

# Employee Spinoffs and Other Entrants: Stylized Facts from Brazil\*

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## Abstract

We gauge the prevalence and performance of firms founded as employee spinoffs, relative to other new firms with and without parents, and relative to diversification ventures of existing firms entering new industries. Using a comprehensive linked employer-employee database from Brazil for the universe of formal firms during 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, survival rates for employee spinoffs are higher 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 and riskiness as embodied in the firm's employees and portable.

**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 importance of employee spinoffs. Comprehensive linked employer-employee data for Brazil allow us to count spinoffs using precise and replicable criteria and to compare basic indicators of their performance to those of other entrants.

We use Brazilian linked employer-employee data because the rich information they contain, combined with the sheer size of the data, allows us to implement two distinct definitions of employee spinoffs, to distinguish employee spinoffs from employer-initiated divestitures, and to investigate relatively rare phenomena such as the absorption of employee spinoffs by other firms.<sup>1</sup> Our data assign unique permanent tax codes to firms and their plants, ensuring that we can distinguish new firms from new plants within existing firms. The data identify firms' industries and employees' occupations.<sup>2</sup> Together with demographic characteristics and earnings, this rich information allows us to define spinoffs based on the move of a new firm's top-paid manager from an existing firm in the same industry as well as to apply a more common definition based on large shifts of employees from existing to new firms. Information on firms' legal forms, and plants and their industries within the firm, help us separate actual and potential divestitures from employee spinoffs even in the absence of capital ownership information.

Counting new firms for Brazil during the period 1995-2001, we find that, depending on spinoff definition, employee spinoffs account for about one-sixth of new firms with salaried management and about 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. Following the classic work of Dunne, Roberts and Samuelson (1988), we examine firm size at entry and exit rates, relative to new firms that are not spinoffs and relative to existing firms entering new industries.<sup>3</sup> Regardless of spinoff definition, we find that 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. Across the four types of entrants studied (unrelated new firms, spinoffs, divestitures, and diversification ventures), size at entry is largest for diversification ventures and exit rates are lowest for divestitures.

One way to interpret our findings regarding performance is to consider the four entrant types as embodying differing levels of initial capital endowments (human, organizational, and other forms) and differing levels of insurance against idiosyncratic risk or uncertainty about product success.

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<sup>1</sup>The Global Entrepreneurship Monitor consistently ranks Brazil, a large and diversified economy and a leading emerging market, among the highly entrepreneurial economies in the world measured by the prevalence of nascent and new firms in the economy (Reynolds et al. 2000, Minniti, Bygrave and Autio 2005).

<sup>2</sup>Occupation variables are not necessarily available in linked employer-employee data for other countries. To take U.S. data as an example, occupational information is currently neither available in the Longitudinal Business Database (LBD) nor in the Longitudinal Employer-Household Dynamics (LEHD) data base. For the LEHD, U.S. unemployment insurance records, on which the employer-employee link is based state by state, do not typically offer educational or occupational information. Educational information on the workforce is imputed by census tract, but to our knowledge occupational information has not been imputed to date.

<sup>3</sup>Dunne, Roberts and Samuelson used U.S. data and did not distinguish spinoffs from other new firms.

Divestitures have arguably the least product uncertainty; and we find that they have the lowest exit rates. Diversification ventures of existing firms have the greatest access to the capital of the parent; and we find that they have the greatest size at entry. Employee spinoffs arguably inherit, through embodiment in workers, the lower product uncertainty and various forms of capital from the parent; and we find that employee spinoffs are intermediate in exit rates between divestitures and unrelated new firms and intermediate in entry size between diversification ventures (and divestitures) and unrelated new firms.

Our work complements recent studies of employee spinoffs in specific high-tech industries. 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. Our sampling approach is closest to that of Eriksson and Kuhn (2006) who study new firms across all sectors of the economy. Eriksson and Kuhn 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. Three major differences between our approach and theirs are that we include new firms with more than ten employees, we attempt to distinguish between employee spinoffs and divestitures among new firms with an employment link back to a parent, and we include existing firms entering new industries in our analysis.

The next section of our paper provides an overview of the literatures on employee spinoffs and divestitures. Section 3 describes the data source. Section 4 introduces our classification of entrants into employee spinoffs, divestitures, diversification ventures, and unrelated new firms, and section 5 compares the frequencies of these entrant types. Section 6 documents the performance of employee spinoffs relative to other entrants, and 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.

The literature on high-tech spinoffs compares their performance to new plants of parents with the idea that new plants of existing firms execute employee 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 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 (2009) argues and presents evidence that spinoff entrepreneurs from large firms are positively selected relative to spinoff entrepreneurs 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. A branch of the divestiture literature examines performance. Cusatis, Miles and Woolridge (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. 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>4</sup> De Negri et al.

