

Working paper

# Employee Spinoffs and Other Entrants

Stylized Facts from  
Brazil

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Oana Hirakawa  
Marc-Andreas Muendler  
James E. Rauch

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## Abstract

We gauge the prevalence and performance of firms founded as employee spinoffs, relative to new firms without parents and to diversification ventures of existing firms entering new industries. Using a comprehensive linked employer-employee database from Brazil for the period 1995-2001, we are able to identify an employee spinoff either when the director/manager moved from a parent in the same industry or when one-quarter of the employees shifted from a common parent. Depending on definition, employee spinoffs account for between one-sixth and one-third of the new firms in Brazil's private sector during this period. Regardless of definition, size at entry is larger for employee spinoffs than for new firms without parents but smaller than for diversification ventures of existing firms. Similarly, exit rates for employee spinoffs are less than for new firms without parents and comparable to those for diversification ventures of existing firms. These results suggest that we can think of some part of a firm's productivity draw in the Jovanovic (1982) model as embodied in the firm's employees and portable by them to a new firm.

**Keywords:** Employee spinoffs; entrepreneurship; firm performance; labor turnover

**JEL Classification:** L26, L25, J21

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## 1. Introduction

Where do new firms come from? One answer is from other firms: firms lose employees, who spin off to form their own businesses. A burgeoning literature seeks to quantify the employee spinoff phenomenon. We use a comprehensive linked employer-employee data set for Brazil to count spinoffs using precise and replicable criteria and compare basic indicators of their performance to those of other entrants.

Klepper and Sleeper (2005) count spinoffs, their “parents,” and other new entrants in the U.S. laser industry through 1994. Franco and Filson (2006) conduct a similar study for the rigid disk drive industry in the period 1977-1997. Eriksson and Kuhn (2006) compare the entry and survival of spinoffs with sizes from two to ten employees to other new small firms, using a linked employer-employee data set for Danish private-sector firms during the period 1981-2000. Our sampling approach is closest to that of Eriksson and Kuhn (2006), but we include new firms with more than ten employees and existing firms entering new industries in our analysis. We follow the classic work of Dunne, Roberts and Samuelson (1988) and examine firm entry size and exit rates relative to both new firms that are not spinoffs and existing firms entering new industries. Dunne et al. used U.S. data and did not distinguish spinoffs from other new firms. We use Brazilian data because they allow identification of employee spinoffs, including distinguishing them from employer-initiated divestitures. The Global Entrepreneurship Monitor consistently ranks Brazil, a large and diversified economy and a leading emerging market, among the most entrepreneurial economies in the world measured by the prevalence of nascent and new firms in the economy (Reynolds, Hay, Bygrave, Camp and Autio 2000, Minniti, Bygrave and Autio 2005).

Our results for Brazil during the period 1995-2001 are that, depending on spinoff definition, employee spinoffs account for around one-sixth of new firms with salaried management and for one-third of new firms with five or more employees – excluding those new firms with state ownership, cooperatives, any type of holding company, and foreign subsidiaries. Regardless of spinoff definition, size at entry for employee spinoffs is larger than for new firms without parents but smaller than for employer-initiated divestitures or diversification ventures of existing firms. Similarly, exit rates for employee spinoffs are lower than for new firms without parents but greater than for employer-initiated divestitures and comparable to those for diversification ventures of existing firms. These results suggest that we can think of some part of a firm’s productivity draw in the Jovanovic (1982) model as embodied in the firm’s employees and portable by them to a new firm.

Section 2 provides an overview of the literatures on employee spinoffs and divestitures. Section 3 describes the data source. Section 4 introduces our classification of new firms into employee spinoffs, divestitures and other types. Section 5 presents comparative statistics on employee spinoffs and other new firms. Section 6 documents the performance of employee spinoffs over time, relative to other types of entrants. Section 7 concludes. The Appendix provides details on the data source and the empirical implementation of definitions.

## 2. Related Literature

The earliest papers on employee spinoffs were motivated by high-profile examples in the U.S. high-tech sector. Subsequently the literature broadened beyond this narrow focus. After all, standard problems with eliciting effort inside organizations (Alchian and Demsetz 1972, Holmstrom 1982) can motivate employee spinoffs in any sector of the economy. In this paper we will not be concerned with the “why” of employee spinoffs, but we nevertheless cover a number of hypotheses in the course of our literature review.

In the literature on employee spinoffs in the high-tech sector, a popular explanation for spinoffs is that employees may have private information about technological discoveries that they make in the course of their employment at incumbent firms, and may want to leave the company to exploit these promising discoveries because various agency costs impede employees from contracting with their firms to develop discoveries (Anton and Yao 1995, Wiggins 1995). Another explanation is that incumbents may be slow to pursue technological innovations made by employees because of organizational difficulties, compelling employees to leave the company

to commercialize on their own. Such organizational difficulties can arise when the innovations require incumbents to significantly alter their business approaches (Henderson and Clark 1990), when incumbents do not possess the competencies required to pursue the innovations (Tushman and Anderson 1986), or when the innovations appeal to new users of a product but not to current customers of incumbents (Christensen 1993).

The more recent literature considers explanations for employee spinoffs other than technological innovations. Klepper and Sleeper (2005) and Franco and Filson (2006) argue that employees may simply want to exploit knowledge they learned during their employment to become competitors with their former employers. Rauch and Watson (2010) model the case where the knowledge exploited by employees is the needs and preferences of their former employers' clients, whom they "steal" when they establish their own firms. Employees need not go into competition with their former employers, however. "Vertical" spinoffs are also possible, in which employees who manage production of inputs within their firms become external suppliers of these same inputs—a version of the "make or buy" decision in which the employee rather than the employer (or the employee in consultation with the employer) decides on external versus internal supply (Rauch 2008). Klepper and Thompson (forthcoming) also stress that employees may be driven to found spinoffs by disagreements with their employers regarding the business strategies of their firms.

The literature on high-tech spinoffs also investigates their performance. In particular, spinoffs are compared to new plants of parents with the idea that new plants of existing firms exploit employees' innovations in house. Parents or "incumbents" may have some advantages of scale, scope, tax, or information that will allow them to commercialize a discovery made by employees more profitably than a new firm started by employees (Klepper 2001). Complementary assets of incumbent firms such as production capabilities, sales channels and marketing capabilities may be crucial to bringing innovations to the market quickly and successfully (Teece 1986). On the other hand, spinoffs are free from "organizational inertia" that incumbents might possess, and which can prevent incumbents from adjusting to a new environment (Hannan and Freeman 1984, Henderson and Clark 1990). New plants of incumbent firms are more likely to inherit established processes and routines of their parent firms, which may preclude them from acting quickly, especially when the industry they enter is rapidly changing. In this regard, the models of Anton and Yao (1995) and Wiggins (1995) suggest that the innovations commercialized by spinoffs are more likely to be path-breaking or to be opening new sub-markets. If that conjecture is correct, spinoffs may show greater success than new plants of incumbents.

As the more recent literature has broadened away from high-tech spinoffs so that possession of a technological innovation is not required to start a new firm, it has compared the performance of spinoffs to that of other new firms rather than to new plants of existing firms. Cabral and Wang (2008) have a model and evidence from the automobile industry showing that spinoffs from surviving firms are superior to other new firms because the spinoffs are self-selected from all employees for entrepreneurial talent, whereas spinoffs from dying firms are negatively selected (at least relative to spinoffs from surviving firms) because all employees are looking to "jump ship" regardless of entrepreneurial ability. The findings of Eriksson and Kuhn (2006) support Cabral and Wang in that spinoffs from surviving firms have lower exit risk than spinoffs from dying firms, which in turn have equal or lower exit risk than other new firms. Hvide (2005) argued and presented evidence that spinoffs from large firms should be positively selected relative to spinoffs from small firms, because small firms can accurately recognize and reward employee ideas whereas large firms can only offer a higher wage, leading employees with the best ideas to leave and start their own firms.

A separate literature analyzes divestitures and corporate spinoffs. In contrast to an employee-initiated spinoff, a divestiture is a management-initiated new firm. Common forms of divestitures are corporate spinoffs into standalone firms, or new firms that emerge as the results of parent firms' mergers and acquisitions, or new firms from a splitup of the parent firm into separate companies through equity transfers. Similar to the literature on employee spinoffs, one branch

of the divestiture literature asks why firms divest. Cusatis, Miles and Woolridge (1993) argue that divestitures help a parent firm restructure and save cost by alleviating the management's span-of-control problem when companies grow large. Krishnaswami and Subramaniam (1999) emphasize that a splitup of parent-firm divisions into separate companies resolves informational asymmetries between investors and managers about the profitability of individual divisions. Chemmanur and Yan (2004) point out that divestitures shrink the parent firm so that a takeover by outsiders becomes more likely, serving to discipline the incumbent management and thus improving parent-firm performance. Also similar to the literature on employee spinoffs, a branch of the divestiture literature compares performance. Cusatis et al. (1993) document that, in addition to abnormal positive stock returns for the parent firm on the divestiture announcement date, both divestitures and their parents experience significantly positive abnormal returns for up to three years after announcement. Nandy and Chemmanur (2005) use large U.S. plant panel data, combined with stock return data for their firms, and document that productivity improves at the parents' plants and, to a lesser degree, at the divested plants upon divestiture, compared to plants at firms with no divestiture. We will see in Sections 4 through 6 below that distinguishing between divestitures and employee spinoffs is important in our data.

### 3. Data

We adopt a workforce-based definition of spinoffs and use employer-reported occupations. We study Brazilian data, where detailed occupational codes are available.<sup>1</sup> Our data derive from the linked employer-employee records RAIS (Relação Anual de Informações Sociais of the Brazilian labor ministry MTE), which offer comprehensive individual employee information on occupations, demographic characteristics and earnings, along with employer identifiers. By Brazilian law, every private or public-sector employer must report this information every year.<sup>2</sup> De Negri, Furtado, Souza and Arbache (1998) compare labor force information in RAIS to that in a main Brazilian household survey (PNAD) and conclude that, when comparable, RAIS delivers qualitatively similar results to those in the national household survey. Menezes-Filho, Muendler and Ramey (2008) apply the Abowd, Kramarz, Margolis and Troske (2001) earnings-estimation methodology to Brazil and show that labor-market outcomes from RAIS broadly resemble those in France and the United States, even after controlling for selection into formal-sector employment, except for unusually high returns to high school and college education and to experience among males. Appendix A presents further details on the data source.

