value 1 if the head of the group is foreign. *Diversification (Paris Area)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in the Paris Area/outside the Paris Area over the total employment of the group. *Diversification (Region)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given region over the total employment of the group. The variables *Rest of the group size*, *Number of firms in the group*, *Diversification* are normalised to have zero mean. One star denotes significance at the 5% level, two stars denote significance at the 1% level, and three stars denote significance at the 0.1% level.

TABLE 10. **ILM activity and group geographical diversification (Outflows)**

Variables	(1)	(2)	(3)	(4)
(Log) Firm size	0.006***	0.006***	0.006***	0.005***
	(0.001)	(0.001)	(0.001)	(0.001)
(Log) Rest of the group size	0.002	0.004**	0.001	0.008***
	(0.001)	(0.002)	(0.001)	(0.002)
(Log) Number of affiliated firms	-0.082***	-0.083***	-0.084***	-0.086***
	(0.003)	(0.003)	(0.003)	(0.003)
State Control	-0.005	0.004	-0.005	0.009
	(0.021)	(0.019)	(0.020)	(0.017)
Foreign control	-0.002	0.003	-0.001	0.008
	(0.050)	(0.048)	(0.049)	(0.047)
Diversification (Paris Area)	0.029***	0.016		
	(0.008)	(0.008)		
Diversification × Rest of the group size		0.024***		
		(0.004)		
Diversification (Region)			0.035***	0.030***
			(0.007)	(0.007)
Diversification (Reg.) × Rest of the group size				0.027***
				(0.003)
N	279,433	279,433	279,433	279,433
Firm × Group and year fixed effect	Yes	Yes	Yes	Yes

Note: Dependent variable: Excess probability of originating from affiliated firm j for workers landing into the same group as compared to workers landing outside the group. *Firm size* is measured by (full time equivalent) total employment; *Rest of the group size* is measured by the (full time equivalent) total employment of all the other firms that are affiliated to the same group as firm j. *State Control* is a dummy variable taking the value 1 if the head of the group is state-owned. *Foreign Control* is a dummy variable taking the value 1 if the head of the group is foreign. *Diversification (Paris Area)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in the Paris Area/outside the Paris Area over the total employment of the group. *Diversification (Region)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given region over the total employment of the group. The variables *Rest of the group size*, *Number of firms in the group*, *Diversification* are normalised to have zero mean. One star denotes significance at the 5% level, two stars denote significance at the 1% level, and three stars denote significance at the 0.1% level.

TABLE 11. **Effect of firm/plant closures in the group on ILM activity**

Variables	Inflows (1)	Inflows (2)	Inflows (3)	Inflows (4)	Inflows (5)	Inflows (6)	Inflows (7)	Inflows (8)	Outflows (9)
(Log) firm size	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***	0.009***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(Log) rest of the group size	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.002
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)
(Log) number of affiliated firms	-0.084***	-0.084***	-0.085***	-0.085***	-0.084***	-0.084***	-0.085***	-0.085***	-0.081***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
State Control	-0.023	-0.025	-0.025	-0.025	-0.025	-0.025	-0.025	-0.026	-0.005
	(0.022)	(0.021)	(0.023)	(0.023)	(0.023)	(0.023)	(0.024)	(0.024)	(0.021)
Foreign Control	-0.034	-0.036	-0.040	-0.040	-0.041	-0.038	-0.043	-0.040	-0.001
	(0.024)	(0.024)	(0.025)	(0.025)	(0.026)	(0.025)	(0.026)	(0.025)	(0.050)
Firm closure in rest of the group (in t-1)	0.017***								
	(0.001)								
Between 1 and 5		0.017***							
		(0.001)							
More than 5		0.026***							
		(0.003)							
Firm closure (in t)			0.009***						
			(0.001)						
Between 1 and 5				0.008***					
				(0.001)					
More than 5				0.012***					
				(0.003)					
Plant closure (in t-1)					0.015***				
					(0.001)				
Between 1 and 5						0.015***			
						(0.001)			
More than 5						0.020***			
						(0.002)			
Plant closure (in t)							0.007***		
							(0.001)		
Between 1 and 5								0.006***	
								(0.001)	
More than 5								0.013***	
								(0.002)	
Own closure									0.086***
									(0.006)
N	289,689	289,689	289,689	289,689	289,689	289,689	289,689	289,689	279,433
Firm × Group and year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Dependent variable: Columns (1)-(7) Excess probability of hiring a worker if she originates from the same group as compared to a worker not originating from the same group. Column (8) Excess probability of originating from affiliated firm j for workers landing into the same group as compared to workers landing outside the group. *Firm size* is measured by (full time equivalent) total employment; *Rest of the group size* is measured by the (full time equivalent) total employment of all the other firms that are affiliated to the same group as firm j. We denote as firm/plant closure a situation in which a firm/plant sees its employment drop by more than 90% from one year to the other. We consider as year of the closure the last year of activity of a given firm/plant, before it loses at least 90% of its workforce. We do not consider as closures all the cases in which more than 70% of the lost employment ends up in the same firm/plant. *Firm closure in the rest of the group (in year t-1)* is a dummy variable that takes the value 1 if in year $t-1$ at least one firm in the rest of the group closes, i.e. it undertakes its last year of activity in yeat $t-1$. *Firm closure (year t)* is a dummy variable that takes the value 1 if al least one firm in the group closes in year t. Similarly for plant closure. *Own closure* is a dummy variable that takes the value 1 if firm j closes in year t. One star denotes significance at the 5% level, two stars denote significance at the 1% level, and three stars denote significance at the 0.1% level.