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<sup>4</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

(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 et al. (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 define a *new firm* in 1995-2001 when its tax ID (first eight digits) appears for the first time. In addition, RAIS offers detailed industry information (at the four-digit *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, signalling 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 or managers) for specific spinoff definitions. During our sample period, sectors are reported under the *CNAE* four-digit classification (*Classificação Nacional de Atividade Econômica*) for 564 industries in the RAIS universe, spanning all sectors of the economy. The level of detail is roughly comparable to the *NAICS 2007* five-digit level. RAIS reports an employee's earnings both as the monthly average wage during a year and as the December wage for jobs at year end. These earnings are measured in multiples of the current minimum wage, which we transform into Brazilian Real deflated to the August 1994 price level. Appendix A has further details on the earnings measures.

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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.

## 4 Definitions of Entrant Types

We take two complementary approaches to identifying employee spinoff firms in the RAIS data. In the first approach, we locate the human capital essential to founding the new firm in its director or manager. Here, the fact that our data identify employees' occupations and earnings as well as firms' industries is crucial.

**Manager spinoff.** *A director/manager spinoff is a new firm whose top paid director, or top paid manager if there is no director, 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 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>5</sup> For example, an accountant for a manufacturing firm may start an accounting firm that caters to manufacturing clients. His new firm will not have the same 4-digit *CNAE* as his former employer and will therefore be missed by the 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 manager spinoffs: on average, the director or manager “brings along” from the parent 23 percent of the non-management employees of the new firm.<sup>6</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>7</sup>

**Workforce spinoff.** *A workforce 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 workforce definition over the 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 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 could be directly compared across countries. The obvious

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<sup>5</sup>Vertical spinoffs are extensively documented for Taiwan in Chapter 7 of Shieh (1992).

<sup>6</sup>That is, on average 23 percent of the non-management employees of manager spinoffs, as counted in Table 2 below, are from the same parent firm as the top paid director or manager.

<sup>7</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.

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 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>8</sup> Here, the coding of firms by *natureza juridica* (legal form) in the RAIS data set and the separate identification of plants within firms are of critical help. 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 Public corporation under private control, Non-public 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 Public corporation under private control, Non-public 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>9</sup>

**Divestiture.** *A divestiture is a new firm with natureza juridica coded as Public corporation under private control, Non-public corporation, Limited liability company, or as unknown that absorbs 70 percent or more of the employees of a plant of an existing firm.*

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 and mutually exclusive classification of *natureza juridica* into non-incorporated legal forms, incorporated legal forms and inadmissible legal forms, see Table C.1 in Appendix C.

Table D.1 in Appendix D summarizes the exhaustive and mutually exclusive classification of new firms resulting from these definitions. Appendix D also describes the classification procedure in more detail.

Our last entrant type is existing firms entering new industries.

**Diversification venture.** *A diversification venture is a group of one or more new plants within an existing firm in a different CNAE 4-digit industry than the existing firm.*

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<sup>8</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>9</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 et al. (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.

Table 1: SAMPLES OF ENTRANTS FOR ANALYSIS

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

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

*Notes:* A new firm is a firm in 1995-2001 whose tax ID did not exist in RAIS 1986-1994 (see Appendix B for tax ID assignment). A diversification venture is a group of one or more new plants within an existing firm in a different CNAE 4-digit industry than the existing firm. The director/manager is the top paid director, or top paid manager if there is no director.

The systematic assignment of tax IDs to plants within firms and the provision of industry information by plant in the RAIS data allow us to track these entrants precisely. We follow Dunne, Roberts and Samuelson (1988) and do not consider new plants of an existing firm in the same industry as entrants.

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

Having defined types of entrants, we can assess their relative frequency in the Brazilian formal sector. The universe from which we sample consists of all new firms and diversification ventures with included legal form. Note that the pool of new firms from which manager spinoffs can be drawn is restricted to those with at least one director or manager, and the pool of new firms from which workforce 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 1 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. Coverage of diversification ventures is more than twice that of new firms in both samples, and the larger sample approaches complete coverage of employment for diversification ventures.<sup>10</sup>

<sup>10</sup>In Tables 1 through 4, employment figures are the ones recorded in December of the new firm's or venture's first year of appearance in RAIS. Averaging employment over the entire calendar year is cumbersome in RAIS. Table 1 does not include new firms of excluded legal form (28,087 firms with 1,041 thousand employees), diversification ventures of excluded legal form (1,751 ventures with 190 thousand employees) and undetermined sector ventures (20,036 ventures with 111 thousand employees). An undetermined sector venture collects an existing firm's new plants whose industry cannot be compared to the original firm's industry because of missing information for new plant or original firm.