A job observation in RAIS is identified by the employee ID, the employer's tax ID (CNPJ), and dates of job accession and separation. To avoid double-counting employees at new firms, we keep only one observation for each employer-employee pair, choosing the job with the earliest hiring date. If the employee has two jobs at the firm starting in the same month, we keep the highest paying one. The rules on tax ID assignments make it possible to identify new firms (the first eight digits of the tax ID) and new plants within firms (the last six digits of the tax ID). Appendix B discusses the relevant details on tax ID assignment. Our data include 71.1 million employees (with 556.3 million job spells) at 5.52 million plants in 3.75 million firms over the sixteen-year period 1986-2001 in any sector of the economy. We limit most attention to the years 1995-2001 and use the period 1986-1994 to ensure that firms we label as new in 1995-2001 have not operated before. In addition, RAIS offers detailed industry information (at the four-digit

<sup>1</sup> To our knowledge, occupational information is currently neither available in the U.S. Longitudinal Business Database (LBD) nor in the Longitudinal Employer-Household Dynamics (LEHD) data base. In LEHD, educational information on the workforce is imputed by census tract. The reason for imputation is that U.S. unemployment insurance records, on which the employer-employee link is based state by state, do not typically offer educational information. But occupational information has not been imputed to date.

<sup>2</sup> RAIS primarily provides information to a federal wage supplement program (Abono Salarial), by which every employee with formal employment during the calendar year receives the equivalent of a monthly minimum wage. RAIS records are then shared across government agencies. An employer's failure to report complete workforce information can, in principle, result in fines proportional to the workforce size, but fines are rarely issued. In practice, employees and employers have strong incentives to ascertain complete RAIS records because payment of the annual public wage supplement is exclusively based on RAIS. The ministry of labor estimates that well above 90 percent of all formally employed individuals in Brazil are covered in RAIS throughout the 1990s. Data collection is typically concluded by March following the year of observation.

CNAE level) starting in 1995. During this 7- year period, 1.54 million new firms and 2.17 million plants entered (of which 581 thousand new plants were created within incumbent firms). By 1995 macroeconomic stabilization had succeeded in Brazil. The Plano Real from August 1994 had brought inflation down to single-digit rates. Fernando Henrique Cardoso, who had enacted the Plano Real as Minister of Finance, became president, signaling a period of financial calm and fiscal austerity. Apart from a large exchange-rate devaluation in early 1999 and a subsequent switch from exchange-rate to inflation-targeting at the central bank, macroeconomic conditions remained relatively stable for the following years.

Occupational classifications in RAIS follow the CBO (Classificação Brasileira de Ocupações). This classification system with more than 350 categories allows us to identify management employees (directors/managers) for specific spinoff definitions. During our sample period, sectors are reported under the CNAE four-digit classification (Classificação Nacional de Atividade Econômica) for 654 industries, spanning all sectors of the economy. The level of detail is roughly comparable to the NAICS 2007 five-digit level. RAIS reports earnings as the monthly average wage, expressed in multiples of the current minimum wage. We use the log of December wages as our earnings measure in performance analysis, defined as the reported December wage times the December minimum wage expressed in Brazilian Real, and deflated to the August 1994 level. Appendix A has further details on the earnings measure.

Table 1 describes the data with respect to business formation. In 1995-2001, the number of formally registered firms grows from over one million to close to 1.5 million, corresponding to an annualized rate of growth of around 6.6 percent. There is considerably more gross entry, however. Around 18.3 percent of firms in 1995 are new, and around 15.9 percent in 2001 are new, implying that exit plays an important role for net growth in the number of firms. An early peak in the formation of new firms occurs in 1997. By then the stable macroeconomic environment and the government's continued commitment to market- oriented policy offered a conducive environment for entrants. A concerted effort by the federal government since 1996 to reduce informality in the labor market may also have contributed to a higher rate of formal registration among entrants. To control for cohort-specific entry and survival patterns, our regression specifications will condition on cohort effects.

We define ventures as groups of new plants within firms. Around one to three percent of existing firms expand, diversify or otherwise grow new ventures either by starting new lines of business or by acquiring existing ventures (2.7 percent in 1995, 1.4 percent in 2001). We use the CNAE 4-digit industry of the new ventures and the existing firm to discern between expansions, defined as new ventures within the same CNAE 4-digit industry, and diversifications, defined as new ventures in a different CNAE 4-digit industry. In the early years, when sector information is less well reported (many undetermined sectors), expansions are slightly more frequent than diversifications. Once sector information is highly complete, however, the data show that expansions within the same industry are about 60 to 80 percent more frequent than diversifications. Over time the total numbers of expansion and diversification plants tend to increase or decrease together, but the number of plants per expansion venture tended to fall during the seven years whereas the number of plants per diversification venture tended to increase. Although expansions average more than two plants and diversifications more than five plants, the median number of plants for both is one. A minority of multi-plant ventures therefore drives the difference in average number of plants between ventures of existing firms and new firms. We now turn to identification of the employee spinoffs among the new firms.

**Table 1: Expansion or Diversification at Existing Firms and Entry of New Firms**

Year	Existing Firms							Entrants	
	Existing	Expansion <sup>a</sup>		Diversification <sup>b</sup>		Undetermined Sector <sup>c</sup>		New	
	Firms	Ventures	Plants	Ventures	Plants	Ventures	Plants	Firms	Plants
1995	1,063,441	11,413	36,367	9,645	51,703	7,979	10,123	195,131	197,928
1996	1,125,299	12,372	34,932	9,678	46,526	4,284	5,893	190,309	192,966
1997	1,176,743	13,181	36,424	9,962	47,272	3,041	3,912	244,139	248,554
1998	1,270,377	13,254	36,301	9,288	43,428	1,808	2,008	220,916	223,746
1999	1,332,871	13,511	27,273	8,537	36,755	1,135	1,798	222,215	241,876
2000	1,403,903	13,010	32,518	8,101	51,638	929	1,090	234,663	240,531
2001	1,487,069	13,235	29,455	7,133	44,197	860	944	236,274	247,810
Total								1,543,647	1,593,411

<sup>a</sup> An expansion venture consists of all new plants started by an existing firm during a given year if these plants are in the same CNAE 4-digit industry as the existing firm. Specifically, we compare the sector associated with the top employee at any new plant with the mode sector of the existing firm during the previous year.

<sup>b</sup> A diversification venture consists of all new plants started by an existing firm during a given year if these plants are in a different CNAE 4-digit industry from the existing firm, comparing the sector associated with the top employee at any new plant with the mode sector of the existing firm during the previous year.

<sup>c</sup> An undetermined sector venture sums over all new plants of an existing firm, for which we cannot compare the new plant sector with the original firm sector. The reasons can be that the new plant has no known sector during its first year in RAIS, or that the existing firm has no known sector during its previous year in RAIS. If a firm opens four new plants during a given year, two of them in a different sector and two in unknown sectors, each plant with five employees, that firm will appear to have one new 10-employee diversification venture, and one 10-employee undetermined sector venture by our classification.

Source: RAIS 1995-2001, new firms and ventures of existing firms.

Notes: Ventures are groups of new plants.

## 4. Spinoff and Divestiture Definitions

We take two complementary approaches to identifying employee spinoff firms in the RAIS data, and let each approach act as a check on the robustness of the other. In the first approach, we locate the human capital essential to founding the new firm in its director or manager.

Definition A. (Director/manager spinoff.) *A director/manager employee spinoff is a new firm whose top paid director (or top paid manager if there are no directors) previously worked for an existing firm in the same 4-digit CNAE industry.*

The top paid director or manager may be the owner of the firm, or may have recruited financial backing from investors who own the firm but are not employed by it. Alternatively, investors may have recruited an experienced director or manager to run a new firm that was their idea. In the latter case, some (but not all) of the human capital essential to founding the new firm is embodied in the unobserved investors. Note that the director/manager spinoff definition will miss many “vertical” spinoffs, in which the top paid director or manager leaves his existing firm to independently produce an input he previously supplied to his former employer internally.<sup>3</sup> For example, an accountant for a manufacturing firm may start an accounting firm that caters to manufacturing industry. His new firm will not have the same 4-digit CNAE as his former employer and will therefore be missed by the director/manager spinoff definition.

Our second approach locates the human capital essential to founding the new firm in a group of employees that embodies its “core competence.” Of course the core competence of a firm is unobserved, so we do not know which or how many employees embody its core competence. For help we turn to a fact about director/manager spinoffs: on average, the director/manager

<sup>3</sup> These vertical spinoffs are extensively documented for Taiwan in Chapter 7 of Shieh (1992).

“brings along” from the parent 23 percent of the non-management employees of the new firm.<sup>4</sup> This suggests that a reasonable cutoff for the share of employees in the new firm that is needed to transfer essential technologies or work routines from the parent firm is one-quarter.<sup>5</sup>

Definition B. (Quarter-workforce spinoff.) *A quarter-workforce employee spinoff is a new firm of five or more employees, at least 25 percent of whom previously worked for the same existing firm.*

We restrict this definition to new firms with five or more employees, because below five employees any new firm with an employee who can be traced to previous employment would automatically be a spinoff. In other words, by restricting ourselves to firms with five or more employees, we ensure that a “team” that embodies the core competence of the new firm must have at least two employees. An advantage of the quarter-workforce definition over the director/manager definition is that we are not restricted to firms with a paid director or manager, nor are we restricted to “horizontal” spinoffs. Moreover, the quarter-workforce definition can be implemented in linked employer-employee data sets in general, even if the data lack occupational information (as is the case in the United States). So findings under this definition are directly comparable across countries. The obvious disadvantage is that without the presence of a director or manager it is entirely possible that no essential human capital is embodied in the group of employees.

