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## **Spinoffs and other entrants: Evidence from Portugal**

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## **Abstract**

This thesis studies the prevalence and survival of spinoff entrants in Portugal from 1987 to 2008. Information on worker flows is used to identify them at a population level, providing evidence on other operations such as mergers and acquisitions. We show that the number of spinoffs has been increasing at a higher rate than other entrants of comparable size. Studying the determinants of their exit suggests that the most important predictor is whether the spinoff was motivated by the failure of the parent firm. The effect of industry specific knowledge and previous experience of the founders from working together in the parent firm is seemingly negligible, with only weak evidence supporting the latter.

## **1. Introduction**

Entry plays a significant role in economic activity, with new firms being responsible for exploring business opportunities and providing an incentive for incumbent firms to innovate to stay in the market. This thesis focuses on one particular kind of entrant, one that is created by a group of employees moving from a previous existing firm. We study the prevalence and performance of spinoffs for Portugal from 1987 to 2008, while providing evidence that other firm restructuring activities such as mergers, acquisitions and changes in firm identifiers have increased in the same time span, both in magnitude and in relative terms. This suggests that the study of this kind of firm to firm relationship is a topic that deserves growing attention, and this characterization can contribute to that purpose.

We use a probit model to estimate the probability of exit, to ascertain whether spinoffs have different exit patterns than comparable entrants, and how do they vary with the type of spinoff, while trying to understand what may cause that gap: the transference of industry specific knowledge, experience and shared routines as a team, and the opportunity cost faced by workers when creating the new venture are all factors that must be taken into consideration.

We identify these operations using matched employer-employee data, where flows of groups of workers between firms are used to establish links between them, an approach that has been gaining popularity in the past decade, opening new possibilities and research applications.

In the next section, we provide a review of the relevant literature and the hypothesis we want to address. This can be divided in the literature regarding the identification of firm links and literature that specifically concerns the determinants and performance of spinoff

firms. Section 3 provides details on the worker flow methodology and describes the prevalence and characteristics of spinoffs, mergers and acquisitions, changes in legal identifier and other operations involving significant flows of workers in Portugal. In section 4 a model of firm exit is used to compare the performance of spinoffs to those of other entrants, and assess whether they can be explained by other observed differences. In Section 5 we provide a discussion of our results in light of other studies of spinoff firms, while Section 6 concludes.

## **2. Literature and Hypothesis**

### **2.1 –Review of the worker flow approach and applications**

One limitation posed by the use of administrative data in the study of firms is that we cannot directly distinguish situations such as mergers and acquisitions, where at least one the firms disappears, from “true” exits. A similar situation can happen when one firm closes and reopens under a new name, or there is a mistake in the identifier of a firm. Not accounting for these situations can then overstate “true” entry and exit rates, as well as measures of job turnover, since workers involved in any of these operations will appear to have left a firm and entered a new one, while this is a result of a restructuring event happening in the same firm. Another issue is that we cannot directly link firms starting as spinoffs to firm of origin, distinguishing them from other entrants, which limits the study of this particular kind of firm. To overcome these problems, a new approach has emerged in recent years, which involves the use of information of workers flows across companies, from which links between firms may be established. While the methodology will be explained in more detail in section 3, it can be summarized as using the following idea: if one firm acquires another, the former will, in administrative terms, exit. However,

where do its workers go? One likely answer, in which this approach is based, is that the majority of them will move to the acquiring firm. Conversely, if we can observe that the founders of a new firm worked together at a previous existing one, we can classify it as a spinoff from that parent. As long as we know where someone is employed in a given year and to where he moves in the following, we can use this to identify links at the firm level. This kind of reasoning will be used in the next sections to identify and characterize firm transitions in the data, and to study in more detail spinoff entrants. For the identification of links between firms, the work we will most closely follow is that of Benedetto et al. (2007). They apply their approach to US data and focus particularly on the study of outsourcing activities. The motivation to study this industry is that, when a firm outsources a particular activity to other, the latter may have incentives to hire employees who previously worked in the former, and who have accumulated experience there. Other studies can be found for Belgium, where Gerts et al. (2009) compare entry and exit measures with and without correcting the data with worker data, and provide evidence of the impact that ignoring this can have on computing establishment entry and exit statistics. Similar results are found for Germany (Hethey and Schmieder (2013)). For Austria, Fink et al. (2010) compare information obtained under this approach with other sources of business statistics, concluding that the results are reliable. While the previous studies contribute for validating the use of this approach, the ones closest to the purpose of this thesis use this information to study entry of spinoffs and the characteristics affecting its performance, which will be discussed below.

