Which Individuals Create Jobs? Managerial Talent and Occupational Skills*

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Abstract

We consider founders of limited liability firms who previously held jobs in the formal sector of Brazil. Managers are five percent of former job holders but their startups account for 27 percent of new firm employment. Relatively little of their overrepresentation as founders or the larger size of their startups is explained by their previous wages or other standard human capital variables. Among non-managerial former occupations we examined those clearly connected to demand (sales) and to supply (technology, purchasing). Only purchasing was comparable to managerial occupations in entrepreneurship and new firm size. Further examination suggests that a key to greater entrepreneurship and larger initial firm size is that workers' former jobs entailed building relationships with other businesses, either as their customers (for demand-side occupations) or as their suppliers (for supply-side occupations).

Keywords: entrepreneurship; management; occupational skills; job creation; serial entrepreneurs

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1 Introduction

We expect individuals who rise to the level of management to have an aptitude for managing and high generic ability or human capital. Both of these traits should make these individuals more likely to become entrepreneurs and to found larger firms, conditional on entrepreneurship.

Using a sample of Brazilian workers who left formal sector jobs to start limited liability firms or find new formal sector employment during the period 2002-2014, we find that former managers account for 19 percent of entrepreneurs and 27 percent of new firm hiring at startup, despite being only five percent of the sample. Former managers have much greater generic human capital than workers with other former occupations, as indicated most importantly by their earnings in their last jobs but also by their educational attainments. Yet our regression analysis shows that generic human capital variables account for a relatively small part of the higher propensity of former managers to become entrepreneurs or the larger sizes of their firms at startup. After also controlling for former employer fixed effects, cause of separation from former employer, and many other variables, we ascribe the remainders to the managerial aptitude or "talent" that led former managers to employ their human capital in management. In our preferred specifications, directors, managers, and supervisors are, respectively, roughly five times, four times, and two times more likely than non-managerial workers to become founding owners of limited liability firms, and these firms employ 40, 18, and 14 percent more workers at startup. We judge our results to be closer to the model of Lucas (1978), where managerial talent is distinct from generic ability, than to the model of Murphy, Shleifer and Vishny (1991), where generic ability is more highly rewarded in entrepreneurship than in wage employment but there is no distinct talent for management.

After demonstrating that managerial talent has impacts on entrepreneurship and new firm size beyond what can be explained by generic human capital, we investigate whether other occupational skills have comparable impacts. The literature on the determinants of firm success has emphasized both the importance of firm productivity and of developing a customer base (Jovanovic 1982, Foster, Haltiwanger and Syverson 2008, 2016, Gourio and Rudanko 2014). We therefore examine former occupations connected to technology and sales, respectively. The work of Amiti and Konings (2007) and Halpern, Koren and Szeidl (2015) showing that access to imported inputs increases productivity suggests that we also examine former occupations connected to purchasing. We find that only purchasing has impacts on both entrepreneurship and new firm size comparable to those of managerial occupations.

A characteristic of purchasing that distinguishes it from other occupations associated with productivity is that it is necessarily a business-to-business (B2B) activity. Choi et al. (2021, p. 20) write, "a greater share of the organizational capital is likely embedded in founding teams of B2B businesses due to the

importance of managing relationships." A possible explanation of the benefits of a purchasing occupation for entrepreneurship and new firm size is that the activity entails building relationships with suppliers that are useful in the new business. We explored the impact of B2B connections further by examining sales-related occupations in industries whose customers were primarily businesses rather than consumers, using an industry classification created by Delgado and Mills (2020). Comparing workers in the occupations of wholesaling and retailing who were employed in industries that sold primarily to businesses versus primarily to consumers, we found that the former were substantially more likely to found new firms and that these firms were substantially larger.

The importance of management for firm performance has been well established for existing firms (Bloom and Van Reenen 2007, Bloom et al. 2013). Fairlie and Robb (2007) are much closer to our work in that they consider business *founders*. They find that "previous work experience in a managerial capacity" is associated with larger (log) sales and a higher probability of having employees in the founding owner's firm, controlling for many human capital attributes (but not the founder's previous earnings). Their data do not allow them to examine the determinants of ownership and do not cover the legal form typically used by large firms.