Both spinoff definitions A and B are vulnerable to the problem that the offspring firms may not be truly new. An existing firm that divests itself of one or more divisions creates a “new” firm that is likely to satisfy both of our spinoff definitions.<sup>6</sup> We receive some help with this problem from the coding of firms by *natureza juridica* (legal form) in the RAIS data set. By Brazilian commercial law, there are two broad categories of legal form: incorporated firms, and associations or partnerships without independent legal existence. Most important for our purposes, associations or partnerships cannot be owned by companies, but only by physical persons. So, if an employee spinoff is an association or partnership, it is not likely to be a divestiture (we call these “non-incorporated” legal forms). In contrast, spinoffs that are incorporated as Corporation under private control, Close corporation, or Limited liability company are quite possibly divestitures (we call these “incorporated” legal forms). Inverting the common criterion in the labor literature that a mass layoff is a reduction of the existing workforce by 30 percent or more (e.g. Jacobson, LaLonde and Sullivan 1993), we label a new firm a divestiture if its *natureza juridica* is coded as Corporation under private control, Close corporation, or Limited liability company, or if it has unknown legal form, and if it absorbs 70 percent or more of the employees of a plant of an existing firm.<sup>7</sup>

Definition C. (Divestiture.) *A divestiture is a new firm with natureza juridica coded as Corporation under private control, Close corporation, Limited liability company, or as unknown that absorbs 70 percent or more of the employees of a plant of an existing firm.*

Finally, we exclude from our analysis branches of government, firms with state ownership, cooperatives, any type of holding company, and branches of foreign firms. In other words, we concentrate on Brazil’s domestically-owned private sector. For our exhaustive classification of *natureza juridica* into non-incorporated legal forms, incorporated legal forms and excluded legal forms, see Table C.1 in the Appendix.

<sup>4</sup> That is, on average 23 percent of the non-management employees of Definition A spinoffs, as counted in Table 4 below, are from the same parent firm as the top paid director or manager.

<sup>5</sup> Eriksson and Kuhn (2006) use one-half as the cutoff for defining a new firm with two to ten employees as a spinoff. However, they note that use of a 30 percent cutoff does not qualitatively change their findings.

<sup>6</sup> One might think the same problem could arise if a firm is sold, creating a “new” firm that is again likely to satisfy both of our spinoff definitions. However, as discussed in Appendix B, a firm that is sold retains its firm identifier and therefore is not coded as a new firm in our data.

<sup>7</sup> We use the share of employees of an existing plant rather than an entire existing firm because a typical divestiture scenario is one in which a parent firm divests itself of a particular plant, which becomes a new firm. This conservative approach makes it more difficult to classify a new firm as an employee spinoff. Benedetto, Haltiwanger, Lane and McKinney (2007) use a cutoff of 80 percent of the employees of an existing firm shifting to another firm in order to cross-validate firm dynamics from administrative firm records with worker flow information. So as to check for the potential sensitivity of our later results to our choice of the cutoff at 70 percent, we control for the share of parent employees shifted in robustness regressions.

Definition D. (New firm with excluded legal form.) *A new firm with excluded legal form is a new firm with natureza juridica coded as Public administration, State-owned limited liability company, State-owned close corporation, Corporation with some state control, Cooperative, Consortium, Business group, or Branch of foreign company.*

Table 2 summarizes the resulting exhaustive and mutually exclusive classification of new firms under Definitions A through D. Appendix D describes the classification procedure in precise detail.

**Table 2: Classification of New Firms**

Type of New Firm	Spinoff criteria <sup>a</sup>	Mass Employee Shift <sup>b</sup>	Legal Form of New Firm <sup>c</sup>
Unrelated new firm	no	yes or no	non-incorporated
Unrelated new firm	no	no	incorporated
Employee spinoff	yes	yes or no	non-incorporated
Employee spinoff	yes	no	incorporated
Divestiture	yes or no	yes	incorporated
Excluded legal form	yes or no	yes or no	—

<sup>a</sup> There are two spinoff criteria: director/manager (Def. A) and quarter-workforce (Def. B). The director/manager criterion isolates the top employee at each new firm first by CBO occupation (where director trumps manager, which trumps other occupations), and second by wage. The last firm at which this top employee worked for at least three months is defined as the new firm's parent. If this parent is within the same sector as the new firm (where we use the sectors associated with the shifting employee at the two jobs), and the top employee is a manager or director, we label the new firm a spinoff (Def. A). If there are two or more director/manager employees tied for top employee, the firm is labeled a spinoff if any one (or all) of these managers' parent firms is in the same sector as the new firm. So multi-parent spinoffs are possible (rare in practice). The quarter-workforce criterion considers the previous employer (employment for at least three months) of all the new firm's employees, regardless of job description or pay. The parent firm is the firm that lost the largest number of employees to the new firm. The new firm is labeled a spinoff as long as it has at least five employees, and 25 percent or more of them come from the parent firm. Multi-parent spinoffs are again possible.

<sup>b</sup> Shift of 70 percent or more of the parent plant workforce to the new firm. The parent plant is the plant of the parent firm that lost the largest share of its employees to the new firm, where the parent firm is the last firm at which a new firm's top employee worked for at least three months under the director/manager criterion and parent firm is the firm that lost the largest number of employees to the new firm under the quarter-workforce criterion. If there are two or more parent firms, we keep the one within the same sector as the new firm for the mass employee shift criterion; remaining ties are broken at random to select a unique parent. The parent plant workforce is the employees ever employed during the year before the new firm's entry. If the new firm has no known parent, or this parent was not present during the previous year (so we cannot obtain its employees), we consider the mass employee shift criterion as not satisfied. The mass employee shift criterion of 70 percent is an inversion of the common criterion for a mass layoff, by which a mass layoff is a reduction of the existing workforce by 30 percent or more (e.g. Jacobson et al. 1993).

<sup>c</sup> For our classification into non-incorporated legal forms, incorporated legal forms and excluded legal forms, see Table C.1 in the Appendix.

Note: Legal form according to natureza juridica variable in RAIS.

## 5. Counting Employee Spinoffs, Other New Firms, and Diversification Ventures

We now turn to descriptive statistics that characterize our samples of new firms and ventures, whose performance we examine in the following section. The universe from which we sample consists of all new firms and diversification ventures with included legal form. We add diversification ventures so we can make the same comparisons as in Dunne et al. (1988) between new firms and entry into new industries by existing firms. We do not consider expansion ventures in our comparisons, following Dunne et al. (1988) for whom expansion ventures are not a form of entry.

Note that the pool of new firms from which Definition A spinoffs can be drawn is restricted to those with at least one director or manager, and the pool of new firms from which Definition B spinoffs can be drawn is restricted to those with at least five employees. We therefore draw two samples from our universe, containing all new firms and diversification ventures with included legal form with at least one director or manager and with five or more employees, respectively. Table 3 shows that having at least five employees is more than four times more common in our

universe than having at least one director or manager. Even the larger sample covers only 21.9 percent of our universe of new firms, though these account for 73.0 percent of employment and 82.3 percent of wages. Coverage of diversification ventures is more than twice that of new firms in both samples, and the larger sample approaches complete coverage of employment and wages for diversification ventures.<sup>8</sup>

**Table 3: Samples of Entrants for Analysis**

Type of new firm or venture	Count	Employment (thousands)	Wage Bill (BRL million)
Universe of new firms	1,515,560	6,038	1,673
with director/manager	5.0%	25.5%	44.0%
with five or more employees	21.9%	73.0%	82.3%
Universe of diversification ventures	60,593	1,365	522
with director/manager	10.9%	54.5%	73.2%
with five or more employees	48.4%	96.4%	98.2%

Source: RAIS 1995-2001, new firms and diversification ventures of existing firms.

Notes: Definition of new firms as in Table 2. Definition of ventures as in Table 1. Brazilian Real (BRL) deflated to August 1994. Employment in thousands, wage bill in BRL million. The universe does not include new firms of excluded legal form (28,087 firms, with 1,041 thousand employees and a total wage bill of 537 million BRL), diversification ventures of excluded legal form (1,751 ventures, with 190 thousand employees and a total wage bill of 144 million BRL) and undetermined sector ventures (20,036 ventures, with 111 thousand employees and a total wage bill of 41 million BRL).

Table 4 shows that director/manager spinoffs and quarter-workforce spinoffs respectively account for about one-sixth and nearly 30 percent of new firms in their samples. The ranking is to be expected given the greater restrictiveness of the director/manager spinoff definition. Under both definitions spinoffs account for larger shares of employees and wages at time of entry than they do of counts of new firms. This holds even more strongly for divestitures. Differences in initial sizes across types of new firms and between new firms and diversification ventures will be examined in the next section.

**Table 4: Entrants by Sample and Type**

Type of new firm or venture	Count	Employment (thousands)	Wage Bill (BRL million)
Director/Manager Sample			
New firms, of which:	76,497	1,542	736
Employee spinoffs	17.0%	23.9%	23.1%
Divestitures	4.3%	22.2%	27.5%
Unrelated new firms	78.7%	53.9%	49.3%
Diversification ventures	6,582	744	382

Five or More Employees Sample			
New firms, of which:	331,987	4,409	1,378
Employee spinoffs	29.3%	31.9%	37.5%
Divestitures	5.5%	14.9%	23.6%
Unrelated new firms	65.3%	53.1%	38.9%
Diversification ventures	29,348	1,315	513

Source: RAIS 1995-2001, new firms and ventures of existing firms.

Notes: Definition of new firms as in Table 2. Definition of ventures as in Table 1. Brazilian Real (BRL) deflated to August 1994. Employment in thousands, wage bill in BRL million.

<sup>8</sup> Employment and wage bill figures are the ones recorded in December of the new firms' or ventures' first year of appearance in RAIS. Averaging employment and wage bills over the entire calendar year is too cumbersome in RAIS.

We can assess the overlap between our two spinoff definitions by considering the subset of new firms with included legal form that have both a director/manager and at least five employees. There are 41,725 firms in this subset, of which 10,783 are director/manager spinoffs, 17,010 are quarter-workforce spinoffs, and 6,386 are both. Thus 59.2 percent of director/manager spinoffs are also quarter-workforce spinoffs but only 37.5 percent of quarter-workforce spinoffs are also director/manager spinoffs. This again emphasizes that Definition A is more restrictive than Definition B.