## **2.2 – The determinants and performance of spinoffs**

Spinoff firms are a particular kind of entrant. What distinguishes them from other firms that enter an industry is that they were a part of a previously existing firm. Whether this

can have beneficial effects on the performance of the entrant or, rather, constitute a liability, as well as the reasons that can explain possible differences to other entrants, is not certain. We provide below a synthesis of the main hypothesis present in the literature, with a particular focus on the ones we will try to test in our sample.

One key distinction that is common in the literature is that between a “pushed” and a “pulled” spinoff (Eriksson and Kuhn (2006), Hethey and Schmieder (2013)). We denote by pushed spinoff one in which the parent firm disappears, while for the pulled spinoff it remains in existence. A pushed spinoff is more likely to reflect a situation in which a part of the workers of a closing firm founded a new one due to a low opportunity cost, resulting from the fact that they would not be able to remain employed in the parent firm. In what concerns pulled spinoffs, they are more likely to reflect situations in which the workers left the firm, not because they were forced by its closing, but rather because they considered they would be better off by moving to a new entrant. To the extent that a pulled spinoff can result from self-selection from workers with higher ability, it should perform better than other start-ups (Cabral and Wang (2009)). Using a different reasoning, where firms have a limited amount of ideas they can develop internally, and employees may start spinoffs when their ideas are rejected by the firm, Cassiman and Ueda (2006), also argue that pulled spinoffs should perform better than comparable start-ups. Here, this results from the assumption that better firms produce better ideas, so ideas rejected by those firms should on average be better, which leads the performance of the spinoff to be positively correlated with that of the mother firm. This model also suggests that this will be particularly relevant for ideas outside the core area of the predecessor, ideas which he will be less likely to follow. Given that there are contradictory explanations on whether spinoffs follow ideas close to those of its parents, we do not establish a specific hypothesis

for this factor. Klepper (2007) reviews several stylized facts related to the performance of spinoffs, where the evidence points to a better performance of spinoffs from better performing firms. In particular, studies on the population of Brazilian (Muendler et al. (2012)), Danish (Eriksson and Kuhn (2007) and Dahl and Reichstein (2007)) and Swedish firms (Andersson and Klepper (2013)) suggest that, from the three groups, pulled spinoffs survive longer. With the exception of Dahl and Reicshtein (2007), pushed spinoffs also tend to perform better than other start-ups. Given both the theoretical arguments and the empirical evidence, we expect that pulled spinoffs have the lowest exit risks across all entrant types. Regarding pushed spinoffs, the predictions are not so clear. To the extent that spinoff performance is correlated with the performance of the mother firm, as hypothesized above, we expect pushed spinoffs to perform worse than the pulled spinoffs. However, we do not have a clear prediction on how they compare with other entrants. In fact, it is possible that factors such as the experience of its founders, both in an industry and as a group, prevail over the fact that they came from a dying firm.

Becky & Okhuysen (2009) provide a review of the theory on coordination between members of a group in an organization, and also point that one of the factors that enhances performance is the familiarity between group members, and point that it is usually considered that this familiarity tends to increase performance. Philips (2002), using data for Silicon Valley law firms, finds evidence that this knowledge can be transferable across firms, with an additional hypothesis being that it also depends on the rank of the workers in the parent firm. While this suggests that the increase in group experience should increase the performance of the spinoff, there is a possible objection: to the extent that a pulled spinoff may result from self-selection of the most able workers, a higher experience can result from the fact that they took longer in the decision create a new firm

and this lower propensity to spinoff may be negatively correlated with their skills, in which case group experience could have a negative effect on the success of spinoff entrants. Given this, we do not have a clear prediction for the effect of this on performance. In the particular case of pushed spinoffs this has an additional interpretation: a positive effect of experience on performance could mean that the benefits of mutual trust and coordination outweigh eventual bad routines that could have led the mother firm to failure.

### **3. Methodology**

#### **3.1 – The Database “*Quadros de Pessoal*”**

The data used in this work is from *Quadros de Pessoal*, consisting on three interconnected sets of files: for each year, we have information available for every worker, for the establishment where he works, and for the firm the establishment belongs. For this analysis, we only considered information at the worker and firm levels. This avoids that transitions of workers across establishments in the same firm are interpreted as firm to firm relationships. The period used in the analysis ranges from 1986 to 2009. There is no worker file for the years of 1990 and 2001, so we cannot identify transitions in those years and the ones immediately after. For those years, we are only using firm level information, which will still be useful in the analysis of firm performance.