TABLE 12. **Heterogeneity of ILM activity by occupations (Inflows)**

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)
(Log) Firm Size	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(Log) Rest of the group size	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
(Log) Number of affiliated firms	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
State Control	-0.011**	-0.011**	-0.011**	-0.011**	-0.011**	-0.011**	-0.011**
	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Foreign Control	-0.031***	-0.031***	-0.030***	-0.031***	-0.031***	-0.031***	-0.031***
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Occupation of destination (Managers/High-Skill excluded)							
Intermediate Occupation	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***	-0.002***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Clerical Support	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Blue Collar	-0.004***	-0.004***	-0.003***	-0.004***	-0.005***	-0.004***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Occupation of origin (Managers/High-Skill excluded)							
Intermediate Occupation	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Clerical Support	-0.006***	-0.006***	-0.005***	-0.006***	-0.006***	-0.006***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Blue Collar	-0.005***	-0.005***	-0.004***	-0.005***	-0.004***	-0.005***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Same Occupation		-0.002***	0.001***			-0.002***	-0.000
		(0.000)	(0.000)			(0.000)	(0.000)
Same Occupation × Intermediate Occupation			-0.002***				-0.000
			(0.000)				(0.000)
Same Occupation × Clerical Support			-0.005***				-0.000
			(0.000)				(0.001)
Same Occupation × Blue Collar			-0.007***				-0.004***
			(0.000)				(0.001)
Diversification (4-digit)				-0.004	-0.022**	-0.008	-0.022*
				(0.007)	(0.008)	(0.007)	(0.008)
Div. × Intermediate Occupation (dest.)					0.015***		0.013***
					(0.002)		(0.002)
Div. × Clerical Support (dest.)					0.028***		0.023***
					(0.003)		(0.003)
Div. × Blue Collar (dest.)					0.028***		0.023***
					(0.003)		(0.003)
Diversification × Same Occupation						0.009***	-0.003
						(0.001)	(0.002)
Div. × Int. Occ. × Same Occ.							0.011***
							(0.001)
Div. × Clerical Support × Same Occ.							0.024***
							(0.002)
Div. × Blue Collar × Same Occ.							0.032***
							(0.002)
N	8,992,670	8,992,670	8,992,670	8,992,670	8,992,670	8,992,670	8,992,670
Firm × Group and year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes

Note: Dependent variable: Excess probability of hiring a worker transiting from occupation o to occupation z if she originates from the same group. *Firm size* is measured by (full time equivalent) total employment; *Rest of the group size* is measured by the (full time equivalent) total employment of all the other firms that are affiliated to the same group as firm j. *State Control* is a dummy variable taking the value 1 if the head of the group is state-owned. *Foreign Control* is a dummy variable taking the value 1 if the head of the group is foreign. The occupational categories are the ones indicated in Table 1. The category Managers/High-Skill groups category 2 and 3. *Same Occupation* is a dummy variable taking the value 1 if the (2-digit) occupation of origin is equal to the (2-digit) occupation of destination. *Diversification (4-digit)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given 4-digit sector to the total employment of the group. The variables *Diversification* is normalised to have zero mean. One star denotes significance at the 5% level, two stars denote significance at the 1% level, and three stars denote significance at the 0.1% level.