Table 2: ENTRANTS BY SAMPLE AND TYPE

Type of new firm or venture	Count	Employment (thousands)
<b>Director/Manager Sample</b>		
New firms, <i>of which:</i>	76,497	1,542
Employee spinoffs	16.9%	23.8%
Divestitures	4.3%	22.2%
Unrelated new firms	78.9%	54.1%
Diversification ventures	6,582	744
<b>Five or More Employees Sample</b>		
New firms, <i>of which:</i>	331,987	4,409
Employee spinoffs	29.0%	31.7%
Divestitures	5.3%	14.8%
Unrelated new firms	65.6%	53.5%
Diversification ventures	29,348	1,315

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

*Notes:* The director/manager is the top paid director, or top paid manager if there is no director, and defines an employee spinoff if her previous employment was in the same CNAE 4-digit industry. In the sample with five or more employees, an employee spinoff is defined if at least 25 percent of employees previously worked for the same firm. A divestiture is a new firm with incorporated or unknown legal form that absorbs 70 percent or more of the employees of a plant of an existing firm. A diversification venture is a group of one or more new plants within an existing firm in a different CNAE 4-digit industry than the existing firm. For definitions of new firms and diversification ventures also see Table D.1 (Appendix D).

Table 2 shows that manager spinoffs and 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 manager spinoff definition. Under both definitions spinoffs account for larger shares of employees 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.

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 41,724 firms in this subset, of which 10,680 are manager spinoffs, 16,867 are workforce spinoffs, and 6,312 are both. Thus 59.1 percent of manager spinoffs are also workforce spinoffs but only 37.4 percent of workforce spinoffs are also manager spinoffs.

Table 3 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 at the beginning, middle, and end of the period we cover. In any given year, the contributions to employment of the new firms and diversification ventures that enter in that year are in the neighborhood of four percent. At the end of the period, the contribution to employment of all the new firms and diversification ventures that entered and survived from 1995 to 2001 is 25.6 percent. This is despite the fact that these entrants exclude the public sector and foreign subsidiaries.

Table 3: SHARES OF FORMAL SECTOR EMPLOYMENT BY ENTRANT, 1995-2001

	1995	1998		2001	
	current	current	cumulative <sup>a</sup>	current	cumulative <sup>a</sup>
RAIS universe	23,222	24,606		27,426	
<i>of which:</i>					
New firms	2.8%	3.5%	13.0%	3.4%	22.2%
Diversification ventures	0.9%	0.8%	2.5%	0.7%	3.4%
New firms (5+ employees)	2.0%	2.6%	8.9%	2.5%	14.9%
Employee spinoffs	0.6%	0.9%	2.9%	0.8%	5.0%
Divestitures	0.3%	0.4%	1.1%	0.4%	2.0%
Unrelated	1.1%	1.3%	4.9%	1.4%	8.0%
Div. ventures (5+ employees)	0.9%	0.8%	2.3%	0.7%	3.3%

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

*Source:* RAIS 1995-2001 formal firms universe, including elsewhere removed new firms with inadmissible legal form. *Notes:* In the new-firm sample with five or more employees, an employee spinoff is defined if at least 25 percent of employees previously worked for the same firm. A divestiture is a new firm with incorporated or unknown legal form that absorbs 70 percent or more of the employees of a plant of an existing firm. A diversification venture is a group of one or more new plants within an existing firm in a different CNAE 4-digit industry than the existing firm. For definitions of new firms and diversification ventures also see Table D.1 (Appendix D).

The bottom part of Table 3 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 by types of new firms, including employee spinoffs. The contribution to 2001 employment of all the employee spinoffs that, from 1995 to 2001, entered with five or more employees and survived is 5.0 percent. This is 27.5 percent of the contribution of all entrants (new firms plus diversification ventures) with five or more employees to Brazilian formal sector employment.<sup>11</sup>

## 6 Employee Spinoff Performance

Dunne, Roberts and Samuelson (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 the number of employees and compute the average initial wage as an additional indicator of performance. Table 4 shows unconditional means for the initial numbers of employees and average initial wages across the groups of entrants listed in Table 2. Table 4 also shows cumulative exit rates after five years for the subsets of these groups consisting of entrants born in 1995 or 1996, following Dunne, Roberts and Samuelson (1988) who examine cumulative exit

<sup>11</sup>As we document in our working paper (Hirakawa, Muendler and Rauch 2010), the sectoral distribution of new firms in Brazil is broadly consistent with worldwide survey evidence on entrepreneurship. 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 mix of employee spinoffs, divestitures and unrelated new firms is roughly similar across sectors.

Table 4: SUMMARY STATISTICS

Type of New Firm or Venture	Initial employment	Average initial wage (BRL-94)	Exit after 5 years
<b>Director/Manager Sample</b>			
New firms	21.25 (0.63)	372.00 (2.10)	52.9% (0.4%)
Employee spinoffs	29.39 (1.07)	344.26 (4.30)	44.9% (1.0%)
Divestitures	107.69 (8.96)	401.38 (8.59)	39.4% (2.1%)
Unrelated new firms	14.64 (0.58)	376.45 (2.47)	55.1% (0.5%)
Diversification ventures	117.15 (6.72)	491.28 (7.45)	46.7% (1.2%)
<b>Five or More Employees Sample</b>			
New firms	13.86 (0.16)	221.09 (0.42)	45.9% (0.2%)
Employee spinoffs	15.03 (0.29)	254.57 (0.96)	38.8% (0.3%)
Divestitures	37.79 (2.27)	250.68 (2.11)	38.1% (0.8%)
Unrelated new firms	11.35 (0.09)	203.65 (0.45)	49.5% (0.2%)
Diversification ventures	45.76 (1.54)	257.08 (1.94)	28.5% (0.5%)