Table 5 provides some perspective on the importance to the Brazilian economy of the new firms and ventures from which we sample. We examine the shares of these entrants in total Brazilian formal sector employment and wages at the beginning, middle, and end of the period we cover. In any given year, the contributions to employment and wages of the new firms and diversification ventures that enter in that year are in the neighborhoods of four percent and two and one-half percent, respectively. At the end of the period, the contributions to employment and wages of all the new firms and diversification ventures that entered and survived from 1995 to 2001 are 25.6 percent and 18.1 percent, respectively. This is despite the fact that these entrants exclude the public sector and foreign subsidiaries.

The bottom part of Table 5 reports the same figures for the larger and more representative of our two samples, new firms and diversification ventures with five or more employees, which allows us to break down the contributions to employment and wages by types of new firms, including employee spinoffs. The contributions to 2001 employment and wages of all the employee spinoffs that, from 1995 to 2001, entered with five or more employees and survived are 5.0 percent and 4.3 percent, respectively. These are 27.5 and 30.1 percent of the contributions of all entrants with five or more employees to Brazilian formal sector employment and wages, respectively.

**Table 5: Entrant Shares of Brazilian Formal Sector Employment And Wage Bill, 1995-2001<sup>a</sup>**

	1995		1998		(cumulative) <sup>a</sup>		2001		(cumulative) <sup>a</sup>	
	Empl.	Wage	Empl.	Wage	Empl.	Wage	Empl.	Wage	Empl.	Wage
RAIS Universe <sup>b</sup> of which:	23,222	10,665	24,606	10,862			27,426	12,229		
New firms	2.8%	1.5%	3.5%	2.1%	13.0%	8.1%	3.4%	2.1%	22.2%	1.5%
Diversification ventures	0.9%	0.8%	0.8%	0.7%	2.5%	2.2%	0.7%	0.6%	3.4%	3.1%
New firms with 5+ employees	2.0%	1.2%	2.6%	1.8%	8.9%	6.2%	2.5%	1.7%	14.9%	11.3%
Spinoffs	0.6%	0.4%	0.9%	0.8%	2.9%	2.3%	0.8%	0.6%	5.0%	4.3%
Divestitures	0.3%	0.3%	0.4%	0.3%	1.1%	1.2%	0.4%	0.4%	2.0%	2.3%
Unrelated	1.1%	0.5%	1.3%	0.6%	4.9%	2.7%	1.3%	0.7%	8.0%	4.7%
Div. ventures with 5+ employees	0.9%	0.8%	0.8%	0.7%	2.3%	2.2%	0.7%	0.6%	3.3%	3.0%

<sup>a</sup> Includes the 1998 (2001) employment and wage bill of new firms and ventures born between 1995 and 1998 (2001). Only the entrants' original plants are included in this tabulation, so the cumulative shares underestimate slightly the importance of new entrants.

<sup>b</sup> Includes all formal sector firms reported in RAIS, including those with natureza jurídica coded as Public administration, State-owned limited liability company, State-owned closed corporation, Corporation with some state control, Cooperative, Consortium, Business group, or Branch of foreign company.

Source: RAIS 1995-2001.

Notes: Definition of employee spinoff (quarter-workforce criterion B only) and divestiture as in Table 2. Definition of diversification venture as in Table 1. Brazilian Real (BRL) deflated to August 1994. Employment in thousands, wage bill in BRL million.

**Table 6: Distribution of New Firms by Sector and Knowledge Intensity**

CNAE 1-digit sector OECD (2001) classification	Director/manager <sup>a</sup>			Five or more employees <sup>b</sup>			Existing Firms <sup>c</sup>
	Spinoffs	Divest.	Unrelated	Spinoffs	Divest.	Unrelated	
Agriculture and fishery	.9%	1.6%	.9%	1.6%	1.7%	1.3%	1.6%
Mining, food processing and textiles	7.4%	7.9%	5.9%	8.1%	8.2%	8.1%	5.9%
Manufacture of wood, metal products, chemicals	7.3%	9.4%	6.7%	8.7%	8.2%	7.0%	6.5%
Manufacture of machinery and equipment	2.6%	3.8%	2.4%	2.9%	3.0%	2.3%	2.1%
Utilities and construction	2.0%	2.0%	2.1%	7.2%	6.1%	8.5%	3.3%
Commerce, repair services, hotels and restaurants	58.5%	51.5%	55.7%	40.3%	50.0%	46.2%	50.5%
Transport, telecommunication, finance, insurance	8.2%	8.3%	5.9%	4.9%	4.6%	3.4%	4.1%
Real estate activities and business services	8.0%	10.7%	12.6%	17.8%	10.8%	13.0%	14.5%
Education, health, social and public services	2.4%	1.8%	2.3%	4.2%	3.8%	4.4%	5.3%
Other social or personal services	2.7%	2.9%	4.9%	3.7%	2.9%	4.8%	5.8%
Unknown	0	.1%	.5%	.6%	.5%	.8%	.4%
Non-high-tech sectors	87.0%	80.7%	81.4%	81.7%	82.4%	82.8%	84.4%
High-tech manufacturing <sup>d</sup>	2.0%	4.9%	2.3%	2.4%	2.6%	1.5%	1.8%
Knowledge-intensive services <sup>e</sup>	10.9%	14.3%	15.8%	15.3%	14.5%	14.9%	13.3%

<sup>a</sup> New firms with at least one director/manager.

<sup>b</sup> New firms with at least five employees.

<sup>c</sup> Includes all formal sector firms reported in RAIS, including those with natureza juridica coded as Public administration, State-owned limited liability company, State-owned closed corporation, Corporation with some state control, Cooperative, Consortium, Business group, or Branch of foreign company.

<sup>d</sup> Includes High-tech and Medium-high-tech manufacturing.

<sup>e</sup> Includes Telecommunication, Finance and insurance, Business services (excluding real estate activities), Education and health services.

Source: RAIS 1995-2001.

Notes: High-tech and knowledge-intensity classification according to OECD (2001) based on CNAE 4-digit industry. Entry size is the total of founding employees with employment at any time during the new firm's first year.

Table 6 shows frequencies of employee spinoffs, divestitures and unrelated new firms by CNAE 1-digit sector in the upper panel, and compares these frequencies to the distribution of existing firms in the final column. The first group of three columns covers the pool of new firms with at least one director or manager and the second group of three columns the pool of new firms with at least five employees. In Brazil, roughly half of new firms enter in commerce, repair services, hotels and restaurants. The next highest frequency of entry is observed in real estate activities and business services. The sectoral distribution of new firms in Brazil is broadly consistent with worldwide survey evidence on entrepreneurship (Minniti et al. 2005), which finds that more than 40 percent of entrepreneurship in high-income countries and more than 60 percent in middle-income countries occurs in consumer-oriented industries. Interestingly, employee spinoffs, divestitures and unrelated new firms exhibit a roughly similar concentration across 1-digit sectors. Compared to the overall distribution of existing firms in the final column, the number of entrants is mostly proportional to the count of existing firms. There are deviations, however. In agriculture, real estate, business services, education, health, and social services, the frequency of entry is smaller than the share of existing firms, suggesting that these sectors exhibit relatively less

entry turnover than the average Brazilian sector. In mining, food processing, textiles, wood and metal products, and chemical manufacturing, in contrast, entry is relatively more frequent than the share of incumbent firms, consistent with relatively high entry turnover in those sectors. In commerce, repair services, hotels and restaurants, where most entry occurs in Brazil, the sample of new firms with at least one manager/diretor exhibits higher entry frequency than the share of incumbent firms, but the sample of new firms with at least five employees exhibits a relatively lower entry frequency; this suggests that most entrants into this sector are smaller than five employees.

In the lower panel of Table 6, we filter the new firm's CNAE 4-digit industry through the OECD (2001) classification of economic activities into high-technology manufacturing and knowledge-intensive services. The mass of Brazil's new businesses is launched in non-high-tech manufacturing and services industries – again with a roughly similar concentration for employee spinoffs, divestitures and unrelated new firms. Around 11 percent of director/manager employee spinoffs and 15 percent of quarter-workforce spinoffs are started in knowledge-intensive services (telecommunication, finance, insurance, business services, education, health), comparable to the share of incumbent firms in the knowledge-intensive sector. New firms in the often referenced high-tech manufacturing industries are relatively rare, and also enter with a frequency proportional to the high-tech manufacturing sector's share of incumbent firms. Assuringly, the distribution of new firms across sectors is similar under both pools of new firms, those with at least one director or manager and those with at least five employees. In the next section we examine the performance of both types of employee spinoff relative to other new firms and ventures within the respective pools of new firms.

## 6. Employee Spinoff Performance

Dunne et al. (1988) measure entrant performance by initial size, market share, and exit rates. We lack output or sales data needed to measure market share, but we can measure initial size using both number of employees and total wage bill. Table 7 shows regressions for initial sizes of new firms and diversification ventures in both of our samples. Columns 1 and 2 cover firms and ventures that have at least one director or manager and columns 3 and 4 cover firms and ventures with at least five employees. Size is measured by the log of the number of employees and the log of the wage bill on December 31 of the calendar year in which the firm or venture is first observed. We drop firms and ventures with zero employees on December 31 of their birth years. The key explanatory variables are indicators for employee spinoff, divestiture, and diversification venture, alongside controls for 4-digit CNAE industry and cohort (entry year of firm or venture).<sup>9</sup> The omitted baseline firm type is unrelated new firms. The exponential functions of the coefficients on the key indicator variables therefore show, within an industry and within a cohort, the ratios of the sizes of employee spinoffs, divestitures, and diversification ventures of existing firms to unrelated new firms.

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<sup>9</sup> The industry indicators used as controls in Tables 7-10 are based on the mode sector for new firms during their first year in the data.

**Table 7: Size at Entry**

O L S	Director/manager		Five or more employees	
	Log Empl.	Log Wage Bill	Log Empl.	Log Wage Bill
(exponentials of coefficients)	(1)	(2)	(3)	(4)
Employee spinoff	1.85 (.02)***	1.95 (.03)***	1.12 (.003)***	1.28 (.005)***
Divestiture	2.67 (.07)***	2.94 (.10)***	1.41 (.01)***	1.60 (.02)***
Diversification venture	3.11 (.07)***	3.86 (.10)***	1.67 (.01)***	2.06 (.02)***
Obs	78,911	78,911	346,813	346,813
R <sup>2</sup>	.29	.31	.13	.14
Mean Dep. variable	1.75	.39	2.07	.37
CNAE industry panels	550	550	560	560
Cohort panels	7	7	7	7

Source: RAIS 1995-2001, new firms and ventures of existing firms with at least one manager/director or at least five employees Brazilian Real (BRL) deflated to August 1994. Wage bill in BRL thousands.