TABLE 13. **Heterogeneity of ILM activity by occupations (Inflows): the differential role of closures**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(Log) Firm Size	0.008***	0.008***	0.008***	0.008***	0.008***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(Log) Rest of the group size	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
(Log) Number of affiliated firms	-0.014***	-0.014***	-0.014***	-0.014***	-0.014***	-0.015***
	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
State Control	-0.011**	-0.011**	-0.010**	-0.010**	-0.010**	-0.010**
	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)	(0.004)
Foreign Control	-0.031***	-0.031***	-0.027***	-0.027***	-0.027***	-0.026***
	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)
Occupation of destination (Managers/High-Skill excluded)						
Intermediate Occupation	-0.002***	-0.002***	-0.002***	-0.011***	-0.002***	-0.010***
	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)	(0.001)
Clerical Support	-0.005***	-0.005***	-0.005***	-0.022***	-0.005***	-0.020***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Blue Collar	-0.004***	-0.004***	-0.004***	-0.022***	-0.004***	-0.017***
	(0.001)	(0.001)	(0.001)	(0.000)	(0.001)	(0.001)
Occupation of origin (Managers/High-Skill excluded)						
Intermediate Occupation	-0.003***	-0.003***	-0.003***	-0.002***	-0.003***	-0.003***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Clerical Support	-0.006***	-0.006***	-0.006***	-0.005***	-0.006***	-0.005***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Blue Collar	-0.005***	-0.005***	-0.005***	-0.004***	-0.005***	-0.004***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Same Occupation		-0.002***			-0.011***	-0.004***
		(0.000)			(0.001)	(0.001)
At least one closure in the group (in t-1)			0.005***	-0.008***	0.002***	-0.008***
			(0.001)	(0.001)	(0.001)	(0.001)
At least one closure × Int. Occ. (dest.)				0.011***		0.010***
				(0.001)		(0.001)
At least one closure × Clerical (dest.)				0.020***		0.018***
				(0.001)		(0.001)
At least one closure × Blue Coll.(dest.)				0.021***		0.016***
				(0.001)		(0.001)
At least one closure (in t-1) × Same Occ.					0.012 ***	0.004***
					(0.001)	(0.001)
Same occupation × Int. Occ.						-0.003***
						(0.001)
Same occupation × Clerical						-0.007***
						(0.001)
Same occupation × Blue Coll.						-0.016***
						(0.001)
Same occupation × Int. Occ. × Closure						0.004***
						(0.001)
Same occupation × Clerical × Closure						0.009***
						(0.001)
Same occupation × Blue Coll. × Closure						0.016***
						(0.001)
N	8,992,670	8,992,670	8,992,670	8,992,670	8,992,670	8,992,670
Firm × Group and year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Dependent variable: Excess probability of hiring a worker transiting from occupation o to occupation z if she originates from the same group. *Firm size* is measured by (full time equivalent) total employment; *Rest of the group size* is measured by the (full time equivalent) total employment of all the other firms that are affiliated to the same group as firm j. *State Control* is a dummy variable taking the value 1 if the head of the group is state-owned. *Foreign Control* is a dummy variable taking the value 1 if the head of the group is foreign. The occupational categories are the ones indicated in Table 1. The category Managers/High-Skill groups category 2 and 3. *Same Occupation* is a dummy variable taking the value 1 if the (2-digit) occupation of origin is equal to the (2-digit) occupation of destination. We denote as firm closure a situation in which a firm sees its employment drop by more than 90% from one year to the other. We consider as year of the closure the last year of activity of a given firm, before it loses at least 90% of its workforce. We do not consider as closures all the cases in which more than 70% of the lost employment ends up in the same firm. *Firm closure in the rest of the group (in year t-1)* is a dummy variable that takes the value 1 if in year $t-1$ at least one firm in the rest of the group closes, i.e. it undertakes its last year of activity in yeat $t-1$. One star denotes significance at

TABLE 14. **Heterogeneity of ILM activity by occupations (Outflows)**

Variables	(1)	(2)	(3)	(4)	(5)
(Log) Firm Size	0.004***	0.004***	0.004***	0.006***	0.006***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(Log) Rest of the group size	-0.006***	-0.005***	-0.005***	-0.006***	-0.006***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
(Log) Number of affiliated firms	-0.015***	-0.016***	-0.015***	-0.015***	-0.015***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
State Control	-0.007	-0.007	-0.007	-0.006	-0.006
	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Foreign Control	-0.030***	-0.030***	-0.030***	-0.028***	-0.028***
	(0.006)	(0.005)	(0.006)	(0.005)	(0.005)
Occupation of destination (CEO excluded)					
Manager	-0.007***	-0.007***	-0.007***	-0.007***	-0.007***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
Intermediate occupation	-0.009***	-0.008***	-0.009***	-0.009***	-0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Clerical Support	-0.012***	-0.011***	-0.012***	-0.012***	-0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Blue collar	-0.011***	-0.010***	-0.011***	-0.011***	-0.011***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Occupation of origin (CEO excluded)					
Manager	-0.008***	-0.011***	-0.011***	-0.008***	-0.007***
	(0.002)	(0.001)	(0.001)	(0.002)	(0.002)
Intermediate occupation	-0.010***	-0.013***	-0.013***	-0.010***	-0.009***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Clerical Support	-0.013***	-0.016***	-0.016***	-0.013***	-0.012***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Blue collar	-0.012***	-0.016***	-0.016***	-0.012***	-0.011***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Diversification × Occupation of origin					
Diversification (4 digit)		-0.075***			
		(0.010)			
Manager		0.061***			
		(0.007)			
Intermediate occupation		0.074***			
		(0.008)			
Clerical Support		0.088***			
		(0.009)			
Blue collar		0.089***			
		(0.009)			
Diversification × Occupation of origin					
Diversification (region)			-0.058***		
			(0.009)		
Manager			0.045***		
			(0.005)		
Intermediate occupation			0.053***		
			(0.006)		
Clerical Support			0.064***		
			(0.007)		
Blue collar			0.062***		
			(0.007)		
Own closure				0.024***	0.041***
				(0.004)	(0.006)
Own closure × Occupation of origin					
Manager					-0.015***
					(0.003)
Intermediate occupation					-0.015***
					(0.003)
Clerical Support					-0.021***
					(0.004)
Blue collar					-0.017***
					(0.004)
N	8,804,083	8,804,083	8,804,083	8,804,083	8,804,083
Adjusted R-squared	0.003	0.005	0.005	0.004	0.004
Firm × Group and year fixed effect	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes

TABLE 15. **Heterogeneity of ILM activity: occupations (Outflows)**

Variables	(1)	(2)	(3)	(4)	(5)	(6)
(Log) Firm Size	0.004***	0.008***	0.008***	0.008***	0.008***	0.008***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)	(0.001)
(Log) Rest of the group size	-0.006***	-0.010***	-0.010***	-0.010***	-0.010***	-0.010***
	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
(Log) Number of affiliated firms	-0.015***	-0.014***	-0.014***	-0.014***	-0.015***	-0.014***
	(0.002)	(0.003)	(0.003)	(0.003)	(0.003)	(0.003)
State Control	-0.007	-0.011**	-0.011**	-0.011**	-0.011**	-0.011**
	(0.005)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
Foreign Control	-0.030***	-0.031***	-0.030***	-0.031***	-0.031***	-0.030***
	(0.006)	(0.005)	(0.005)	(0.005)	(0.005)	(0.005)
Occupation of destination (Managers/High-Skill excluded)						
Intermediate Occupation	-0.002***	-0.002***	-0.002***	-0.002***	-0.011***	-0.008***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)
Clerical Support	-0.005***	-0.005***	-0.005***	-0.005***	-0.014***	-0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Blue Collar	-0.005***	-0.004***	-0.004***	-0.005***	-0.014***	-0.010***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Occupation of origin (Managers/High-Skill excluded)						
Intermediate Occupation	-0.003***	-0.003***	-0.003***	-0.003***	-0.009***	-0.009***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.002)	(0.002)
Clerical Support	-0.006***	-0.006***	-0.005***	-0.006***	-0.012***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Blue Collar	-0.005***	-0.005***	-0.005***	-0.004***	-0.011***	-0.011***
	(0.001)	(0.001)	(0.001)	(0.001)	(0.002)	(0.002)
Same Occupation		-0.003***	0.001			
		(0.000)	(0.000)			
Same Occupation × Intermediate Occupation			-0.002***			
			(0.000)			
Same Occupation × Clerical Support			-0.006***			
			(0.000)			
Same Occupation × Blue Collar			-0.007***			
			(0.001)			
Diversification (4-digit)				-0.010***		
				(0.005)		
Div × Intermediate Occupation (Origin)				0.018***		
				(0.002)		
Div × Clerical Support (Origin)				0.032***		
				(0.003)		
Div × Blue Collar (Origin)				0.033***		
				(0.004)		
Diversification (Region)					-0.016	
					(0.005)	
Div. × Intermediate occupation (Origin)					0.011***	
					(0.001)	
Div. × Clerical Support (Origin)					0.022***	
					(0.003)	
Div. × Blue Collar (Origin)					0.021***	
					(0.003)	
Own closure						0.024***
						(0.004)
N	8,804,083	8,804,083	8,804,083	8,804,083	8,804,083	8,804,083
Firm × Group and year fixed effect	Yes	Yes	Yes	Yes	Yes	Yes
Year dummies	Yes	Yes	Yes	Yes	Yes	Yes

Note: Dependent variable: Excess probability of originating from affiliated firm j for workers transiting between occupation o and occupation z landing into the same group as compared to workers landing outside the group. *Firm size* is measured by (full time equivalent) total employment; *Rest of the group size* is measured by the (full time equivalent) total employment of all the other firms that are affiliated to the same group as firm j. *State Control* is a dummy variable taking the value 1 if the head of the group is state-owned. *Foreign Control* is a dummy variable taking the value 1 if the head of the group is foreign. The occupational categories are the ones indicated in Table 1. The category Managers/High-Skill groups category 2 and 3. *Same Occupation* is a dummy variable taking the value 1 if the (2-digit) occupation of origin is equal to the (2-digit) occupation of destination. *Diversification (4-digit)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given 4-digit sector to the total employment of the group. *Diversification (Region)* is computed as the opposite of the sum of the squares of the employment shares of all firms affiliated with a group, where each share is the ratio of the total employment of affiliated firms active in a given region

TABLE 16. **Bilateral flows: closures vs. normal times**

Variables	Origin (2)	Pair (3)	Origin (5)	Pair (6)
Firm of destination group affiliated	-0.0013***	0.0011	-0.0023***	0.0043***
	(0.0003)	(0.0007)	(0.000)	(0.001)
Same Group	0.0334***	-0.0122**	0.0197***	-0.0207***
	(0.0019)	(0.0041)	(0.001)	(0.003)
Closure × firm of destination group affiliated	0.0004	0.0025***	0.0005	0.0017*
	(0.0004)	(0.0006)	(0.000)	(0.001)
Closure × same group	**0.1487*** **	**0.1187*** **	**0.1489*** **	**0.1253*** **
	(0.0039)	(0.0050)	(0.004)	(0.005)
Destination firm in Boom			0.0168***	0.0233***
			(0.001)	(0.001)
Destination in Boom × Closure			0.008	0.0023
			(0.001)	(0.002)
Destination in Boom × Same group			0.0501***	0.0470***
			(0.005)	(0.005)
Destination in Boom × Closure × Same Group			**0.0252***	**0.0244***
			(0.01)	(0.011)
N	1,171,552	1,171,552	1,492,153	1,492,153
Firm of origin FE	YES	NO	YES	NO
Firm of origin × firm of destination FE	NO	YES	NO	YES
Year dummies	YES	YES	YES	YES
Time to closure dummies	YES	YES	YES	YES