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

*Notes:* The director/manager is the top paid director, or top paid manager if there is no director, and defines an employee spinoff if her previous employment was in the same CNAE 4-digit industry. In the sample with five or more employees, an employee spinoff is defined if at least 25 percent of employees previously worked for the same firm. A divestiture is a new firm with incorporated or unknown legal form that absorbs 70 percent or more of the employees of a plant of an existing firm. A diversification venture is a group of one or more new plants within an existing firm in a different CNAE 4-digit industry than the existing firm. For definitions of new firms and diversification ventures also see Table D.1 (Appendix D). Wages are measured in December of the initial year and deflated to the August 1994 price level. Average initial wages are averages of initial firm mean wages. Standard errors in parentheses.

rates of entrants at five year intervals. We see that, for both the director/manager and five or more employees samples of entrants, unrelated new firms have the smallest initial size and highest exit rate. Diversification ventures or divestitures show the best performance for every indicator across both samples, and employee spinoffs are always intermediate except for having the lowest average initial wage in the director/manager sample.

In Table 5 we further investigate the relative performance of entrant groups by initial size and exit rate, the performance measures used by Dunne, Roberts and Samuelson (1988), and control for industry and cohort composition. Columns 1 and 2 cover entrants that have at least one director or manager and columns 3 and 4 cover entrants with at least five employees. Size is measured by the log of the number of employees so in columns 1 and 3 we drop entrants with zero employees on December 31 of their birth years. The dependent variable in columns 2 and 4 is an indicator that takes the value of one for entrants born five years earlier that have exited and zero

Table 5: SIZE AT ENTRY AND CUMULATIVE EXIT FIVE YEARS AFTER ENTRY

OLS exponentials of coefficients in columns 1 and 3	Director/manager		Five or more employees	
	log Empl. at $t$ (1)	Exit by $t+5$ (2)	log Empl. at $t$ (3)	Exit by $t+5$ (4)
Employee spinoff	1.85 (.022)**	-.096 (.012)**	1.12 (.004)**	-.071 (.004)**
Divestiture	2.66 (.075)**	-.153 (.022)**	1.41 (.011)**	-.121 (.008)**
Diversification venture	3.11 (.066)**	-.033 (.014)*	1.67 (.014)**	-.083 (.007)**
Obs.	78,911	16,564	346,813	87,476
$R^2$	.29	.08	.13	.10
Mean Dep. variable	1.75	.52	2.07	.44
CNAE industry panels	550	504	560	538
Cohort panels	7	2	7	2

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

Notes: The director/manager is the top paid director, or top paid manager if there is no director, and defines an employee spinoff if her previous employment was in the same CNAE 4-digit industry. In the sample with five or more employees, an employee spinoff is defined if at least 25 percent of employees previously worked for the same firm. A divestiture is a new firm with incorporated or unknown legal form that absorbs 70 percent or more of the employees of a plant of an existing firm. A diversification venture is a group of one or more new plants within an existing firm in a different CNAE 4-digit industry than the existing firm. For definitions of new firms and diversification ventures also see Table D.1 (Appendix D). Omitted category: unrelated new firms. Coefficients in columns 1 and 3 reported as exponential functions of coefficients from OLS regression so they reflect the ratio of sizes relative to unrelated new firms; standard errors in columns 1 and 3 computed with the Delta method. All regressions condition on CNAE industry and cohort fixed effects. Robust standard errors in parentheses: \* significance at five, \*\* at one percent level.

otherwise.<sup>12</sup> The key explanatory variables in these linear regressions 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>13</sup> The omitted baseline entrant type is unrelated new firms. The exponential functions of the coefficients on the key indicator variables in columns 1 and 3 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. Similarly, the coefficients on the key indicator variables in columns 2 and 4 show, within an industry and within a cohort, the percentage point differences between the exit rates of unrelated new firms and those of employee spinoffs, divestitures, and diversification ventures of existing firms.

<sup>12</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>13</sup>The industry indicators used as controls in Tables 5 through 7 are based on the mode sector for new firms during their first year in the data.

Table 5 shows that diversification ventures of existing firms are about three times as large as unrelated new firms among entrants with directors or managers and one and two-thirds as large among entrants with at least five employees. The first result accords especially well with the findings of Dunne, Roberts and Samuelson (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>14</sup> For both samples of entrants, divestitures are closer in size to diversification ventures than to unrelated firms, which 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.