Notes: Definition of employee spinoff and divestiture as in Table 2. Definition of diversification venture as in Table 1.

Omitted category: unrelated new firms. Coefficients reported as exponential functions of coefficients from OLS regression, standard errors computed with the Delta method, so that reported coefficients capture the ratios of the sizes relative to unrelated new firms.

All regressions condition on CNAE industry and cohort fixed effects. Robust standard errors in parentheses: \* significance at ten, \*\* five, \*\*\* one percent.

Diversification ventures of existing firms are three to four times larger than unrelated new firms among firms with directors or managers and about twice as large among firms with at least five employees. This is consistent with the findings of Dunne et al. (1988) for U.S. manufacturing entrants, who state (p. 504) that “new-firm entrants in each industry are on average 28.4% as large as existing producers, while diversifying-firm, new-plant entrants are 87.1% . . . as large.”<sup>10</sup> Some of our result is driven by the minority of diversification ventures with multiple plants. However, if we repeat the entire exercise at the plant level (not shown), diversification plants are still two to three times larger than plants of unrelated new firms among plants with directors or managers, and 21 percent larger (employees) or 57 percent larger (wage bill) among plants with five or more employees. In all regressions, divestitures are closer in size to diversification ventures than to unrelated firms (the same holds true at the plant level). This supports our criteria for identifying divestitures since they should look like ventures of existing firms rather than new firms. Employee spinoffs, on the other hand, are much closer to the entry size of unrelated new firms than to diversification ventures of existing firms (though the reverse is true at the plant level). The performance of director/manager spinoffs relative to diversification ventures is somewhat stronger than that of quarter-workforce spinoffs. Below, we will suggest an interpretation of our spinoff results in terms of the Jovanovic (1982) model of firm entry and exit.

Dunne et al. (1988) examine cumulative exit rates of entrants at five year intervals. We can follow two of our entrant cohorts, those “born” in 1995 and 1996, for five years. In addition, we can compute the hazard rates of exit year to year for all available cohorts, e.g. the share of entrants born from 1995 to 1997 that survive for three years and exit after four. These will tell us whether any differences in cumulative exit across entrant types were the result of accumulation of constant differences in exit hazard or driven by a “shake out” in the early years of existence, say.

Tables 8 and 9 show regressions for the exit of new firms and diversification ventures, covering firms and ventures with at least one director or manager and firms and ventures with at least five employees, respectively. The dependent variable in the first column of each table is an

<sup>10</sup> To make the comparison with Dunne et al. (1988) more accurate, we can drop the indicators for employee spinoff and divestiture from Table 7 so that the coefficients on diversification ventures give their sizes relative to all new firms, not just unrelated new firms. In this case the new coefficients for columns 1 through 4 are 2.66, 3.26, 1.58, and 1.85, respectively.

indicator that takes the value of one for entrants born five years earlier that have exited and zero otherwise.<sup>11</sup> The dependent variable in the remaining columns of each table is an indicator that takes the value of one for entrants that survived for  $t$  years and exited after  $t+1$  years and zero for entrants that survived for  $t+1$  years. The means of the dependent variables show that 52 percent and 44 percent of new firms and diversification ventures with at least one director or manager and with at least five employees, respectively, have exited after five years, and that the hazard rates of exit peak after two years and decline gradually thereafter. Again, the key explanatory variables are indicators for employee spinoff, divestiture, and diversification venture, alongside controls for 4-digit CNAE industry and cohort.

**Table 8: Exit of New Firms and Ventures with Director/Manager**

	Cumulative		Hazard				
	t+5		t+1	t+2	t+3	t+4	t+5
	(1)		(2)	(3)	(4)	(5)	(6)
Employee spinoff	-.096 (.012)***		-.041 (.003)***	-.045 (.004)***	-.031 (.005)***	-.026 (.007)***	-.020 (.010)**
Divestiture	-.151 (.022)***		-.051 (.005)***	-.061 (.007)***	-.034 (.009)***	-.046 (.012)***	-.034 (.017)*
Diversification venture	-.033 (.014)**		-.030 (.004)***	-.018 (.006)***	.003 (.008)	-.011 (.009)	.001 (.013)
Obs.	16,564		68,134	48,062	30,731	18,655	9,051
R <sup>2</sup>	.081		.018	.024	.028	.032	.059
Mean dep. variable	.52		.10	.15	.14	.14	.13
CNAE industry panels	504		549	541	526	512	479
Cohort panels	2		6	5	4	3	2

Source: RAIS 1995-2001, new firms and ventures of existing firms with at least one manager/director.

Notes: Definition of employee spinoff (director/manager criterion A only) and divestiture as in Table 2. Definition of diversification venture as in Table 1. Omitted category: unrelated new firms. All regressions condition on CNAE industry and cohort fixed effects. Robust standard errors in parentheses: \* significance at ten, \*\* five, \*\*\* one percent.

In Table 9, the first column shows that a diversification venture is 8 percent less likely to have exited than an unrelated new firm after five years. This is again consistent with the findings of Dunne et al. (1988, p. 513) for U.S. manufacturing entrants, who compute exit rates for diversification ventures from 6 to 14 percent lower than for new firms after five years, depending on cohort.<sup>12</sup> In Table 8, however, the difference between the cumulative exit rates of diversification ventures and unrelated new firms is much smaller than in Table 9. Looking at the remaining columns of Table 8, we see that this occurs because the exit hazard rate advantage of diversification ventures relative to unrelated new firms disappears after two years. We do not have an explanation for this finding, especially since there is no similar qualitative divergence between Table 8 and Table 9 for the exit rate advantages of employee spinoffs and divestitures relative to unrelated new firms.<sup>13</sup> The first columns of both Table 8 and Table 9 show that divestitures have the strongest performance, with the lowest cumulative exit rate of any type of new firm or venture. Finally, Tables 8 and 9 show that Definition A and B employee spinoffs have cumulative exit rates after

<sup>11</sup> As explained at the end of Appendix D, a new firm or venture is not considered to have exited until all its initial plants have exited. Even then, however, a new firm's 8-digit CNPJ root could survive because it has introduced a new plant. Survival of a firm's CNPJ root after exit of all its initial plants is very rare in our data. Modification of our exit definition for new firms to take account of this possibility causes the estimated exit rates for new ventures to rise relative to those for new firms by quantitatively insignificant amounts.

<sup>12</sup> As before, we can make the comparison with Dunne et al. (1988) more accurate by dropping the indicators for employee spinoff and divestiture from column 1 of Table 9 so that the coefficient on diversification venture gives exit relative to all new firms, not just unrelated new firms. We then find that a diversification venture is 6 percent less likely to have exited than a new firm after five years, the low end of the Dunne et al. (1988) range.

<sup>13</sup> If we restrict Table 8 to new firms and ventures with five or more employees, the results do not qualitatively change. Thus it is the director/manager filter that generates the unexpected exit behavior for diversification ventures.

five years that are respectively 10 and 7 percent lower than those of unrelated firms.<sup>14</sup> In both tables the exit hazard rates for employee spinoffs, divestitures, and diversification ventures consistently show their largest differences from those of unrelated new firms during the first two years of existence of the new firms or ventures, though this result almost vanishes for diversification ventures in Table 9.<sup>15</sup>

**Table 9: Exit of New Firms and Ventures With Five or More Employees**

	Cumulative		Hazard				
	t+5		t+1	t+2	t+3	t+4	t+5
	(1)		(2)	(3)	(4)	(5)	(6)
Employee spinoff	-.069 (.004)***		-.026 (.001)***	-.031 (.002)***	-.023 (.002)***	-.021 (.002)***	-.019 (.003)***
Divestiture	-.121 (.008)***		-.035 (.002)***	-.049 (.003)***	-.035 (.004)***	-.034 (.004)***	-.027 (.006)***
Diversification venture	-.082 (.007)***		-.024 (.002)***	-.021 (.003)***	-.017 (.004)***	-.022 (.004)***	-.022 (.006)***
Obs.	87,476		306,458	229,426	157,433	102,015	54,630
R <sup>2</sup>	.098		.022	.023	.023	.024	.030
Mean dep. variable	.44		.09	.12	.12	.11	.10
CNAE industry panels	538		560	555	548	545	531
Cohort panels	2		6	5	4	3	2

Source: RAIS 1995-2001, new firms and ventures of existing firms with at least five employees.

Notes: Definition of employee spinoff (quarter-workforce criterion B only) and divestiture as in Table 2. Definition of diversification venture as in Table 1. Omitted category: unrelated new firms. All regressions condition on CNAE industry and cohort fixed effects. Robust standard errors in parentheses: \* significance at ten, \*\* five, \*\*\* one percent.

Our aim in this section is to establish regularities regarding the performance of employee spinoffs relative to other new firms and ventures, rather than test hypotheses about relative performance. Nevertheless, there is a mechanical reason why Definition A and especially Definition B spinoffs should show better performance, and we would like to control for this. Application of both definitions requires that we be able to track workers at a new firm to previous employment. Mechanically, then, employees at a Definition A and especially Definition B spinoff are more likely than employees at an unrelated new firm to have formal sector work experience. It would not be surprising if such firms were to survive in the formal sector longer. In the first and fourth columns of Table 10, therefore, we add a control variable for the share of new firm or venture employees that are “trackable”. As expected, a greater share of trackable employees is associated with reduced cumulative exit rates for both new firms and ventures with at least one director or manager and new firms and ventures with at least five employees. However, the impact on exit rates of spinoffs is only slightly reduced.<sup>16</sup>

<sup>14</sup> A potential concern is that the superior performance of employee spinoffs relative to unrelated new firms is driven by firms with incorporated legal form, for which the classification of new firms as employee spinoffs is less certain. We reran our size and exit regressions for firms with non-incorporated legal form only, dropping divestitures. The differences in initial size and exit rates between employee spinoffs and unrelated new firms were qualitatively unchanged.