Note: Dependent variable: fraction of workers moving from affiliated firm i to firm j in year t to the total number of workers that leave firm i in year t. Firm i is a firm that eventually closes within our sample period. *Firm of destination group affiliated* is a dummy variable that takes the value 1 if firm j is group affiliated. *Same Group* is a dummy variable taking the value 1 if firm i and firm j belong to the same group. *Closure* is a dummy variable taking the value 1 in the last two years of firm i's activity. *Destination firm in a Boom* is a dummy variable that takes the value 1 if the firm of destination operates in a sector that is experiencing a boom in year $t+1$. Booms and busts are identified from the fluctuations of real sectoral sales, where nominal sales are deflated by industry-specific price deflators, following the Braun and Larrain (2005) peak-to-trough criterion. Troughs occur when (the log of) real sales are below their trend (computed using a Hodrick-Prescott filter with a smoothing parameter of 100) by more than one standard deviation. For each trough, we go back in time until we find a local peak, which is defined as the closest preceding year for which (detrended) real sales are higher than in the previous and posterior year. A bust goes from the year after the local peak to the year of the trough. The same procedure is used to identify sectoral booms. A peak occurs when current real sales are more than one standard deviation above their trend. Once a peak is identified, we go back in time until we find a local trough, i.e., the closest preceding year for which (detrended) real sales are lower than in the previous and posterior year. The years falling between a local trough and a peak are labelled as a boom. One star 5% significance, two stars 1% significance, and three stars 0.1% significance. Standard errors are clustered at the group level.

TABLE 17. **Bilateral flows and wage changes: closures vs. normal times by occupational categories**

	Flow of workers		**Wage change**	
	Firm of Origin-Occ. of Origin	Pair - Occ. of Origin	Firm of Origin-Occ. of Origin	Pair - Occ. of Origin
Variables	(1)	(2)	(3)	(4)
Firm of destination group affiliated	-0.0011***	0.002	0.0406***	-0.0095
	(0.000)	(0.000)	(0.006)	(0.031)
Same Group	-0.0010	-0.0135***	0.0131	0.0088
	(0.001)	(0.002)	(0.020)	(0.032)
Closure × firm of destination group affiliated	0.0009***	0.0013***	-0.0134	0.0089
	(0.000)	(0.000)	(0.007)	(0.028)
Closure × same group	**0.0522*** **	**0.0437*** **	**0.0245**	**-0.0103**
	(0.002)	(0.002)	(0.022)	(0.028)
Male			0.0029	0.0006
			(0.002)	(0.002)
Age			-0.0006	-0.0061***
			(0.001)	(0.002)
Age squared			-0.0000	0.0001***
			(0.000)	(0.000)
Duration			0.0003***	0.0003***
			(0.000)	(0.000)
Same group × Managers	0.0193***	0.0164***	0.1175***	-0.0201
	(0.001)	(0.003)	(0.028)	(0.063)
Same group × Intermediate Occupations	0.0129***	0.0126***	0.0463*	-0.061
	(0.001)	(0.003)	(0.021)	(0.042)
Same group × Clerical Support	0.0054***	0.0129***	0.0177	0.0305
	(0.001)	(0.002)	(0.026)	(0.044)
Closure × same group × Managers	**-0.0248*** **	**-0.0217*** **	**-0.0888** **	**0.0106**
	(0.002)	(0.003)	(0.033)	(0.068)
Closure × same group × Intermediate Occupations	**-0.0213*** **	**-0.0179*** **	**-0.0279**	**0.0265**
	(0.002)	(0.003)	(0.024)	(0.041)
Closure × same group × Clerical Support	**-0.0140*** **	**-0.0166*** **	**-0.0471**	**-0.0582**
	(0.002)	(0.003)	(0.030)	(0.044)
N	4,686,112	4,686,112	905,087	905,087
Firm of origin × occupation of origin FE	YES	NO	YES	NO
Pair × occupation of origin FE	NO	YES	NO	YES
Year dummies	YES	YES	YES	YES
Time to closure dummies	YES	YES	YES	YES

All relevant second and third level interactions are included. Dependent variables: In columns (1)-(2) is the fraction of workers originally undertaking occupation k and moving from affiliated firm i to firm j in year t to the total number of workers that leave firm i in year t. In columns (3)-(4) is the wage change of a worker moving from affiliated firm i to firm j in year t. Firm i is a firm that eventually closes within our sample period. *Firm of destination group affiliated* is a dummy variable that takes the value 1 if firm j is group affiliated. *Same Group* is a dummy variable taking the value 1 if firm i and firm j belong to the same group. *Closure* is a dummy variable taking the value 1 in the last two years of firm i's activity. One star 5% significance, two stars 1% significance, and three stars 0.1% significance. Standard errors are clustered at the group level.