#### **3.2 – Identification of links across companies**

The first issue that arises when using this kind of data to study mergers and spinoffs is that they are not directly identified. To overcome this problem, we closely follow the work flow approach first proposed by Benedetto et al. (2007). The basis for this approach is that labor is a significant share of a firm's production factors. If we follow transitions



of labor across firms, it may be possible to derive meaningful interpretations regarding links between those firms.

To simplify the analysis, we keep only one observation for each worker per year, corresponding to the company where he worked the most hours. For each worker and year, we identify the company where he worked in the previous year and the company where he worked in the following year. For each firm and year, we group all the workers who came from the same firm in the previous year and do the same for those who went to the same firm in the following year, excluding those who did not move across companies. From here, we create two separate panels, one for potential predecessors – firms of origin of a cluster of workers – and another for potential successors – firms that received a cluster of workers – acknowledging that these two categories may overlap, whenever there are workers entering and exiting the firm in the same year. Each observation in these panels is unique in terms of year, cluster in analysis and the identifier of the successor or predecessor, respectively. Merging these two panels means that each observation will now correspond to a potential link between two firm identifiers. The next step is to discuss how to classify those links.

### **3.3 – Interpreting the links between firm identifiers**

Once the links are found, it is important to establish criteria for their classification. This is done according to the relative size of the cluster in analysis, when compared with the number of workers in each of the firms involved. To avoid misinterpreting usual labor market flows as decisions with an impact at a firm level, a minimum absolute size of five workers for the cluster in transition is defined, following Benedetto et al. (2007). In

addition, we exclude transitions observed from 2008 to 2009<sup>1</sup>. This leaves us with 46639 observations. To interpret those links, we need further assumptions regarding the relative size of the cluster, when compared to the number of workers in each company. When a merger or acquisition happens between two firms, we would expect one of two situations: Either the identifiers of the two firms disappear and a new one is created, or one of them disappears and the other represents the joint firm, with most of the workers of both firms in it. Conversely, for a spinoff, we expect that a relatively small share of the workers who were at the predecessor move to the new firm in the subsequent year, where they represent a large share of the work force. Given this, we follow once again Benedetto et al. (2007) criteria and establish two workforce conditions, regarding the relative size of the cluster of workers to each firm:

**Predecessor workforce condition:** The cluster represents at least 80% of employment at the predecessor in the year before the transition;

**Successor workforce condition:** The cluster represents at least 80% of employment at the successor in the year after the transition.

Given this, there are four possible combinations, which are summarized in Table 1 along with their most plausible interpretations.

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<sup>1</sup> Although we are able to identify transitions for this period, the econometric model used in section 4 implies that we exclude the last year from the sample, so they were omitted for comparison purposes.

**Table 1 – Classification according to workforce conditions**

	At least 80% of the workforce comes from the predecessor	Less than 80% of the workforce comes from the predecessor
At least 80% of the workforce moves to the successor	Rename 3776 (8.10%)	Merger or Acquisition 4790 (10.27%)
Less than 80% of the workforce moves to the successor	Spinoff 4102 (8.80%)	Reason Unclear 33971 (72.84%)

Spinoffs are the category of major interest for this thesis. As depicted in the table, they are verified when most of the workforce of a firm in a given year represented a relatively small share of labor that the predecessor firm was employing in the year before. Regarding the other categories, a merger or acquisition happens when two firms, here represented by the majority of their workforce, join into a new one, so that each of them, individually, corresponds to less than 80% of the workforce at the new firm. Renames can happen when firms change their identifier due to ownership changes that do not involve acquisition by another firm or changes in the legal form of a firm, where the latter represents roughly 50% of the operations in this category. Firms can also shut down due to other legal issues and reopen under a new name, keeping the production structure relatively similar, or there may be a mistake in the firm identifier. Since the production structure remains similar, we may not want to consider this as an entrant. Finally, when the cluster in analysis has a significant magnitude of at least five workers, but they do not represent a large share of either company, it may be harder to derive a meaningful interpretation for the transition. A possible reason for firms to be labeled as “Reason Unclear” is the outsourcing of activities from one firm to another.