<sup>15</sup> The large difference in number of observations between the first and last columns in both tables occurs because the first columns include all firms and ventures in the two qualifying cohorts whereas the last columns only include firms and ventures that survived until t+4.

<sup>16</sup> The mean of “share trackable” for new firms is 61.4 percent.

**Table 10: Cumulative Exit Five Years After Entry of New Firms and Ventures : Additional Specifications**

	Director/manager			Five or more employees		
	(1)	(2)	(3)	(4)	(5)	(6)
Employee spinoff	-.086 (.012)***	-.060 (.012)***	-.063 (.013)***	.066 (.004)***	-.069 (.004)***	-.068 (.005)***
Divestiture	-.137 (.022)***	-.096 (.022)***	-.090 (.023)***	-.119 (.008)***	-.116 (.008)***	-.102 (.013)***
Diversification venture	-.025 (.014)*	.031 (.014)**	.034 (.015)**	-.081 (.007)***	-.070 (.007)***	-.064 (.007)***
Share: Trackable employees	-.077 (.014)***	-.051 (.014)**	-.047 (.024)*	-.014 (.008)*	-.002 (.008)	-.009 (.009)
Log initial employment		-.050 (.003)***	-.050 (.003)***		-.024 (.002)***	-.025 (.002)***
Share: Shifted parent employees			.003 (.002)			-.010 (.010)
Obs.	16,564	16,564	12,334	87,476	87,476	77,674
R <sup>2</sup>	.083	.098	.102	.098	.099	.104
Mean dep. variable	.52	.52	.50	.44	.44	.43
CNAE industry panels	504	504	491	538	538	537
Cohort panels	2	2	2	2	2	2

Source: RAIS 1995-2001, new firms and ventures of existing firms with at least one manager/director or at least five employees.

Notes: Definition of employee spinoff (director/manager criterion A and quarter-workforce criterion B) and divestiture as in Table 2. Definition of diversification venture as in Table 1. Omitted category: unrelated new firms. All regressions condition on CNAE industry and cohort fixed effects. Robust standard errors in parentheses: \* significance at ten, \*\* five, \*\*\* one percent.

Are the lower cumulative exit rates of employee spinoffs (and divestitures and diversification ventures) relative to unrelated new firms explained by their larger initial sizes? To answer this question we add the log of the number of initial employees as a control variable in the second and fifth columns of Table 10.<sup>17</sup> This is indeed associated with lower exit rates for both new firms and ventures with at least one director or manager and new firms and ventures with at least five employees. The impacts on exit rates of divestitures and diversification ventures with at least five employees are slightly reduced, but the impact on the exit rate of employee spinoffs with at least five employees is unchanged. There are greater changes for new firms and ventures with at least one director or manager. For employee spinoffs and divestitures, impacts on exit rates are now below those for the same categories with at least five employees. For diversification ventures, the impact on exit rates is now slightly positive, maintaining the unexpected exit behavior for diversification ventures with at least one director or manager. Nevertheless, it is clear that the lower cumulative exit rates of employee spinoffs relative to unrelated new firms are an element of superior performance over and above greater entry size.

Finally, it is possible that some of the apparently better performance of employee spinoffs relative to unrelated new firms results from an overly restrictive definition for divestitures. In other words, some employee spinoffs may actually be planned divestitures even though they contain less than 70 percent of the employees of any plant of their parent firm. To control for this possibility, in the third and sixth columns of Table 10 we add a variable for the share of employees of the plant of the parent firm from which the new firm or venture absorbs the most workers.<sup>18</sup> This

<sup>17</sup> Initial employees in these tables include all founding employees with a job at the new firm at any time during the first year, rather than in December only.

<sup>18</sup> For an unrelated new firm with at least one director or manager, a "parent" is just the existing firm from which the new firm received its top employee. For an unrelated new firm with at least five employees, a parent is just the existing firm from which the new firm absorbs the most workers, where "most" could be as low as one. The number of observations drops in these columns because many unrelated new firms lack (identifiable) parent firms.

variable has no statistically significant association with cumulative exit rates.<sup>19</sup> The coefficients for employee spinoffs are essentially unaffected.<sup>20</sup>

Exit does not necessarily imply failure. A new firm may be acquired by another firm and thereby earn its founders a tidy return. We define an exiting new firm or venture as absorbed if at least 70 percent of the exiting firm or venture’s workforce is contracted by another firm during the year of exit; otherwise we call the exit a failure. For a meaningful application of the 70-percent definition, we restrict the sample to new firms and ventures with at least five employees at time of exit. When we restrict the regression sample to failures and survivors (dropping absorptions from the sample) in column 2 of Table 11, the inferior performance of unrelated new firms becomes even starker, and diversification ventures show the largest difference between failure rates and general exit rates. We restrict the regression sample to absorptions and survivors (dropping failures from the sample) in column 3. Compared to unrelated new firms, spinoffs and divestitures are more likely to be absorbed, and diversification ventures are three to four times more likely to be absorbed than are spinoffs or divestitures.<sup>21</sup>

**Table 11: Cumulative Failure and Absorption Five Years After Entry: New Firms and Ventures With Five or More Employees**

	Any Exit	Failure	Absorption
O L S	(1)	(2)	(3)
Employee spinoff	-.069 (.004)***	-.082 (.004)***	.024 (.002)***
Divestiture	-.121 (.008)***	-.138 (.008)***	.024 (.005)***
Diversification venture	-.082 (.007)***	-.120 (.007)***	.082 (.006)***
Obs.	87,476	84,785	51,685
R2	.098	.104	.043
Mean Dep. Variable	.44	.42	.05
CNAE industry panels	538	537	528
Cohort panels	2	2	2

Source: RAIS 1995-2001, new firms and ventures of existing firms with at least five employees.

Notes: Column 1 restates results from Table 9, subsample in column 2 excludes absorptions, subsample in column 3 excludes failures. Definition of absorption: 70 percent of exiting firm’s workforce shift to another firm (exit is failure otherwise). Definition of employee spinoff (quarter-workforce criterion B only) and divestiture as in Table 2. Definition of diversification venture as in Table 1. Omitted category: unrelated new firms. All regressions condition on CNAE industry and cohort fixed effects. Robust standard errors in parentheses: \* significance at ten, \*\* five, \*\*\* one percent.

Dunne, Roberts and Samuelson (1989, p. 679) interpret their findings regarding the performance of diversification ventures relative to new firms in terms of the Jovanovic (1982) model of firm entry and exit. In their view a diversification venture inherits the unobserved productivity parameter of its parent and the posterior distribution of that parameter. Since the parent is selected for

<sup>19</sup> However, in results not shown, the share of shifted employees reduces exit hazard rates for t+4 and t+5 for new firms and ventures with at least five employees by quantitatively small but statistically significant amounts, and has the same effect on the exit hazard rate for t+5 for new firms and ventures with at least one director or manager (but a positive and statistically significant effect, even smaller in absolute value, on the exit hazard rate for t+2 for these firms and ventures). In these same specifications the share of trackable employees reduces exit hazard rates for t+1 and t+2 for new firms and ventures with at least five employees by quantitatively small but statistically significant amounts. Finally, in these specifications the negative effect on exit hazard rates for diversification ventures with at least five employees tends to strengthen slightly with time.

<sup>20</sup> It is also possible that some of the apparently better performance of employee spinoffs relative to unrelated new firms results from workers who maintain concurrent employments at parent and spinoff so that spinoffs keep a close connection to parents. Accordingly, we include the share of concurrent employees at parent and spinoff in regressions like those in Table 10 (not reported). The concurrent-employment regressor itself is statistically insignificant, and coefficients for employee spinoffs are unaffected.

<sup>21</sup> Of those entrants that are absorbed, 45 percent of diversification ventures are absorbed by their parents compared to 28 percent of spinoffs and 26 percent of divestitures.

high productivity relative to the typical new firm by virtue of having survived for some period of time, the diversification venture is also selected for relatively high productivity and therefore relatively large size at entry. Moreover, the variance of the posterior distribution inherited by the diversification venture will be lower than the variance of the distribution for a new firm, and therefore it is less likely that the diversification venture will draw a low productivity realization that causes it to exit.

A natural extension of the reasoning of Dunne et al. (1989) to employee spinoffs is to assume that a spinoff's unobserved productivity parameter is a convex combination of the productivity parameter of an unrelated new firm and its parent firm, and that its posterior distribution of that parameter is likewise a mixture of the distributions for an unrelated new firm and its parent firm. This will yield size at entry and exit rates that are in between those of unrelated new firms and those of diversification ventures. This interpretation is consistent with the idea that employees take knowledge from parent firms to spinoffs, but that the knowledge is not necessarily alienable intellectual property as in the literature on high-tech spinoffs.

## 7. Conclusion

Employee spinoffs have been found to be an important type of new business in many industries and many economies. Existing firms continuously lose employees, some of whom spin off to start their own businesses. Rich linked employer-employee data for Brazil allow us to systematically compare employee spinoffs to other new businesses, including management-initiated divestitures, and to diversification ventures of existing firms. Our identification of employee spinoffs draws on employer-reported occupations, firm identifiers and industry classifications, as well as firms' legal forms and mass employment shifts between firms.

Under one criterion, employee spinoffs are defined as new firms whose top salaried director or manager moved from a parent in the same industry. Under a second criterion, employee spinoffs are defined as new firms that fill at least a quarter of their jobs with workers who shifted from a common parent. Our findings are largely consistent across the two employee-spinoff definitions and lend mutual support to the definitions. Additional restrictions set employee spinoffs apart from divestitures and other entrants. Depending on definition, employee spinoffs account for between one-sixth and one-third of the respective new firms in Brazil's private sector during the period 1995-2001. Employee spinoffs grow into important employers. Total employment of employee spinoffs with at least a quarter of their workforce from a common parent, entering from 1995 to 2001, reaches five percent of all Brazil's formal-sector employment, private and public, by the end of the period.

Size at entry is larger for employee spinoffs than for new firms without parents but smaller than for diversification ventures of existing firms. Similarly, exit rates for employee spinoffs are less than for new firms without parents and comparable to those for diversification ventures of existing firms. These results suggest that we can think of some part of a firm's productivity draw in the Jovanovic (1982) model as embodied in the firm's employees and portable by them to a new firm.