TABLE 18. **Bilateral flows: closures vs. normal times by firm of destination's size and financial status**

Variables	Origin (1)	Pair (2)	Origin (3)	Pair (4)	Origin (5)	Pair (6)	Origin (7)	Pair (8)
Firm of destination group affiliated	-0.0013***	0.0011	-0.0012	-0.0005	-0.0003	0.0015	-0.0009	0.0012
	(0.0003)	(0.0007)	(0.0017)	(0.0031)	(0.0005)	(0.0011)	(0.0006)	(0.0016)
Same Group	0.0334***	-0.0122**	0.0359***	0.0034	0.0353***	-0.0046	0.0376***	-0.0040
	(0.0019)	(0.0041)	(0.0100)	(0.0187)	(0.0029)	(0.0066)	(0.0039)	(0.0088)
Closure × firm of destination group affiliated	0.0004	0.0025***	0.0058*	0.0053	0.0029***	0.0027**	0.0023*	0.0007
	(0.0004)	(0.0006)	(0.0024)	(0.0028)	(0.0008)	(0.0009)	(0.0010)	(0.0011)
Closure × same group	0.1487***	0.1187***	0.0746***	0.0561*	0.1441***	0.1388***	0.1611***	0.1641***
	(0.0039)	(0.0050)	(0.0190)	(0.0256)	(0.0074)	(0.0082)	(0.0087)	(0.0096)
TA below 10pct × Closure × same group			0.0208	-0.0212				
			(0.0533)	(0.0636)				
TA above 50pct × Closure × same group			0.0511*	0.0646*				
			(0.0205)	(0.0274)				
TA above 90pct × Closure × same group			0.0367***	0.0372***				
			(0.0098)	(0.0113)				
LEV below 10pct × Closure × same group					-0.0051	-0.0087		
					(0.0201)	(0.0220)		
LEV above 50pct × Closure × same group					0.0163	0.0179		
					(0.0104)	(0.0119)		
LEV above 90pct × Closure × same group					-0.0708***	-0.0485*		
					(0.0192)	(0.0229)		
COV below 10pct × Closure × same group							-0.0475***	-0.0428**
							(0.0129)	(0.0147)
COV above 50pct × Closure × same group							-0.0063	-0.0203
							(0.0120)	(0.0134)
COV above 90pct × Closure × same group							-0.0083	-0.0040
							(0.0144)	(0.0161)
N	1,171,552	1,171,552	705,413	705,413	700,253	700,253	637,665	637,665
Firm of origin FE	YES	NO	YES	NO	YES	NO	YES	NO
Firm of origin × firm of destination FE	NO	YES	NO	YES	NO	YES	NO	YES
Year dummies	YES	YES	YES	YES	YES	YES	YES	YES
Time to closure dummies	YES	YES	YES	YES	YES	YES	YES	YES

All relevant second and third level interactions are included. One star 5% significance, two stars 1% significance, and three stars 0.1% significance. Standard errors are clustered at the group level. Car distance in not demeaned. HHI is demeaned.

A For which occupations is the ILM more active?

In this section we present detailed results on the intensity internal labor market activity by occupation.

TABLE 19. Inflows - Rankings by occupation of origin/occupation of destination

Occupation of origin	Code	Mean	**Occupation of destination**	Code	Mean
Top managers of industrial/commercial firms with more than 10 employees	23	0.03623	Top managers of industrial/commercial firms with more than 10 employees	23	0.04009
Top managers of industrial/commercial firms with less than 10 employees	22	0.03183	Top managers of industrial/commercial firms with less than 10 employees	22	0.03539
Administrative and commercial managers	37	0.02567	Top managers/chiefs of handicraft firms	21	0.03080
Healthcare professionals, legal professionals and other professionals	31	0.02502	Administrative and commercial managers	37	0.02497
Engineers and technical managers	38	0.02485	Supervisors and 'agents de maitrise'	48	0.02463
Supervisors and 'agents de maitrise'	48	0.02287	Healthcare professionals, legal professionals and other professionals	31	0.02271
Top managers/chiefs of handicraft firms	21	0.02110	Engineers and technical managers	38	0.02223
Maintenance, repair and transport qualified workers	65	0.02173	Professors, researchers, scientific occupations	34	0.02179
Professors, researchers, scientific occupations	34	0.02134	Maintenance, repair and transport qualified workers	65	0.02142
Technicians	47	0.02106	Agricultural worker	69	0.02004
Teachers and other education, training and library occupations	42	0.01991	Technicians	47	0.01996
Intermediate administrative and commercial occupations in firms	46	0.01980	Intermediate administrative and commercial occupations in firms	46	0.01906
Agricultural worker	69	0.01979	Surveillance and security occupations	53	0.01857
Surveillance and security occupations	53	0.01836	Teachers and other education, training and library occupations	42	0.01823
Handicraft qualified workers	63	0.01735	Journalists, media, arts and entertainment occupations	35	0.01758
Clerical support in firms	54	0.01726	Industrial qualified workers	62	0.01753
Healthcare support occupations and social services occupations	43	0.01723	Clerical support in firms	54	0.01713
Industrial qualified workers	62	0.01716	Industrial non qualified workers	67	0.01679
Journalists, media, arts and entertainment occupations	35	0.01682	Healthcare support occupations and social services occupations	43	0.01679
Handicraft non qualified workers	68	0.01680	Handicraft non qualified workers	68	0.01652
Drivers	64	0.01603	Handicraft qualified workers	63	0.01644
Industrial non qualified workers	67	0.01494	Sales and related occupations	55	0.01544
Sales and related occupations	55	0.01479	Drivers	64	0.01466
Personal service occupations	56	0.01077	Personal service occupations	56	0.01448

Rankings are net of year effects and firm fixed effects (Department restriction)

TABLE 20. Inflows - Rankings by occupation pairs net of year and firm fixed effect: top ten, bottom ten (Department restriction)