We also see from Table 5 that a diversification venture is 3 percentage points less likely to have exited than an unrelated new firm after five years for the director/manager sample and 8 percentage points less likely for the sample of entrants with at least five employees. The second result is consistent with the findings of Dunne, Roberts and Samuelson (1988, p. 513) for U.S. manufacturing entrants, who compute exit rates for diversification ventures from 6 to 14 percentage points lower than for new firms after five years, depending on cohort.<sup>15</sup> For both samples of entrants, divestitures have the lowest cumulative exit rate of any venture. Finally, manager and workforce employee spinoffs have cumulative exit rates after five years that are respectively 10 and 7 percentage points lower than those of unrelated firms.<sup>16</sup>

Our aim in this section is to establish regularities regarding the performance of employee spinoffs relative to other entrants, rather than test hypotheses about relative performance. Nevertheless, there is a mechanical reason why manager and especially workforce spinoffs should show better performance, and we would like to control for this. Application of both spinoff definitions requires that we be able to track employees at a new firm to previous employment. Mechanically, then, employees at a manager and especially workforce 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 fifth columns of Table 6, therefore, we add a control variable for the share of new entrant employees who are *trackable*, i.e., employees who had a formal sector job before. As expected, a greater share of trackable employees is associated with reduced cumulative exit rates for both entrants with at least one director or manager and entrants with at least five employees. However, the impact on exit rates of spinoffs is only slightly reduced.

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<sup>14</sup>To make the comparison with Dunne, Roberts and Samuelson (1988) more accurate, we can drop the indicators for employee spinoff and divestiture from columns 1 and 3 of Table 5 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 and 3 are 2.66 and 1.58, respectively.

<sup>15</sup>As before, we can make the comparison with Dunne, Roberts and Samuelson (1988) more accurate by dropping the indicators for employee spinoff and divestiture from columns 2 and 4 of Table 5 so that the coefficients on diversification ventures give exit relative to all new firms, not just unrelated new firms. The new coefficients for columns 2 and 4 are then are then -.012 and -.055, respectively, the latter just missing the low end of the Dunne, Roberts and Samuelson (1988) range.

<sup>16</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.

Table 6: CUMULATIVE EXIT FIVE YEARS AFTER ENTRY: ADDITIONAL SPECIFICATIONS

OLS	Director/manager				Five or more employees			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Employee spinoff	-.086 (.012)**	-.060 (.012)**	-.064 (.012)**	-.062 (.012)**	-.066 (.004)**	-.069 (.004)**	-.069 (.004)**	-.063 (.004)**
Divestiture	-.137 (.022)**	-.096 (.022)**	-.103 (.022)**	-.096 (.022)**	-.119 (.008)**	-.116 (.008)**	-.116 (.008)**	-.110 (.008)**
Diversific. venture	-.025 (.014)	.031 (.014)*	.026 (.014)	.027 (.014)	-.081 (.007)**	-.070 (.007)**	-.069 (.007)**	-.063 (.007)**
Share: Trackable	-.077 (.014)**	-.051 (.014)**	-.025 (.021)	-.022 (.021)	-.014 (.008)	-.002 (.008)	-.005 (.008)	-.0003 (.009)
log Initial empl.		-.050 (.003)**	-.048 (.003)**	-.053 (.003)**		-.024 (.002)**	-.024 (.002)**	-.025 (.002)**
Prev. log Wage			-.020 (.006)**				-.007 (.004)	
Indiv. comp.				-.088 (.017)**				-.117 (.010)**
Plant comp.				.012 (.010)				.019 (.005)**
Residual				-.023 (.013)				-.002 (.008)
Obs.	16,564	16,564	15,224	15,224	87,476	87,476	85,894	85,894
$R^2$	.083	.098	.098	.099	.098	.099	.100	.101
Mean dep. var.	.52	.52	.51	.51	.44	.44	.44	.44
CNAE ind. panels	504	504	502	502	538	538	538	538
Cohort panels	2	2	2	2	2	2	2	2

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

Notes: The director/manager is the top paid director, or top paid manager if there is no director, and defines an employee spinoff if her previous employment was in the same CNAE 4-digit industry. In the sample with five or more employees, an employee spinoff is defined if at least 25 percent of employees previously worked for the same firm. A divestiture is a new firm with incorporated or unknown legal form that absorbs 70 percent or more of the employees of a plant of an existing firm. A diversification venture is a group of one or more new plants within an existing firm in a different CNAE 4-digit industry than the existing firm. For definitions of new firms and diversification ventures also see Table D.1 (Appendix D). Omitted category: unrelated new firms. The previous log wage is the average monthly log wage at the preceding employer; the three log wage components—individual characteristics, the plant-fixed component, and a residual—are from a linear regression decomposition of the previous log wage into employee observables, a plant fixed effect and a residual using repeated annual cross sections of the linked employer-employee data. All regressions condition on CNAE industry and cohort fixed effects. Robust standard errors in parentheses: \* significance at five, \*\* at one percent level.