Additionally, these categories can be refined according to conditions at the firm level, which tell us whether the predecessor leaves after the transition and whether the successor is an entrant. This means that, for each cell in Table 1, there are four possible subdivisions. To acknowledge for the fact that a firm may leave a small set of workers to deal with administrative tasks before exiting and, similarly, an entrant may hire a small set of workers to for those reasons (Benedetto et al. (2007); Pivetz et al. (2001)), the following conditions are used to identify whether the predecessor exits and the successor is an entrant, respectively:

**Predecessor exiting condition:** number of workers after the transition corresponds to less than 10% of the workforce in the year before and is composed by less than five workers, or identifier is no longer in the database in that year;

**Successor entering condition:** number of workers before the transition corresponds to less than 10% of the workforce in the year of the transition and is composed by less than five workers, or the identifier was not in the database in that year.

Although the last two conditions are not used in the definition of the different categories, they can help us to refine the previous classification by separating, within each category, situations that may have different interpretations or reliability levels. As an extreme case, a change in identifier in which either the predecessor firm keeps in operation or the successor already existed is likely to result from incorrect criteria or mistakes in the data. For spinoffs, this allows us to distinguish situations in which the mother firm disappears, the pushed spinoffs mentioned before from those where it continues, the pulled spinoffs. Similarly, we would expect that at least one of the firms involved in a merger or acquisition disappears, so when this does not happen we cannot be that confident about

that classification. Although this can translate a partial acquisition, the fact that the threshold of 80% is chosen to translate the majority of a firm suggests that this should not be verified. Table 2 summarizes the results with the additional firm categories.

**Table 2 – Classification including firm conditions**

		Successor is an Entrant		Successor was in existence		Total
		80% comes from predecessor	Less than 80% from predecessor	80 % comes from predecessor	Less than 80% comes from predecessor	
Predecessor Exits	80% moves to successor	Rename 3501 7.51%	Merger or Acquisition 2570 5.51%	Rename 96 0.21%	Merger or Acquisition 1986 4.26%	8153 17.48%
	Less than 80% moves to successor	Pushed Spinoff 1993 4.27%	Reason Unclear 6153 13.19%	Pushed Spinoff 69 0.15%	Reason Unclear 4811 10.32%	13026 27.93%
Predecessor Lives on	80% moves to successor	Rename 159 0.34%	Merger or Acquisition 92 0.20%	Rename 20 0.04%	Merger or Acquisition 142 0.30%	413 0.89%
	Less than 80% moves to successor	Pulled Spinoff 1914 4.10%	Reason Unclear 5527 11.85%	Pulled Spinoff 126 0.27%	Reason Unclear 17480 37.48%	25047 53.70%
Total		7567 16.22%	14342 30.75%	311 0.67%	24419 52.36%	46639 100%

As seen, most of the observations lie where we would expect them to, with the categories that we described as being less likely representing only a small share of the total of transitions in analysis. We make an additional division, relatively to the classification presented above, regarding whether the companies involved in a merger or acquisition or spinoffs were in the same industry, measured by the highest division level of the industry classification code. For mergers and acquisitions, this allow us to distinguish between horizontal operations, involving firms in the same industry, from vertical mergers and

conglomerates. We find that approximately 60% of the mergers or acquisitions we identified are horizontal operations, and this share is constant across the period in analysis. For spinoffs, this will be used to test some of the ideas presented in the previous section.

### 3.4 – Overview of Mergers and Spinoffs in Portugal

It is important to have an idea of the evolution of these operations across the years. Table 3 shows that there has been a growth in the number of such operations across time. Since the total number of firms has also increased in the period in analysis, this alone could be explaining the growth pattern. Figure 1 shows that this does not seem to be the case, since the proportion to all new entrants with over five employees also increased over the same period. The fact that there is an increasing trend in both the spinoffs and mergers or acquisitions series suggests that these kind of restructuring activity has been gaining more relevance over time, even in relative terms.