TOP TEN

Occupation pair	Code	Mean
Professors, researchers, scientific occupations-Top managers of industrial/commercial firms with more than 10 employees	34-23	0.05179
Top managers of industrial/commercial firms with more than 10 employees -Professors, researchers, scientific occupations	23-34	0.04803
Top managers of industrial/commercial firms with more than 10 employees-Top managers of industrial/commercial firms with more than 10 employees	23-23	0.04408
Top managers/chiefs of industrial/commercial firms with less than 10 employees-Top managers of industrial/commercial firms with more than 10 employees	22-23	0.03798
Top managers of industrial/commercial firms with more than 10 employees-Administrative and commercial managers	23-37	0.03481
Top managers of industrial/commercial firms with more than 10 employees-Administrative and commercial managers	37-23	0.03410
Top managers/chiefs of industrial/commercial firms with less than 10 employees- Administrative and commercial managers	22-37	0.03320
Administrative and commercial managers-Top managers/chiefs of industrial/commercial firms with less than 10 employees	37-22	0.03201
Supervisors and 'agents de maitrise'-Supervisors and 'agents de maitrise'	48-48	0.03187

BOTTOM TEN

Occupation pair	Code	Mean
Personal service occupations-Clerical support in firms	56-54	0.0118
Handicraft non qualified workers- Handicraft qualified workers	68-63	0.01349
Industrial qualified workers-Industrial non qualified workers	62-67	0.01345
Sales and related occupations-Clerical support in firms	55-54	0.01231
Industrial non qualified workers-Industrial qualified workers	67-62	0.01203
Industrial qualified workers - Industrial qualified workers	62-62	0.01010
Handicraft qualified workers-Handicraft qualified workers	63-63	0.00984
Sales and related occupations-Sales and related occupations	55-55	0.00778
Personal service occupations-Personal service occupations	56-56	0.00608
Drivers-Drivers	64-64	0.00341

TABLE 21. Outflows - Rankings by occupation of origin/occupation of destination (Department correction and fixed effects)

Occupation of origin	Code	Mean	**Occupation of destination**	Code	Mean
Top managers of industrial/commercial firms with more than 10 employees	23	0.0370	Top managers/chiefs of industrial/commercial firms with less than 10 employees	22	0.0351
Top managers/chiefs of industrial/commercial firms with less than 10 employees	22	0.0268	Top managers of industrial/commercial firms with more than 10 employees	23	0.0350
Administrative and commercial managers	37	0.0248	Top managers/chiefs of handicraft firms	21	0.0320
Supervisors and 'agents de maitrise'	48	0.0230	Administrative and commercial managers	37	0.0237
Healthcare professionals, legal professionals and other professionals	31	0.0223	Healthcare professionals, legal professionals and other professionals	31	0.0228
Engineers and technical managers	38	0.0213	Supervisors and 'agents de maitrise'	48	0.0223
Top managers/chiefs of handicraft firms	21	0.0195	Professors, researchers, scientific occupations	34	0.0200
Intermediate administrative and commercial occupations in firms	46	0.0181	Engineers and technical managers	38	0.0199
Technicians	47	0.0179	Intermediate administrative and commercial occupations in firms	46	0.0176
Professors, researchers, scientific occupations	34	0.0177	Teachers and other education, training and library occupations	42	0.0176
Maintenance, repair and transport qualified workers	65	0.0172	Agricultural worker	69	0.0175
Surveillance and security occupations	53	0.0168	Technicians	47	0.0173
Teachers and other education, training and library occupations	42	0.0161	Maintenance, repair and transport qualified workers	65	0.0171
Agricultural worker	69	0.0151	Surveillance and security occupations	53	0.0161
Clerical support in firms	54	0.0151	Journalists, media, arts and entertainment occupations	35	0.0155
Journalists, media, arts and entertainment occupations	35	0.0150	Healthcare support occupations and social services occupations	43	0.0152
Industrial qualified workers	62	0.0145	Clerical support in firms	54	0.0151
Handicraft qualified workers	63	0.0144	Handicraft non qualified workers	68	0.0144
Healthcare support occupations and social services occupations	43	0.0144	Handicraft qualified workers	63	0.0143
Handicraft non qualified workers	68	0.0143	Drivers	64	0.0132
Drivers	64	0.0139	Sales and related occupations	55	0.0129
Sales and related occupations	55	0.0130	Industrial qualified workers	62	0.0128
Personal service occupations	56	0.0128	Personal service occupations	56	0.0122
Industrial non qualified workers	67	0.0101	Industrial non qualified workers	67	0.0107

TABLE 22. Outflows - Rankings by occupation pairs: top ten, bottom ten (Department correction and fixed effects)

TOP TEN

Occupation pair	Code	Mean
Top managers of industrial/commercial firms with more than 10 employees-Professors, researchers, scientific occupations	23-34	0.0591
Top managers of industrial/commercial firms with more than 10 employees-Top managers of industrial/commercial firms with more than 10 employees	23-23	0.0455
Top managers of industrial/commercial firms with more than 10 employees-Top managers/chiefs of industrial/commercial firms with less than 10 employees	23-22	0.0375
Administrative and commercial managers-Top managers/chiefs of industrial/commercial firms with less than 10 employees	37-22	0.0357
Top managers of industrial/commercial firms with more than 10 employees-Administrative and commercial managers	23-37	0.0356
Professors, researchers, scientific occupations Top managers of industrial/commercial firms with more than 10 employees	34-23	0.0344
Top managers of industrial/commercial firms with more than 10 employees-Clerical support in firms	23-54	0.0347
Administrative and commercial managers-Top managers of industrial/commercial firms with more than 10 employees	37-23	0.0332
Top managers of industrial/commercial firms with more than 10 employees-Journalists, media, arts and entertainment occupations	23-35	0.0321
Top managers of industrial/commercial firms with more than 10 employees-Engineers and technical managers	23-38	0.0312