Our findings have potentially important implications even beyond firm dynamics and entrepreneurial policy. For example, using our quarter-workforce spinoff definition, Muendler and Rauch (2009) identify parent firms that spawn both employee spinoff plants and expansion or diversification plants, and show that spinoff plants locate even closer to their parents than the parents' own new plants, controlling for sector, the share of initial employees from the parent, and initial plant size. This supports the argument of Klepper (2009), based on case studies of the U.S. automobile industry in Detroit and the U.S. semiconductor industry in Silicon Valley, that employee spinoffs can play a key role in the initiation of industry clusters. We hope that our quantification of the employee spinoff phenomenon encourages further research into all its impacts.

## Appendix

### A. Employer-employee Data

*Screening of employee data.* Employees in RAIS are identified by the individual-specific PIS number (Programa de Integração Social). A given plant may report the same PIS multiple times within a single year so that the employee can withdraw from the employer-funded severance pay account (FGTS) through spurious layoffs and rehires. In addition, some PIS values (especially very small or symmetric numbers) are recorded by an unrealistically large number of different plants. To handle these issues, we devise a systematic way to label PIS values that we think should not be trusted for tracking employee's employment histories: if an employee appears at more than twelve jobs in any given year, or if there is more than one apparent gender change (i.e. there are two or more years in the data when the employee is listed as being of both genders), we mark the employee as having an invalid PIS. None of the 14,272 employees caught by this rule is deleted from the data. Instead, we only disregard their work history for purposes of identifying the parent of a new firm and for defining spinoffs.

To avoid double-counting employees at new firms, we keep only one observation for each employer-employee-year combination, choosing the job with the earliest hiring date. If the employee has two jobs at the firm starting in the same month, we keep the highest paying one (randomly dropping observations in case of ties). For new ventures of existing firms, we apply this rule at the plant-year level, thus allowing the employee to appear once per plant during the plant's first year,<sup>22</sup> again choosing the job with the earliest hiring date and highest wage.

To compute the December performance measures (employment and wage bill) as reported in Tables 3 and 4, and as employed on the left-hand side in Table 7, we choose a modified version of the data cleaning described above. Instead of allowing only one observation per worker per year at the new firm or plant, we allow only one observation per worker on December 31 at the given firm or plant (in the job with the top December wage). This way we make sure that we do not lose from our December count any employees who worked in a different occupation at the firm earlier in the year.

*Earnings.* We use the reported December wage as our earnings measure, which is recorded in multiples of the monthly minimum wage that prevails at the time. The reported December wage in RAIS excludes the 'thirteenth salary,' which is a special December payment made in some sectors. Multiplying our reported December wage figures by twelve provides a good estimate of an annual wage. We calculate the wage value in Brazilian Real (BRL) and deflate all wages to August 1994, when Brazil adopted a new monetary regime with single-digit annual inflation rates (starting with a BRL value at par with the U.S. dollar).

The RAIS manual for respondents states explicitly the forms of payment that are considered valid components of the monthly wage rate. These include: salaries; extraordinary additions, supplements and bonuses; tips and gratuities; commissions and fees; contracted premia; overtime earnings for contracted extra hours; hazard earnings; executive earnings; cost reimbursement components if they exceed fifty percent of the base salary and are for travel or transfers necessary for the execution of the job; payments for periods of vacation, holidays and parental leave; vacation gratuities if they exceed twenty days of salary; piece wages; and in-kind remunerations such as room and board. As a rule, components are considered part of salary if they are taxable income or are subject to Brazilian social security contributions.

Payments that are not considered wage components include: severance payments for layoffs; indemnity payments for permanent maternal leave and any other indemnity payments; so-called 'family payments' under Brazilian labor law; vacation gratuities if they do not exceed twenty days of salary; additional social security earnings due to an employee's illness; moving expenses; travel cost reimbursements if they do not exceed fifty percent of the base salary;

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<sup>22</sup> In plant-level analysis, we apply this rule at the plant-year level for both new plants of new firms and new plants of existing firms.

scholarships for interns; meals, equipment and clothing for execution of the job; participation in the employer's profits; and so-called pro-labore payments for services by owners who do not have a dependent employment relationship.

*Occupations.* Occupations are categorized using the so-called CBO classification codes in RAIS. For our implementation, it is not necessary to reclassify CBO codes to conform with the ISCO-88 categories. Our main use of the occupational coding is to identify directors/managers. The Portuguese title 'diretor geral', for instance, is similar to the occupation of a CEO, 'diretor de finanças' similar to CFO.

## B. Firm Identifiers

Consistent application of firm identifiers is crucial for our identification of new plants and firms. Plant-level information in RAIS is based on the CNPJ identification number, where CNPJ ('cadastracional de pessoa jurídica') stands for Brazil's national register of legal juristic persons. The first eight digits of CNPJ numbers (CNPJ radical) define the firm and the subsequent six digits the plant/branch within the firm. The CNPJ number is assigned or extinguished, and pertaining register information updated, under legally precisely defined conditions.

The CNPJ number is administered by the Brazilian tax authority Receita Federal, the Brazilian equivalent to the U.S. IRS. In the CNPJ register, Receita Federal maintains information related to the firm's legal form and related matters, which is separately also recorded in RAIS. The following nine types of transactions either trigger the creation or extinction of CNPJ numbers, or updating of the register while maintaining CNPJ numbers. Once extinguished, a CNPJ number cannot be reassigned to any other plant in the future.

1. *Opening a business, becoming a juristic person.* Obtain CNPJ. It is required of any juristic person ('pessoa jurídica') in Brazil, a legal entity in Brazilian common and commercial law, to register a CNPJ number with the Receita Federal upon opening a business.<sup>23</sup>
2. *Change in business name ('nome empresarial'), or business sector ('porte da empresa'), or legal form ('natureza jurídica').* Maintain CNPJ, update register information. Changes from individual entrepreneurs to associations or partnerships of entrepreneurs and owners, or the reverse, do not result in reported changes in legal form.
3. *Change in ownership ('quadro de sócios') at associations and partnerships, or change in management ('administradores'), or change in equity holding at associations and partnerships ('inclusão e alteração de capital social').* Maintain CNPJ, update register information. Note that changes to incorporated firms – juristic persons with independent legal existence such as a limited liability company ('sociedade por quotas de responsabilidade limitada') – are treated differently, see 8 below.
4. *Other changes to the register, including mothballing ('interrupção temporária de atividades') and resumption of operations ('reinício das atividades interrompidas temporariamente'), a change in tax status ('opção ou exclusão do simples', 'qualificação tributária'), a change of responsible physical person (human being) for the CNPJ juristic person ('pessoa física responsável perante o CNPJ'), and several other administrative cases.* Maintain CNPJ, update register information.
5. *Bankruptcy and liquidation.* Maintain CNPJ, update register information. It pertains to the Receita Federal to administer the CNPJ of the extinguished juristic person. Liquidation may be by court order or extrajudicial settlement. The opening and closing of a bankruptcy case must be reported.
6. *Opening new plants/branches.* New plants or branches are registered with the individual CNPJ numbers, where the first eight digits (CNPJ radical) define the firm and the subsequent six digits the plant/branch within the firm.

<sup>23</sup> There is also a set of legal entities that are not formally juristic persons but are put on equal legal footing with juristic persons by Receita Federal, including real estate condominiums, mutual funds, employer consortia, and foreign consulates.

7. *Partial divestiture/corporate spinout ('cisão parcial')*. Maintain CNPJ, update register information. The newly independent firm (divestiture or spinout) receives an own CNPJ. In practice, a partial divestiture might coincide with the acquisition of an individual plant by another firm.
8. *Merger of firm with other firm ('fusão'), acquisition of firm by other firm ('incorporação') or complete divestiture/corporate spinout into newly independent firms ('cisão total')*. Extinguish CNPJ of firm that undergoes change. In the case of mergers and complete divestitures, the newly independent firm(s) obtain CNPJ(s) of their own. In the case of a plant acquisition, if the divested plant is not incorporated as a firm, the acquiring firm's CNPJ radical is retained and six new digits for the new plant are added. Note that the above applies to the acquisition of the firm as a whole, not select plants within the firm (for those cases see 7).
9. *Inactivity since day of foundation ('empresa que não iniciou atividades (inativa desde a abertura)')*. Extinguish CNPJ.

Important for employee spinoffs, a change in ownership at associations or partnerships does not result in a change in CNPJ, as explained under item 3. Divestitures by Definition C include both management-initiated offspring that become standalone firms (corporate spinouts or complete splitups ('cisão total')) and management-initiated offspring from parent firms' M&A activity (such as a merger ('fusão'), an acquisition ('incorporação'), and a partial splitup ('cisão parcial')). These are covered under items 7 and 8.

### **C. Natureza Juridica (Legal Form)**

By our Definitions A and B, employee spinoffs are employee-initiated offspring firms whose key employees stem from one or multiple legally separate parent firms. We choose our empirical implementation such that it is unlikely that parent firms or acquiring companies hold a capital stake in the employee spinoff (the employee spinoff may or may not face contractual obligations with the parent firm). For this purpose, we use the natureza juridica (legal form) variable in RAIS to discern three important types of legal form: associations or partnerships without independent legal existence, private incorporated firms, and types of incorporated firms to be excluded from analysis. Associations or partnerships can only be owned by physical persons, not by other companies. There is minor reporting error in legal form: around .1 percent of new firms have more than one (non-missing) legal form in their first year. We assign the mode of its legal form during the year to every firm.

Table C.1 shows the frequency of natureza juridica among new firms. More than 97 percent of new firms are concentrated in just four legal forms: limited liability companies with 56 percent, sole-proprietor companies with 32 percent, non-profit organizations (5 percent) and for-profit associations (4 percent). Only the limited liability company is an incorporated legal type that can be owned by another company, whereas the remaining three legal forms among the top four are associations or partnerships without independent legal existence. As mentioned, associations or partnerships can only be owned by physical persons. The latter three legal forms are thus also not subject to CNPJ changes, see item 3 in the preceding Appendix. We consider the latter three legal forms highly likely employee spinoffs if they satisfy the criteria of Definitions A or B. We return to the use of natureza juridica in our description of spinoff and divestiture definitions below.