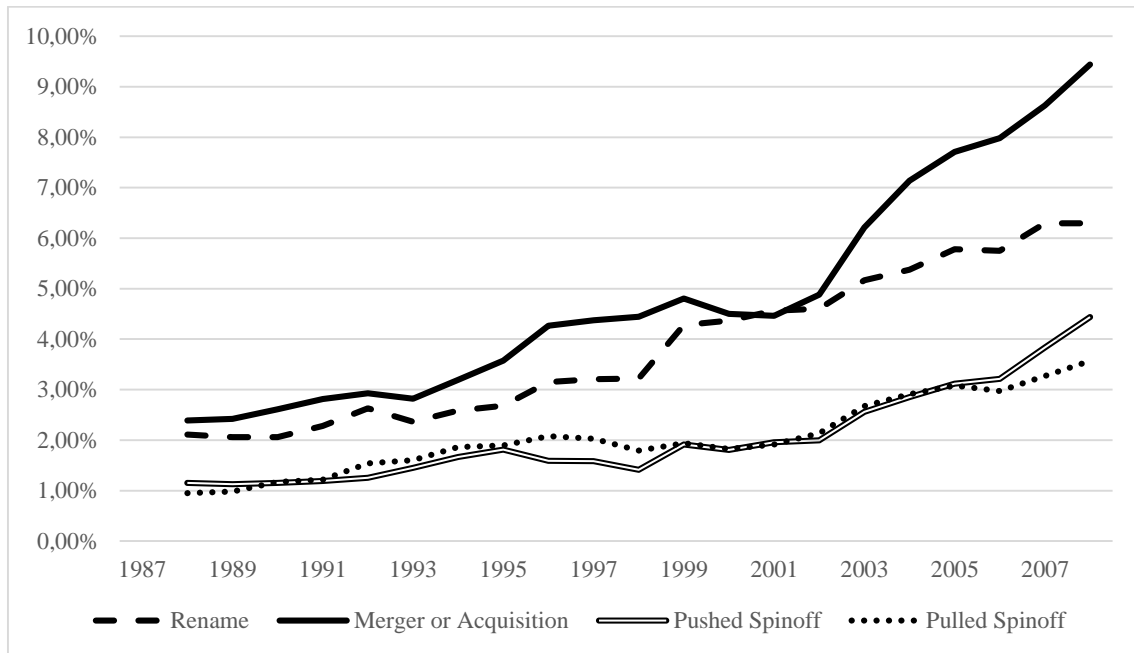
**Table 3 – Evolution of Cluster Transitions over time**

	1987-1989	1992-1994 <sup>2</sup>	1995-1997	1998-2000	2003-2005	2006-2008	Total
Mergers or Acquisitions	428	535	622	866	1061	1278	4790
Pulled Spinoffs	170	302	301	351	432	484	2040
Pushed Spinoffs	206	290	228	348	422	586	2062
Renames	377	428	456	784	800	931	3776
Reason Unclear	2850	4806	4223	5508	6365	10219	33971
Total	4031	6361	5830	7857	9080	13480	46639

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<sup>2</sup> Until 1993 the survey was collected in March. From 1994 on it was collected in October. Given this, this column corresponds to a period of 3 years and 7 months.

**Figure 1 – Transitions as share of total entry<sup>3</sup>**



Additionally, the size distribution of predecessor and successor firms is in Tables A.1 and A.2, showing that this approach can be used to study firms of different class sizes.

Another factor of interest regards the geographical patterns of these transitions. Table A.3, in Appendix, gives information on how many transitions in each category involve changes in region, both at the municipality and district levels. Additionally, to account for situations in which the municipalities are too close, so that the interpretations mentioned above are most likely irrelevant, we also report numbers where only transitions involving firms whose respective council centers are more than 40 km apart, measured in straight line, are accounted as changing council or district. Less than 10% of the transitions of either pulled and push spinoffs, mergers and acquisitions involve changes over this threshold. It is unlikely that those changes in location, particularly the ones

<sup>3</sup> The values are measured as 3 year moving averages of the respective categories, divided by total entry in a given year. Linear interpolations were used for the years in which we cannot identify transitions.

involving longer distances, translate situations in which the workers actually moved to the other region, since we are considering a minimum of five workers for our analysis. In fact, for mergers and acquisitions, they are more likely to represent situations in which firms use inorganic growth to expand to other geographical markets, instead of consolidating their presence on their own region. For pulled spinoffs, this can mean that part of the employees from firms that operate in different places may decide that they have more knowledge about their specific geographical market and are better off from separating from the mother firm to retain the benefits of that knowledge. It can also translate situations in which a firm decides to exit a market and their employees from that specific market decide to occupy the place left by the parent by creating their own venture. The numbers suggest that, while consolidation in the same market seems to me more relevant for determining the decision of firms to engage on such operations, these changes in location are a motivation that should not be disregarded.