BOTTOM TEN

Occupation pair	Code	Mean
Industrial non qualified workers -Handicraft non qualified workers	67-68	0.0102
Industrial non qualified workers - Clerical support in firms	67-54	0.0100
Handicraft qualified workers-Handicraft qualified workers	63-63	0.0077
Industrial qualified workers -Industrial non qualified workers	62-67	0.0065
Sales and related occupations-Sales and related occupations	55-55	0.0055
Industrial qualified workers -Industrial qualified workers	62-62	0.0050
Personal service occupations -Personal service occupations	56-56	0.0037
Industrial non qualified workers-Industrial qualified workers	67-62	0.0032
Drivers-Drivers	64-64	0.0027
Industrial non qualified workers-Industrial non qualified workers	67-67	-0.0005

B Equivalence between the coefficients estimated in equation (4) and equation (8) and OLS

The OLS coefficient from the linear probability model in equation (1), for a given occupation of origin o, occupation of destination z and year t (subscript t dropped), is:

$$\gamma_{c,j}^{OLS} = \frac{Cov(E_{i,c,j}, BG_{i,j})}{Var(BG_{i,j})} = \frac{\sum_{i=1}^{N}(E_{i,c,j} - \overline{E}_{c,j})(BG_{i,j} - \overline{BG}_j)/N}{\sum_{i=1}^{N}(BG_{i,j} - \overline{BG}_j)^2/N} \tag{11}$$

$$= \frac{\sum_{i=1}^{N} E_{i,c,j}BG_{i,j}/N - \overline{E}_{c,j}\overline{BG}_j}{\sum_{i=1}^{N} BG_{i,j}^2/N - \overline{BG}_j^2} = \frac{\sum_{i=1}^{N} E_{i,c,j}BG_{i,j}/N - \overline{E}_{c,j}\overline{BG}_j}{\overline{BG}_j - \overline{BG}_j^2} \tag{12}$$

where N is the number of workers belonging to the set c.

Since $\beta_{c,j}^{OLS} = \overline{E}_{c,j} - \gamma_{c,j}^{OLS}\overline{BG}_j$:

$$\begin{aligned}
\gamma_{c,j}^{OLS} + \beta_{c,j}^{OLS} &= \frac{\sum_{i=1}^{N} E_{i,c,j}BG_{i,j}/N - \overline{E}_{c,j}\overline{BG}_j}{\overline{BG}_j - \overline{BG}_j^2} + \overline{E}_{c,j} - \gamma_{c,j}^{OLS}\overline{BG}_j \\
&= \frac{\sum_{i=1}^{N} E_{i,c,j}BG_{i,j}/N - \overline{E}_{c,j}\overline{BG}_j + \overline{E}_{c,j}(\overline{BG}_j - \overline{BG}_j^2) - \gamma_{c,j}^{OLS}\overline{BG}_j(\overline{BG}_j - \overline{BG}_j^2)}{\overline{BG}_j - \overline{BG}_j^2} \\
&= \frac{\sum_{i=1}^{N} E_{i,c,j}BG_{i,j}/N - \overline{E}_{c,j}\overline{BG}_j^2 - \gamma_{c,j}^{OLS}\overline{BG}_j(\overline{BG}_j - \overline{BG}_j^2)}{\overline{BG}_j - \overline{BG}_j^2} \\
&= \frac{\sum_{i=1}^{N} E_{i,c,j}BG_{i,j}/N - \overline{BG}_j^2(\overline{E}_{c,j} + \gamma_{c,j}^{OLS} - \gamma_{c,j}^{OLS}\overline{BG}_j)}{\overline{BG}_j - \overline{BG}_j^2} \\
&= \frac{\sum_{i=1}^{N} E_{i,c,j}BG_{i,j}/N - \overline{BG}_j^2(\beta_{c,j}^{OLS} + \gamma_{c,j}^{OLS})}{\overline{BG}_j - \overline{BG}_j^2}
\end{aligned}$$

Hence

$$(\overline{BG}_j - \overline{BG}_j^2)(\gamma_{c,j}^{OLS} + \beta_{c,j}^{OLS}) = \sum_{i=1}^{N} E_{i,c,j}BG_{i,j}/N - \overline{BG}_j^2(\beta_{c,j}^{OLS} + \gamma_{c,j}^{OLS}) \tag{13}$$

$$\gamma_{c,j}^{OLS} + \beta_{c,j}^{OLS} = \frac{\sum_{i=1}^{N} E_{i,c,j}BG_{i,j}/N}{\overline{BG}_j} = \frac{\sum_{i=1}^{N} E_{i,c,j}BG_{i,j}}{\sum_{i=1}^{N} BG_{i,j}} \tag{14}$$