Do larger initial sizes explain the lower cumulative exit rates of employee spinoffs (and divestitures and diversification ventures) relative to unrelated new firms? To answer this question we add the log of the number of initial employees as a control variable in columns 2 and 6 of Table 6.<sup>17</sup> This is indeed associated with lower exit rates for both entrants with at least one director or manager and entrants with at least five employees. The impact on exit rates of diversification ventures with at least five employees is slightly reduced, but the impacts on exit rates of employee spinoffs and divestitures with at least five employees are virtually unchanged. There are greater changes for entrants 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. 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.

Given the findings for average initial wages in Table 4, it seems prudent to also control for human capital of startup employees when comparing cumulative exit rates of entrant types. An employee's wage at the preceding firm is a measure of the human capital that the employee brings to the current job. We trace each worker back to the last previous employer in the formal sector, and then average the previous log wage over all workers at an entrant (omitting from the mean the log wages of employees with no trackable previous employer for up to fifteen years). Indeed, the log average monthly wage that an employee earned in the previous job shows a negative association with the new firm's exit rates (statistically significant at the five-percent level for entrants with a director or manager), but the coefficient estimates for entrant types change little.

An employee's human capital includes his personal abilities as well as the employer-specific knowledge that he may transfer. Related to this distinction, we decompose every employee's log wage in a given year into three additive components: first a component associated with observable employee characteristics, second an employer fixed wage component, and third a residual. By construction, the employer fixed component includes a pure employer wage premium and the average of the unobserved employee qualities at the employer.<sup>18</sup> In columns 4 and 8 of Table 6, we replace the employees' average log wages at their previous employer with the three log-wage components. We find that the individual worker component matters most. Having employees with highly compensated observable characteristics in their previous formal jobs predicts significantly higher survival chances of entrants. In contrast, a high employer wage premium at the previous employer is associated with higher exit rates of the spinoff (statistically significant at the five-percent level in the larger sample of entrants with five or more employees). A reason is perhaps

<sup>17</sup>Initial employees in this table 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>We run separate annual Mincer regressions on the universe of our linked employer-employee data and decompose the log average monthly wage in a given year  $t$  into

$$\ln w_{it} = x_{it}\beta_t + \psi_{J(it)t} + \varepsilon_{it}$$

following Menezes-Filho, Muendler and Ramey (2008), where  $w_{it}$  is employee  $i$ 's annual wage,  $x_{it}$  is a vector of observable worker characteristics including gender, experience, education and occupation,  $\beta_t$  is a vector of estimated parameters,  $\psi_{J(it)t}$  is a plant effect ( $j = J(it)$  being the plant that employs  $i$ ), and  $\varepsilon_{it}$  is the residual. The plant effect combines a pure plant effect with the plant average of pure worker effects:  $\psi_{jt} = \phi_{jt} + \bar{\alpha}_{jt}$ , where  $\phi_{jt}$  is the pure plant effect and  $\bar{\alpha}_{jt}$  is the average of pure employee effects  $\alpha_i$  over employees at plant  $j$  at  $t$  (Abowd et al. 2001). Our decomposition thus includes an employee's co-worker effects with the employer effect.

that the presence of competing high-wage incumbents reduces an entrant's survival chance.<sup>19</sup> The residual component, which includes unobservable match effects at the previous employer, is not significantly related to entrant performance.

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, we added a variable for the share of employees of the plant of the parent firm from which the entrant absorbs the most employees (not shown).<sup>20</sup> This variable has no statistically significant association with cumulative exit rates, and the coefficients for employee spinoffs are essentially unaffected.

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 entrants with at least five employees at time of exit. In column 2 of Table 7 we restrict the regression sample to failures and survivors, dropping absorptions from the sample. The inferior performance of unrelated new firms becomes even starker, and diversification ventures show the largest difference between failure rates and general exit rates. In column 3 we restrict the regression sample to absorptions and survivors, dropping failures from the sample. The dependent variable now takes the value one for entrants born five years earlier that have been absorbed and zero otherwise. 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>

We can summarize by returning to the interpretive framework we set out in our introduction, considering the four entrant types as embodying differing levels of initial capital endowments (human, organizational, and other forms) and differing levels of insurance against idiosyncratic risk or uncertainty about product success. Divestitures draw upon the capital of their parent firms when starting up and generally do not face any of the product uncertainty of a diversification. We find that they have the lowest exit (or failure) rates. Diversification ventures have the most access to the capital of the parent firms and some of their lower risk, but face some uncertainty about product success. We find that they have the greatest size at entry. Employee spinoffs partially inherit the lower product uncertainty and various forms of capital from the parent, whereas unrelated new firms have the least amount of both capital and insurance. We find that spinoffs are intermediate in exit rates between divestitures and unrelated new firms and intermediate in size at entry between diversification ventures (and divestitures) and unrelated new firms. Inheritance from a parent firm

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<sup>19</sup>There are parents and third-party firms among the previous employers. In an attempt to investigate separately the previous employer component for spinoff parents, we added to the specification in column 8 the interactions between an indicator of a spinoff parent and the log-wage components. We found no statistically significant coefficients on the interactions (but their signs mirrored those of the main effects).