#### **4. The Survival of Spinoffs**

The main question we want to address is whether having entered the market as a spinoff is determinant to firm performance, for firms similar in other observed characteristics. We include in our analysis firms with at least five employees in the year of entry, excluding those founded in 1990, 1991, 2001 and 2002, since for those years we are not able to tell spinoffs from other entrants. Our measure of performance is exit: we want to know what influences the probability that a firm exits in a given year, so we can know whether the type of entry is determinant for this, or just a matter of different sample compositions. To observe exit in a given year, we need to observe whether the firm is in the database in the subsequent year. This implies excluding the year of 2009, since we would not be able to tell whether a firm exited in the last year of observations. One last



control is to exclude every firm that exited as a merger or acquisition, rename or reason unclear since, for the reasons discussed in the previous sections, if the firm exited in one of those ways, exiting may translate reasons other than failure, which is what we want to capture in our model.

Table 4 presents the unconditional survival patterns of the firms in each group. The survival rate is defined as the share of firms that survived until a given age, here defined as an interval, from those which we would be able to observe until that age. The hazard rate is defined as the probability that a firm exits at a given interval, knowing it survived until that interval.

**Table 4 – Unconditional Survival and Hazard Rates**

<b>Age</b>	<b>Number of Potential Survivors</b>	<b>Survival rate</b>	<b>Hazard Rate</b>
<b>Pushed Spinoffs</b>			
1-3	1983	87.39%	0.20
4-6	1445	67.40%	0.17
7-9	1038	55.49%	0.17
10-12	869	46.03%	0.14
13-16	653	39.97%	0.16
17-21	271	32.47%	0.32
<b>Pulled Spinoffs</b>			
1-3	1889	92.91%	0.15
4-6	1448	77.35%	0.15
7-9	1058	65.22%	0.15
10-12	902	56.76%	0.14
13-16	631	48.49%	0.14
17-21	229	39.74%	0.11
<b>Other entrants</b>			
1-3	78199	89.33%	0.20
4-6	67725	70.54%	0.17
7-9	56266	58.44%	0.16
10-12	50968	49.85%	0.13
13-16	37865	43.93%	0.15
17-21	19269	36.29%	0.17

Consistently with our hypothesis and the patterns found for Denmark and Sweden, pulled spinoffs have the higher survival and lower hazard rates from all the entrant types.

However, here pushed spinoffs have the lowest survival rates, which in Sweden is verified for the “Other entrants” category. Additionally, the convergence in hazard rates verified in the other countries may be verified in our sample until the 13-16. In fact, the hazard rate for pulled spinoffs starts at a value of 0.15 and remains relatively constant, while for the other groups it starts at a higher value and decreases to a similar magnitude. While there is a sharp decline in the hazard rate of pulled spinoffs in the last period (and rise in that of pushed spinoffs), this can result from the smaller sample in analysis.

Our main question is on whether the differences between groups persist for firms similar in other observed characteristics, or can be attributed to the type of entry on itself. For this, we estimate a probit model where the dependent variable is a dummy equal to 1 in the year of exit. Table 5 summarizes our control variables, showing that some differ significantly across groups. In particular, pulled spinoffs have, on average, a larger size at entry and a more educated workforce.

**Table 5 - Average values of independent variables at entry**

	Pushed Spinoffs	Pulled Spinoffs	Other entrants
Same industry as parent	0.59	0.39	0 (by definition)
Median tenure in parent firm	6.36	7.35	0 (by definition)
Percentile 75 of tenure in parent firm	9.27	10.65	0 (by definition)
Average age of employees	37.04	37.61	33.59
Average education level (in years of schooling)	6.56	7.54	6.73
Employment	19.09	28.69	9.51
Number of Firms	1916	1692	76008

The effect of entry type is captured by dummy variables for whether the firm entered as a pulled or pushed spinoff, with the base category being all other entrants with five or more employees.

To test whether the performance of a spinoff depends on the industry specific knowledge acquired at the previous firm or, on the other hand, spinoffs can be justified by a perceived opportunity that deviates from the parent's core area of activity, we use a dummy variable for each type of spinoff, that is equal to 1 if the firm is in the same industry than the predecessor.

As a proxy for the experience that the workers have as a team and may transmit to the spinoff firm, we use the median tenure at the mother firm, for the workers that moved to the spinoff entrant. The choice of this variable assures that at least half of the team has been working in the same firm for a given amount of time. In our setting, this tests whether this coordination is limited to the scope of a firm, or transferrable as the team moves to create its own firm. To consider the hypothesis that the rank of the workers involved in a spinoff may also be relevant (Phillips (2002)) we also use the 75th in model (2).