As we do, Levine and Rubinstein (2017) track former employees to self-employment in limited liability (incorporated) firms. However, they do not know whether these self-employed individuals are founding owners as opposed to joining existing businesses. They are more concerned with which individuals increase their earnings through self-employment than with which individuals create jobs. Choi et al. (2021) track former employees to "founding teams" that contain a mixture of owners of sole proprietorships and individuals with positive earnings in the first year of operation of incorporated firms and sole proprietorships. Their main interest is in the impact of premature death of a founding team member on subsequent firm performance.

The next section of our paper describes our data, our identification of firm founders, and how we link them to previous employment. Section 3 examines the tendency of former managers to be overrepresented in entrepreneurship and to found larger firms. Section 4 does the same for non-managerial occupations. Section 5 explores the robustness of our results. Section 6 concludes.

2 Data

Our study combines two Brazilian administrative data bases. Linked employer-employee data allow us to associate workers to firms. Records of "proprietors" (owners) from the federal firm registry allow us to associate owners to firms. Integrating the two data bases allows us to associate owners to workers.

The linked employer-employee data base RAIS (*Relação Anual de Informações Sociais* of the Brazilian labor ministry *MTE*) is organized by job spell within reporting year. Each job spell is identified by employee ID, firm-plant ID, and dates of job accession and separation. The first eight digits of the 14-digit firm-plant ID identify the firm to which the plant belongs. Worker age, education, and gender are recorded, as are earnings, industry, and occupation. By Brazilian law, every private or public-sector employer must report this information every year.[1] De Negri et al. (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 employment, except for unusually high returns to high school and college education and to experience among males.

The ownership records are from the federal firm registry maintained by the Brazilian tax authority Secretaria da Receita Federal (RF), which provides a snapshot of ownership at a moment in time. For each firm with recorded owners the RF data base provides the owners' dates of accession to the firm. Ownership shares and dates of possible divestment are not provided in the data version available to us.[2] We refer to the owners present at firm startup as the *founding owners*. Many firms do not have recorded owners. In particular, owners of "non-incorporated" firms are typically not recorded in the RF data base. These firms tend to be small. We restrict our analysis to firms with limited liability legal form (Sociedade Empresária ou Simples Limitada), which account for 53.5 percent of firms and 63.9 percent of December employment among new private-sector, for-profit firms during the period 2002-2014.[3]

Starting in 2002, RAIS includes a worker's personal ID CPF (similar to a US Social Security number) in addition to the RAIS-specific employee ID PIS/PASEP. This information allows us to match owners to

[1] 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 maintain complete RAIS records because payment of the annual public wage supplement is exclusively based on RAIS. The Brazilian statistical agency Insituto Brasileiro de Geografia e Estatística reports that, since the 1990s, RAIS data coverage has approached 97 percent of the formal sector of the economy, rendering RAIS a census of the formal labor market.

[2] The RF records on owners by firm are publicly available through an online query interface maintained by the federal Brazilian tax authority (*Emissão de Comprovante de Inscrição e de Situação Cadastral*). Our records are based on the October 31, 2022 snapshot at the Brazilian central bank, which has access to similar records as available in public query. Owners who divest are not removed from the data but their date of divestment is not available for research.

[3] We exclude from this calculation firms with any state ownership, cooperatives, business groups, and foreign subsidiaries. Of the 46.5 percent of new private-sector, for-profit firms that do not have limited liability legal form, over 90 percent are sole proprietor commercial companies (legal form Empresário (Individual)). December employment is a convenient measure of firm size because, for every worker with an employment spell reported during a given year, RAIS provides an indicator whether the employment spell lasted through December 31, facilitating a count of the number of employees at that point in time.

workers at Brazil's central bank. The year 2002 is therefore the first year of our sample period. In 2014 Brazil entered a political crisis. GDP growth remained marginally positive in 2014 but there was a severe recession with negative GDP growth of 3-4 percent in both 2015 and 2016. We therefore make 2014 the last year of our sample period.

We identify new firms as firms with eight-digit Cadastro Nacional de Pessoa Juridica (CNPJ) IDs that did not appear in RAIS prior to 2002 (we search back to 1986, the first year available to us).[4] Founding owners are then defined as owners whose years of accession to a firm are the same or earlier than the first year the firm appears in RAIS. It is important to note that a firm does not appear in RAIS unless it has at least one employee, so all the founding owners that we study are employers and all their firms are employer firms. Having identified founding owners, we trace them to the most recent jobs they held prior to (or in) their new firms' first years. We only consider jobs held for at least three months. We use the last month that the owner was employed to identify the most recent job. If there is more than one most recent job, we use the highest paying job. We break any remaining ties by keeping the job with the highest firm ID number, or the last alphabetical occupation description.