Table C.1: Treatment of Legal Form

Natureza Juridica (legal form)	Presumed type			Total		RAIS codes
	Non- incrp	In- corp.	Excluded			
Public administration			x	6,718	.4%	1015-1996
State-owned company <sup>a</sup>			x	16,909	1.1%	2011-2038
Corporation		x		4,110	.3%	2046, 2054
Limited liability company		x		867,656	56.2%	2062
Partnership	x			3,008	.2%	2070-2100, 2127
For-profit association	x			47,193	3.1%	2119
Sole-proprietor company <sup>b</sup>	x			493,130	32.0%	2135, 2992
Cooperative			x	3,553	.2%	2143
Consortium			x	318	.02%	2151
Business group			x	436	.03%	2160
Branch of foreign company			x	153	.01%	2178
Non-profit organization	x			77,616	5.0%	3018-3999
Professional w/out employees <sup>c</sup>	x			379	.02%	4030
Professional w/ employees <sup>c</sup>	x			4,880	.3%	4049
Entrepreneurial proprietor	x			1,518	.1%	4073
Other professionalc	x			2,408	.2%	4014- 4995 <sup>d</sup>
Unknown		x		13,662	.2%	
Total				1,543,647	100.0%	

<sup>a</sup> State-owned limited liability company and close corporation, and Corporation with some state control.

<sup>b</sup> Includes other private businesses.

<sup>c</sup> Includes self employment.

<sup>d</sup> Excluding above codes.

Source: RAIS 1995-2001, new firms.

Note: Incorporated legal forms underly Definition C. Excluded legal forms underly Definition D.

#### D. Implementation of Spinoff and Divestiture Definitions

We apply two distinct sets of spinoff criteria (Definitions A and B), each administered at the firm level (first eight digits of the CNPJ tax number).<sup>24</sup> To identify a potential parent firm, we use the job histories of the new firm's founding employees, where the founding employees are the individuals employed at the firm during its first year in RAIS.<sup>25</sup> In particular, we look at each of the founding employee's previous substantial job, which we identify in the data as the last preceding employment spell (by hiring month) with a duration of at least three months.<sup>26</sup> We search for the previous job as far back as the RAIS data allows us. Our data start in 1986, which gives us nine years of potential labor market experience before 1995, the year in which we first consider firm entries.

*Director/manager spinoff.* The *director/manager* definition (A) isolates the top employee at each new firm first by job description (where director trumps manager, which trumps other

<sup>24</sup> In robustness checks where we administer the spinoff definitions A and B at the plant-level, we apply the two criteria to new firm-plants using the full CNPJ code as identifier.

<sup>25</sup> Firm age comparisons with other data sources show that RAIS reports date of firm creation plausibly precisely. In plant-level robustness analysis, we identify the parent plant.

<sup>26</sup> If the employee started two or more jobs in a month, we select the highest paying job, randomly dropping ties. We also require that the previous employment spell is at a different firm than the new firm at which the worker is currently employed.

descriptions), and secondarily by wage. The previous firm at which this top employee worked for at least three months is identified as the new firm's parent. If this parent is within the same disaggregated industry (same 4-digit CNAE sector of which there are 654) as the new firm, and the top employee is a manager or director, we label the new firm a spinoff. For this purpose, we do not compare mode industries of the parent and new firm (since the parent firm may operate plants in several industries); instead we use the industries associated with the transferring top employee at her old and new job. If either of the two industries is missing, the spinoff definition is not satisfied. If there are two or more director/manager employees tied for top employee, the firm is labeled a spinoff if any one (or all) of these employee's parent firms is in the same industry as the new firm. So multi-parent spinoffs are possible, but they are rare in practice (multi-parent spinoffs represent 0.7 percent of all director/manager spinoffs). This definition is only applied to new firms with management-level employees, of which there are 78,838 (or about 5 percent of the entire new-firm sample).

*Quarter-workforce spinoff.* The quarter-workforce definition (B) considers the previous place of substantive employment (lasting at least three months) of all the new firm's employees, regardless of job description or pay. The parent firm is the firm that supplied the largest number of employees to the new firm. The new firm is labeled a spinoff as long as 25 percent or more of the new firm's employees come from the parent firm. This definition would trivially label as spinoffs all firms with four or fewer initial employees, therefore we only apply it to the 340,856 new firms (out of 1.5 million) with five or more initial employees. Multi-parent spinoffs are again possible (they constitute 4.7 percent of the quarter-workforce spinoffs).

For both definitions (A and B), if there are two or more parent firms (multi-parent spinoff), we keep the parent within the same industry for purposes of testing the mass employee shift criterion (Definition C). Any remaining ties are broken at random to select a unique parent.

*Legal form of new firm.* We further use legal form data (the mode calculated for each new firm) to discern clear employee spinoffs, a gray area, and clear non-spinoffs. As described above (Appendix C), incorporated firms can be owned by other companies and can thus be subject to CNPJ changes as ownership changes (Appendix B). We treat new firms that are incorporated as gray-area firms because management-initiated divestitures could be a motive of their creation (natureza juridica 2046, 2054 or 2062, or unknown). In contrast, personal businesses such as associations and partnerships cannot be owned by other companies under Brazilian commercial law, and are thus not subject to CNPJ changes. We therefore consider associations and partnerships as highly likely employee spinoffs if they satisfy the spinoff definitions (natureza juridica 2070-2135, 2992, 3018-3999, 4014-4995). We exclude from the analysis legal forms that designate employers as public administration (natureza juridica 1015-1996), state-owned companies or corporations with some state control (2011-2038) or as special companies such as cooperatives, consortia, business groups and branches of foreign companies (2143-2178). Table C.1 documents that the bulk of new firms' legal forms are included: 56.5 percent of new firms fall into the gray area and 40.8 percent of new firms are highly likely spinoffs.

We apply the following refinement to our two spinoff definitions. A firm is a spinoff if a spinoff definition is satisfied (Definition A or B) and the legal form of the new firm is clearly spinoff. A firm is also a spinoff if the spinoff definition is satisfied, the legal form of the new firm is gray area, and strictly less than 70 percent of the parent plant's workforce shift to the new firm. We now turn to the latter mass-employee shift criterion that distinguishes spinoffs from divestitures.

*Divestitures, including corporate spinouts.* If 70 percent or more of a parent plant's workforce switch to a new CNPJ from one year to the next, we call the new plant a divestiture plant. We impose no minimum size on a parent firm for this computation. This definition is based on an

<sup>27</sup> In plant-level robustness analysis, the parent is also identified at the plant level, so there is no further selection necessary.

<sup>28</sup> We count parent plant employees as follows. We disregard employment spells of less than three months, and we keep only one appearance of any given employee per year per plant.

employee count at the parent, contrary to our spinoff definitions which are based on employee counts at the new firm. In particular, we identify the parent at the firm level and single out the parent-firm's plant with the highest fraction of employees that shift to a new firm.<sup>27</sup> The denominator in the share of shifting workers is the count of substantive parent employees over the year prior to the new firm's entry.<sup>28</sup> If the new firm has no trackable employees, or if the parent firm did not appear in RAIS during the previous year, we cannot calculate the share of parent plant employees that shifted, and we assume that the value is below 70 percent.

The 70-percent cutoff is motivated by the reverse of the labor economists' definition of a mass layoff (e.g. Jacobson et al. 1993), by which 30 percent or more of the existing workforce experience a separation. We label all divestiture firms that originate from 70 percent of a parent plant's workforce with an according indicator in the data. So, we call a firm a divestiture if the legal form of the new firm is gray area and at least 70 percent of the parent plant's workforce switch to the new firm. The share of parent plant employees that shift to the new firm is also used as an added control in exit probability regressions. For those regressions, we also need to construct the share of shifting workers at new ventures of existing firms. For new ventures, the parent firm is simply the 8-digit root part of the existing firm's CNPJ number. Similar to divestitures, we select the parent plant with the highest share of its employees lost to the new venture to calculate the denominator for the share of shifting workers.

*Unrelated startup firms.* Firms with included legal form that do not fall into the spinoff or divestiture categories are in the outside comparison group.

*New ventures of existing firms.* During our sample period 1995-2001, 580,557 new plants are started at 152,694 existing firms. We divide these into expansion plants (same 4-digit CNAE industry as parent firm), diversification plants (different 4-digit CNAE industry), and plants for which we cannot perform the sector comparison (because either the new plant or the parent firm has no known sector). The parent firm's industry is the firm's mode CNAE sector during the immediately preceding year in the data. An expansion or diversification venture of an existing firm is the sum of its expansion or diversification plants. Analogously to new firms, a new venture passes the director/manager filter if any of its plants has a director or manager, and a new venture passes the five or more employees filter if the sum of its plants has five or more employees.

*Mode sector assignment.* For regression purposes, we assign to each firm (or plant) its mode sector value for that year, computed over the raw data and over all employees (not just December-31 employees). Many firms with no employees in December of a given year go on to have a workforce in December of future years. Of the new firms from 1995 that survive through 2001, for instance, more than seven percent had zero employment on December 31 of 1995. We would lose many observations in performance regressions controlling for initial year sector if we only based the sector on December-31 employees. For new ventures of existing firms, we compute the mode sector as follows: we take the mode sectors of its plants, weigh them by the number of employees of each plant, and compute the mode. New firms or ventures with no known sector are not excluded from regressions, instead they are included under a common "unknown sector" category.

*Exit.* We adopt the following exit definition for the regressions in Tables 8 through 10: a plant is considered active (has not yet exited) in a year  $t$  if it has any employment at any time during year  $t$  or during any of the following years  $t + \tau$ . A new firm or venture survives as long as any of its initial plants is still active. We define the exit indicator variable  $\text{exit}(t + \tau)$  to be 0 if the new firm or venture has not yet exited at year  $t + \tau$ , and to be 1 if it exited in  $t + \tau$  or in a previous year. The exit indicator is only defined for firms and ventures for which it is possible to test survival. For instance, since our data end in 2001,  $\text{exit}(t + 5)$  is only defined for firms and ventures that enter in 1995 or 1996.<sup>29</sup>

<sup>29</sup> Note also that this means that we underestimate survival for firms and ventures entering later in the sample because it is possible for a firm or venture to be absent from the data in one year and to re-appear in following years.

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