As a control for the human capital embodied in the firm, we use the mean education level of the workers, measured in years of schooling, in the year of entry. This accounts for possible differences in human capital across the two groups that could lead to differences in the exit rates. We also control for the mean age of the workers in a firm, which can work as a proxy for experience, allowing to distinguish the possible effect of experience in the predecessor from general working experience. We allow this variable to have a non-linear effect, by including a quadratic term.

As a measure of entry size, we use the logarithm of employment in the firm in the year of entry.

All the variables discussed above are specified as being time invariant, i.e., we are measuring the characteristics of the firm in the year of entry. To see how the probability of exit evolves over time, we include the age of the firm and squared term, and interactions with both types of spinoff. Output from the estimation is presented below

**Table 6 – The determinants of firm exit**

Dependent Variable: Exit	(1)		(2)	
Pushed Spinoff	0.059	(1.39)	0.054	(1.24)
Pulled Spinoff	-0.232	(-5.32)***	-0.237	(-5.26)***
Same Industry×Pushed Spinoff	0.035	(0.95)	0.035	(0.96)
Same Industry×Pulled Spinoff	0.227	(0.60)	0.023	(0.61)
Median Tenure				
Median Tenure×Pushed Spinoff	-0.007	(-2.15)**		
Median Tenure×Pulled Spinoff	-0.001	(0.33)		
Percentile 75×Pushed Spinoff			-0.004	(-1.75)*
Percentile 75×Pulled Spinoff			-0.001	(0.49)
Age	-0.483	(-29.49)***	-0.048	(-29.47)***
Age <sup>2</sup>	1.438	(14.41)***	1.438	(-14.41)***
Age × Pushed Spinoff	-0.167	(-1.53)	-0.167	(-1.53)
Age <sup>2</sup> × Pushed Spinoff	1.210	(1.69)*	1.223	(1.71)*
Age×Pulled Spinoff	0.430	(3.54)***	0.430	(3.53)***
Age <sup>2</sup> × Pulled Spinoff	-1.788	(-2.19)**	-1.783	(-2.18)**
Log-Likelihood	-140120.74		-141750.79	
Number of Observations	544279		544279	
Number of Firms	79616		79616	

Due to the non-linear nature on the model, we cannot directly interpret the coefficients as marginal effects. However, we can infer on the sign of the effect of each variable.

The results above are consistent with the hypothesis that pulled spinoffs perform better than other firms. Within pulled spinoffs, however, there is apparently no effect on whether the spinoff diverts or not from the parent's industry: the existence of industry specific knowledge does not seem a key explanation for their survival pattern.

Regarding the pushed spinoffs, they do not differ significantly from the comparison group. Within pushed spinoffs, there is no evidence that those in the same industry as the parent have different exit risks than the others. While the other country level studies only control for whether the spinoff is in the same industry, not distinguishing between pushed and pulled operations for this purpose, their results show that being in the same industry has a positive effect on performance (although it dissipates over the years for Denmark (Eriksson and Kuhn (2006))). Our results do not support this hypothesis.

Regarding the median tenure of the cluster of workers in the parent firm, we only find an effect for the pushed spinoffs, for which this variable has a negative and significant sign. The results on this regard are qualitatively similar for several choices of the percentile in analysis, besides the ones reported in (1) and (2). The results are robust to several other specifications non-reported here, including interactions of entrant type the size of the firm, with measuring firm size according to different classes and using dummies for the age of each entrant instead of a quadratic firm. Given this, we find no evidence that the team experience effects mentioned earlier are relevant for determining performance, at least when we control for other characteristics of the workforce like education and human capital.

In our specification, we allow for a quadratic form on the effect of age of performance. In general, age decreases the probability of exit, and there is evidence that its effect is

non-linear. The effects on the interaction terms with each type of spinoff should be interpreted with care. The fact that the coefficients for the pushed spinoffs are barely significant, and smaller in magnitude than those for pulled spinoffs, means that there is no significant additional effect of age on pushed spinoffs, when compared to other entrants, which is consistent with the unconditional hazards described in table 5, where age reduces exit risks for both pushed spinoffs and the base group. Conversely, for pulled spinoffs the coefficients are significant and have a comparable magnitude but a different sign than the effect of age without interactions. This suggests that the overall effect for this type of entrant will be close to zero, which is consistent with the relatively constant hazard rates observed in the descriptive statistics.