<sup>20</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 employees, where "most" could be as low as one.

<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.



Table 7: CUMULATIVE FAILURE AND ABSORPTION FIVE YEARS AFTER ENTRY: FIVE OR MORE EMPLOYEES SAMPLE

OLS	Any Exit (1)	Failure (2)	Absorption (3)
Employee spinoff	-.071 (.004)**	-.084 (.004)**	.024 (.002)**
Divestiture	-.121 (.008)**	-.138 (.008)**	.023 (.005)**
Diversification venture	-.083 (.007)**	-.121 (.007)**	.081 (.006)**
Obs.	87,476	84,784	51,686
$R^2$	.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 diversification ventures of existing firms with five or more employees.

*Notes:* Column 1 restates results from Table 5 (column 4), subsample in column 2 excludes absorptions, subsample in column 3 excludes failures (dependent variable now equals one for entrants born five years earlier that have been absorbed and zero otherwise). An absorption is defined if at least 70 percent of the exiting firm or venture's workforce shifts to another firm (firm exit is failure otherwise). An employee spinoff is defined if at least 25 percent of employees previously worked for the same firm. A divestiture is a new firm with incorporated or unknown legal form that absorbs 70 percent or more of the employees of a plant of an existing firm. A diversification venture is a group of one or more new plants within an existing firm in a different CNAE 4-digit industry than the existing firm. For definitions of new firms and diversification ventures also see Table D.1 (Appendix D). Omitted category: unrelated new firms. All regressions condition on CNAE industry and cohort fixed effects. Robust standard errors in parentheses: \* significance at five, \*\* at one percent level.

is valuable, according to the model of Jovanovic (1982), because the parent has been selected for high productivity, relative to the typical new firm, by virtue of having survived. A spinoff's inheritance from the parent, in the absence of managerial control by the parent, suggests that some part of the parent's productivity and riskiness is embodied in its employees and portable by them to a new firm.

The superior performance of employee spinoffs compared to unrelated new firms is robust to a variety of controls related to physical and human capital. The robustness of the performance premium is consistent with the idea that there is a significant amount of organizational or intangible capital that is transferrable. Recently, advances have been made in quantifying the contribution of organizational and intangible capital to aggregate economic growth (Corrado, Hulten and Sichel 2009, McGrattan and Prescott 2010) and to individual firm market valuation (Brynjolfsson, Hitt and Yang 2002). Our results suggest that it may also be possible to quantify the portability of organizational and intangible capital from established to new firms.

## 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 employees who shifted from a common parent. Our findings are largely consistent across the two employee spinoff 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 between 1995 and 2001, reaches five percent of all Brazil's formal-sector employment, private and public, by the end of the period.

Employee spinoffs are larger at entry than unrelated new firms but smaller than diversification ventures of existing firms. Similarly, employee spinoffs survive more frequently than unrelated new firms and with comparable frequency to diversification ventures. These results are consistent with the idea that employees embody some part of a parent firm's productivity and riskiness and that this capability is portable by the employees to a new firm. The literature on high-tech spinoffs has emphasized employee knowledge that is alienable intellectual property. We find that the bulk of employee spinoffs is in non-high tech sectors, and that on average top managers bring 23 percent of the spinoff workforce with them from parent firms. Both facts suggest that knowledge that is tacit or at least not easily contractible contributes in important ways to the success of most employee spinoffs.

# 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. We handle these issues in a systematic way: 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 all but one observations with equal monthly average wages). 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, again choosing the job with the earliest hiring date and highest pay.

To compute the December performance measures (employment and wage per worker) as reported in Tables 1 through 4, and as employed on the left-hand side in Table 5, we choose a modified version of the data cleaning described above. Instead of allowing only one observation per employee per year at the new firm or plant, we allow only one observation per employee 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.** An employee's earnings in RAIS are expressed in multiples of the current monthly minimum wage. RAIS reports the average monthly wage during a calendar for all observations, and the December wage for jobs held at year end. We use both wage measures, depending on context, and calculate the wage value in Brazilian Real (BRL), deflated to August 1994. In July 1994, 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 a respondent needs to consider as valid components of the monthly wage rate. As a rule, components are considered part of the salary if they are taxable income or are subject to Brazilian social security contributions. For additional details on included wage components and excluded payments, please see the Appendix to our working paper (Hirakawa, Muendler and Rauch 2010).

**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 and managers. The Portuguese title ‘diretor geral’, for instance, is similar to the occupation of a CEO, ‘diretor de finanças’ similar to a 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 (‘cadastro nacional de pessoa jurídica’) stands for Brazil’s national register of legal entities. The first eight digits of CNPJ numbers (CNPJ radical) define the firm and the subsequent six digits the plant within the firm. The CNPJ number is assigned or extinguished, and pertaining register information updated, under legally precisely defined conditions.