A concern in U.S. studies such as Levine and Rubinstein (2017) is that owners should be employed by the firms they own so we can be sure they are not passive investors. In our data, only 1.5 percent of founding owners of limited-liability firms who can be traced to last jobs from which they separated are employed by the firms they start. Tax incentives and social-security provisions in Brazil strongly favor paying executive compensation as dividends rather than salaries. Moreover, 73.8 percent of founding owners leave their previous jobs, which they have no reason to do if they are passive investors. We shall see below that when the founding owners do not leave their previous jobs the firms they start tend to be significantly smaller, consistent with these firms suffering from lack of owner attention compared to firms founded by owners who leave their jobs.

3 Managerial Talent and Job Creation

For the remainder of this paper we focus on new firms whose founding owners can be traced to previous employment. We hypothesize that workers with greater managerial talent are more likely to have held managerial positions in their last jobs. We can identify three levels of managerial occupations in RAIS: "directors," "managers," and "supervisors." Directors, but not managers, are equivalent to "C-level" positions in the United States. Managers, but not supervisors, belong to a one-digit occupation group reserved

[4]Firms that are sold or otherwise change ownership do not receive new CNPJ IDs, so we do not erroneously identify them as new.

for leaders and policy-makers, as described below. We hypothesize that among workers whose last position was in management, those with more managerial talent rose to the level of manager and those with the most managerial talent rose to the level of director.

Occupational classifications in RAIS follow the CBO (Classificação Brasileira de Ocupações). We use the second edition, published in 2002, which codes 2511 occupations at the six-digit level. For the sample of workers used in Figure 1 (or Table 1) below, 4.2 percent have occupations coded only using the first edition of the CBO, published in 1994. We use a crosswalk to assign these workers a 2002 code. When the crosswalk does not yield a unique assignment, we use the workers who have both 1994 and 2002 codes to find the modal 2002 code for the 1994 code, and assign these modal 2002 codes to the unassigned workers with only 1994 codes.

We include as directors and managers all workers whose last jobs were coded in CBO principal sub-groups 12 and 14, respectively. Supervisors, unlike directors and managers, are not grouped together by the CBO. We included every six-digit occupation title containing the word "supervisor," plus occupations in four-digit groups with "supervisor" in the group title.

We find 632,037 founding owners who 1) started limited-liability firms that first appeared in RAIS during the period 2002-2014, 2) can be traced to last jobs from which they have causes of separation, and 3) have, from those last jobs, occupation codes and other worker characteristics used in the entrepreneurship regressions below. An advantage of working with this sample is that we can control for cause of separation (e.g., fired versus quit) in those regressions. We compare these founding owners to other workers who separated from their last jobs, but found jobs with different firms instead of starting their own new firms. More specifically, we consider workers whose last jobs were in the firm-years in which founding owners held their last jobs. This allows us to include firm-year fixed effects in regressions with founding owner status as the dependent variable, so that differences in propensity to become entrepreneurs is identified using characteristics of workers originating from the same firms in the same years. Firm-year fixed effects will control for differences in "entrepreneurial culture" between firms.

Prior to the regression analysis of the next two subsections, we show in Figure 1 the shares of workers, founding owners, and new firm employment accounted for by managerial and other occupations. The sample of founding owners in the second bar of the figure is as described above. Working backward, the sample of workers in the first bar of the figure is those who 1) were employed in firm-years in which founding owners held their last jobs, 2) have causes of separation from those jobs and found new (formal sector) jobs or became founding owners before the end of 2014, and 3) have, from their last jobs, occupation codes and other worker characteristics used in the entrepreneurship regressions below. Working forward, the sample

of firms for which employment is counted in the third bar of Figure 1 is those with limited liability that first appeared in RAIS during 2002-2014 and had at least one founder in the sample for the second bar of the figure. We use employment in December of the year in which the firm first appeared in RAIS. Letting n equal the number of founders for a given new firm, we attribute $1/nth$ of its December employment to each founder since we have no data on ownership shares.[5]

Figure 1: Shares of workers, founding owners, and new firm employment accounted for by managerial and other occupations