## **5. Discussion**

It is important to stress that our classification of spinoff differs from the other country level studies. While they consider entrants with between 2 to 10 employees, where only 50% needs to come from the same firm, our sample includes larger firms, since we are considering firms with at least 5 workers and pose no upper limit on firm size. The main difference is that, in our sample, the decision to spinoff is more likely to result from interactions between the parent firm and its employees, since it will have a larger effect on the former, while they explicitly want to capture decisions made by workers. In fact, some operations that we classify as spinoffs are considered divestitures in their analysis. The fact that the main results are in line their studies, however, suggests that the difference perform of spinoffs will not be sensible to the definition. One advantage of our sample choice, is that it is more appropriate for the study of the hypothesis regarding the transference of coordination and routines across organizations.

The results obtained are in line with theories that suggest a better performance of spinoffs of better performing firms, both compared to other spinoffs and other startups. However, they do not allow us to strongly infer on whether that stems from industry specific knowledge or on pursuing ideas outside the core area of activity of the predecessor. In fact, if the forces that drive each of the hypothesis are present in our sample, none of them outweighs the other, so that there is no distinctive effect on whether a spinoff is or not in the same industry as its parent.

The persistence of initial differences in exit risks seems to be smaller, if any, in our case than for Denmark (Eriksson and Kuhn (2006) and Sweden (Andersson and Klepper (2009)). In fact, the authors find that, contrary to the unconditional estimates where there seems to be a convergence in exit risks, pulled spinoffs actually increase the gap to other entrants, while the opposite happens in our case.

Finally, one important hypothesis that we introduce in this context of country level studies is the possibility that, even after controlling for other determinants of experience and worker characteristics, the experience that the workers have together at the older firm may be relevant for performance. However, we only find weak evidence that, in the case of pushed spinoffs, this may have an effect on survival, suggesting that these kind of intangibles is not determinant for the performance of the spinoff.

## **Conclusions**

The use of the worker flow methodology opens new possibilities in the study of firms using administrative data. It allow us to trace operations that would be, otherwise, hard to quantify, namely regarding the reasons that lead firms to enter or exit a market, or the ways in which they are growing. We employ this to the universe of Portuguese firms for

the period of 1987 to 2008 and provide evidence that they are used by a small, but non-negligible, fraction of companies in our country. This assessment discusses the diverse events that the approach allow us to capture and shows that, within each of them, there is considerable heterogeneity regarding the scope of the operations. Firms may join forces for horizontal consolidation, acquire others in the same vertical chain or exploit the benefits or conglomerates. Similarly, when workers leave and found spinoffs those can be or not in the same industry. Finally, geographical information shows that roughly 10% of operations involve changes to a distant city which, added to the above motivations, shows that there are different drivers for these operations, each being a source of further study on itself.

We study in more detail the survival of spinoff entrants, comparing it with other entrants. Our results are in line with the literature and, particularly other country level studies for Brazilian, Danish and Swedish firms, in that the reason for the spinoff to happen is determinant on its survival. In particular, pulled spinoffs, for which the parent survives, have lower exit risks than other start-ups. However, we do not find any difference on the performance of pushed spinoffs to other entrants. This evidence is suggested in terms of unconditional hazard rates, and persists after controlling for other factors through the use of regression analysis. We do not find industry specific factors to affect the performance of spinoff firms, and find only weak evidence that the benefits from previous having worked together may influence survival, for workers with comparable human capital. All in all, this suggests that the forces that drive the better performance of the pulled spinoffs are other kind of intangibles that we cannot properly account for.



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## Appendix

**Table A.1 – Size of Predecessor firms, by category**

	Rename	Merger or Acquisition	Pushed Spinoff	Reason Unclear	Pulled Spinoff
5-9 Employees	2244	2583	588	2184	140
10-49 Employees	1329	1843	1205	12007	975
50-249 Employees	171	304	209	8372	576
250 or more Employees	32	60	60	11408	349

**Table A.2 – Size of Successor firms, by category**

	Rename	Merger or Acquisition	Pushed Spinoff	Reason Unclear	Pulled Spinoff
5-9 Employees	2218	1082	1134	2233	1011
10-49 Employees	1356	2456	802	12452	802
50-249 Employees	172	867	103	8467	187
250 or more Employees	30	385	23	10819	40

**Table A.3 – Operations involving changes in City or District**

		Merger or Acquisition	Pushed Spinoff	Pulled Spinoff
Change in City	All	926	356	517
	More than 40km	395	99	205
Change in District	All	428	123	253
	More than 40km	363	89	189