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 legal entity.* Obtain CNPJ. It is required of any legal entity under Brazilian common and commercial law (‘pessoa jurídica’) to register a CNPJ number with the federal tax authorities (Receita Federal) upon opening a business.
2. *Change in business name (‘nome empresarial’), or business sector (‘porte da empresa’), or legal form (‘natureza jurídica’).* Maintain CNPJ, update register information.
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—legal entities 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 (‘reincio 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 legal entity (‘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 legal entity. 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.
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(s) own CNPJ(s). 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 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)

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 one-tenth of a 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

Table C.1: TREATMENT OF LEGAL FORM

<i>Natureza Juridica</i> (legal form)	Presumed type			<i>Total</i>	RAIS codes	
	Non- incrp.	In- corp.	Ex- cluded			
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 professional <sup>c</sup>	x			2,408	.2%	4014-4995 <sup>d</sup>
Unknown		x		13,662	.9%	.
<i>Total</i>				1,543,647	100.0%	

<sup>a</sup>State-owned limited liability company and State-owned non-public corporation, and Public 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 (eight-digit tax IDs do not exist in 1986-1994).

*Note:* Incorporated legal forms underly the definition of a divestiture (a new firm with *natureza juridica* coded as Public corporation under private control, Non-public corporation, Limited liability company, or as unknown that absorbs 70 percent or more of the employees of a plant of an existing firm). Excluded legal forms are Branches of government, Firms with state ownership, Cooperatives, any type of Holding company, and Branches of foreign firms.

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 our manager or workforce definitions. We return to the use of *natureza juridica* in our description of spinoff and divestiture definitions below.

## D Implementation of Spinoff and Divestiture Definitions

We apply two distinct sets of spinoff criteria (our manager and workforce definitions), each administered at the firm level (first eight digits of the CNPJ tax number). 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>22</sup> In particular, for each of the founding employees we identify the previous *substantial job* as the last preceding employment spell (by hiring month) with a duration of at least three months.<sup>23</sup> We search for the previous job as far back as the RAIS data allow 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).

**Manager spinoff.** The *director/manager* criterion isolates the top employee at each new firm first by job description (where director trumps manager, which trumps other descriptions), and secondarily by average monthly 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* industry of which there are 564 in the RAIS universe) as the new firm, and the top employee is a director or manager, 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 manager employees tied for top employee, the firm is labelled 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 manager spinoffs). This definition is only applied to new firms with management-level employees, about 5 percent of the entire new-firm sample (see Table 1).

**Workforce spinoff.** The *workforce* definition 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 labelled a spinoff as long as 25 percent or more of the new firm's employees come from the parent firm, counting all employees who are associated with the new firm at any point during its first year. This definition would trivially label as spinoffs all firms with four

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<sup>22</sup>Firm age comparisons with other data sources show that RAIS reports date of firm creation plausibly precisely.

<sup>23</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 employee is currently employed.

or fewer initial employees, therefore we only apply it to the new firms with five or more initial employees. Multi-parent spinoffs are again possible (they constitute 4.7 percent of the workforce spinoffs).

For both spinoff definitions, 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 for divestitures. 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 help distinguish employee spinoffs from management-initiated divestitures. 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). For new firms that are incorporated, management-initiated divestitures could therefore 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 under the incorporated legal forms and 40.8 percent of new firms fall under the non-incorporated legal forms.

We apply the following refinement to our two spinoff definitions. A firm is a spinoff if a spinoff definition is satisfied (manager or workforce) and the legal form of the new firm is non-incorporated. A firm is also a spinoff if a spinoff definition is satisfied, the legal form of the new firm is incorporated, and strictly less than 70 percent of any parent plant's workforce shifts 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 firm a divestiture. We impose no minimum size on a parent firm for this computation. This definition is based on an 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. The denominator in the share of shifting employees is the count of substantive parent employees over the year prior to the new firm's entry.<sup>24</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, LaLonde and Sullivan 1993), by which 30 percent or more of the existing

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<sup>24</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.



Table D.1: 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>See Appendix D for definitions of manager spinoffs and workforce spinoffs, based on a director/manager criterion (top employee switches from same-industry parent to spinoff) and on a quarter-workforce criterion (25 percent or more of the new firm's employees from same parent firm).

<sup>b</sup>See Appendix D for the criterion of a shift (70 percent or more of a parent plant's workforce switch) and the definition of a divestiture.

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

*Note:* New firms are firms in 1995-2001 whose root tax ID (first eight digits) did not exist in RAIS 1986-1994. Legal form according to *natureza juridica* in RAIS.

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 incorporated 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 employees 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 employees.

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

Table D.1 summarizes the exhaustive and mutually exclusive classification of new firms resulting from these definitions.

**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 (computed as described in the next paragraph). The industry of a new plant is the industry associated with its top employee. A diversification venture of an existing firm is the sum of its 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, weight them by the number of employees of each plant, and compute the mode. New firms 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 Tables 4 through 6: 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  $exit(t + \tau)$  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. In particular, since our data end in 2001,  $exit(t + 5)$  is only defined for firms and ventures that enter in 1995 or 1996.

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