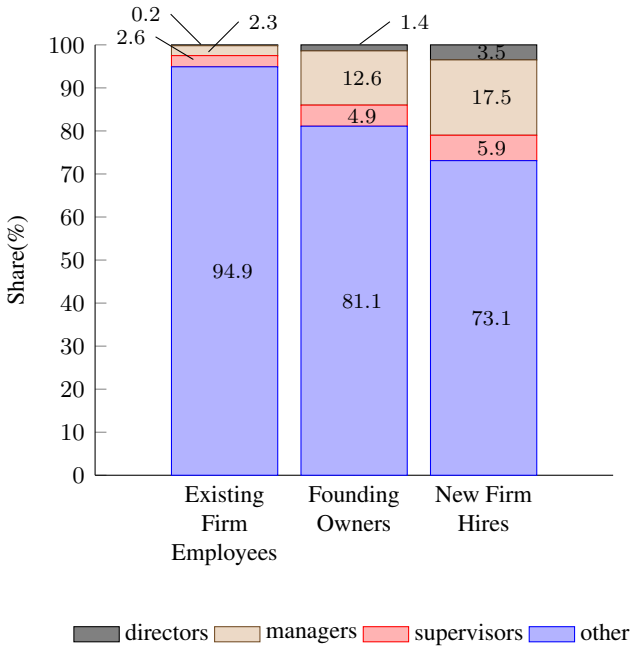


Figure 1 shows that, although only five percent of workers who left their jobs held managerial occupations, they account for 19 percent of founding owners of limited liability firms and 27 percent of the employment of those firms (attributable by previous occupation to founding owners who separated from their last employers) in December of their founding years. The overrepresentation of former managers in founding owners and new firm job creation is greatest for former directors and least for former supervisors.

The overrepresentation of former managers in entrepreneurship and new firm employment may, of course, have many causes other than talent for management. To investigate we estimate a series of regressions in which an indicator for firm founder or the logarithm of new firm employment is the dependent variable. We control for a steadily increasing number of alternative explanations of the association of former managers with entrepreneurship and new firm employment. We will use linear regressions to examine

[5]To align with the fixed-effect regressions below, we omit from the first and second bars of Figure 1 the 76,333 workers who become founding owners who separate from firm-years from which no other workers separate. These observations are automatically dropped from the fixed-effect regressions. We also omit the new firms founded by these workers from the third bar of Figure 1.

the impacts of former managerial occupations on the probability of becoming founding owners in the next subsection, and on the logarithm of new firm employment in the following subsection. We will call the regressions in the next subsection "entrepreneurship regressions" and the regressions in the following subsection "firm size regressions."

3.1 Managerial occupations and probability of becoming founding owners

Table 1 provides descriptive statistics for the worker sample to be used in the fixed-effect entrepreneurship regressions. As expected, every group of workers with a managerial occupation has higher mean wages, tenure, age, and post-high school education than non-managerial workers. Moreover, directors have higher means than managers and managers have higher means than supervisors for all of these characteristics. The variable "lag" equals the difference in calendar years between the year the worker starts his new job or founds his firm and the year in which he separates from his previous job.[6] 81 percent of non-managerial workers, 82 percent of former directors, and 85 percent of former managers or supervisors have lag values equal to zero or one, so most workers who are going to return to the formal sector do so quickly. Directors, managers, and supervisors are all less likely to have been fired from their last jobs than non-managerial workers, but managers and supervisors are also less likely than non-managerial workers to have quit. Investigation of other causes of separation shows that workers in managerial occupations are far more likely than workers in non-managerial occupations to have retired from their last jobs.

Table 2 reports our entrepreneurship regressions. The first column includes no covariates other than indicators for the three managerial occupation levels. The coefficients indicate that former directors, managers, and supervisors are 7.1, 5.6, and 1.2 percentage points more likely to become founding owners than workers who had other former occupations. These are very large effects relative to the mean founding owner probability of 1.2 percent, as we would have expected from Figure 1.

In the second column of Table 2 we add firm-year fixed effects, so that we identify the effect of former occupation on entrepreneurship using the differences between workers who left the same firm in the same year. This addresses the concern that managers might come from especially "entrepreneurial" firms. The coefficients on the director and manager indicators decrease somewhat and the coefficient on the supervisor indicator increases. In the third column we include twelve indicators for the number of years from one to twelve between when a worker left his job and when he either started another (formal sector) job or founded a limited liability firm. The coefficients on these indicators (not shown) increase monotonically to a peak of 0.06 in year ten and are all positive except for year one. A plausible explanation for the positive and increas-

[6] During the intervening years the worker may be out of the labor force, unemployed, employed in the informal sector, or owner of an informal sector firm.

Table 1: Summary statistics for worker sample used in entrepreneurship regressions

	(1) all	(2) non-managers	(3) directors	(4) managers	(5) supervisors
Founding owner	0.011	0.010	0.079	0.063	0.022
Deflated wage (in reals)	479.225	437.790	3360.480	1554.552	823.561
Median	261.619	254.775	1378.098	890.912	494.974
Tenure (in months)	28.651	27.548	51.752	49.727	48.837
Median	12.300	12.000	25.000	23.000	23.300
Age (in years)	32.586	32.408	41.799	35.744	35.594
Median	30.000	30.000	41.000	35.000	34.000
Female founder	0.366	0.367	0.295	0.326	0.373
Less than high school	0.412	0.425	0.087	0.136	0.215
High school graduate	0.371	0.372	0.214	0.328	0.396
Some college	0.054	0.051	0.073	0.102	0.111
College graduate	0.159	0.148	0.613	0.429	0.276
Graduate degree	0.003	0.003	0.013	0.005	0.002
Fired	0.672	0.679	0.565	0.464	0.600
Quit	0.187	0.190	0.196	0.148	0.137
Other cause of separation	0.141	0.131	0.239	0.388	0.263
Lag (years)	1.011	1.017	0.977	0.883	0.910
Lag share = 0 or 1	0.811	0.809	0.822	0.847	0.848
occ group 0	0.001	0.001	0.000	0.000	0.000
occ group 1	0.039	0.014	1.000	1.000	0.000
occ group 2	0.105	0.110	0.000	0.000	0.025
occ group 3	0.103	0.107	0.000	0.000	0.045
occ group 4	0.204	0.200	0.000	0.000	0.571
occ group 5	0.174	0.179	0.000	0.000	0.156
occ group 6	0.090	0.094	0.000	0.000	0.045
occ group 7	0.220	0.230	0.000	0.000	0.076
occ group 8	0.037	0.037	0.000	0.000	0.048
occ group 9	0.028	0.028	0.000	0.000	0.035
Observations	51936097	49310472	107268	1185996	1332361

Sources: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot)

Notes: Founding owner equals 1 if a former worker becomes a founding owner of a limited liability firm and equals 0 if the former worker remains a worker. Former workers who do not reappear in the formal sector, who become founding owners of firms with other legal forms, or who become non-founding owners are not included in the sample. Less than high school includes former workers who are illiterate, primary school dropouts or graduates, middle school dropouts or graduates, or high school dropouts.

Table 2: Determinants of entrepreneurship

	(1)	(2)	(3)	(4)	(5)	(6)
Director	0.0705**	0.0662**	0.0654**	0.0536**	0.0471**	0.0475**
	(0.00255)	(0.00205)	(0.00202)	(0.00197)	(0.00183)	(0.00184)
Manager	0.0561**	0.0458**	0.0460**	0.0320**	0.0293**	0.0303**
	(0.00324)	(0.00197)	(0.00192)	(0.00186)	(0.00176)	(0.00174)
Supervisor	0.0121**	0.0138**	0.0142**	0.0148**	0.00764**	0.00821**
	(8.34e-04)	(5.17e-04)	(5.04e-04)	(4.69e-04)	(3.86e-04)	(3.83e-04)
Log deflated wage					0.00386**	0.00406**
					(1.13e-04)	(1.08e-04)
Log tenure					0.00256**	0.00292**
					(8.94e-05)	(9.83e-05)
Log age					0.0126**	0.0133**
					(2.10e-04)	(2.25e-04)
Female founder					−0.00327**	−0.00317**
					(8.66e-05)	(8.63e-05)
occ group 0				0.0181**	0.0129**	0.0119**
				(0.00281)	(0.00177)	(0.00180)
occ group 1				0.0210**	0.0123**	0.0126**
				(4.85e-04)	(4.89e-04)	(4.77e-04)
occ group 2				0.0189**	0.00982**	0.0101**
				(5.09e-04)	(4.87e-04)	(4.78e-04)
occ group 3				0.0113**	0.00708**	0.00743**
				(2.85e-04)	(3.75e-04)	(3.50e-04)
occ group 4				0.00788**	0.00690**	0.00722**
				(2.74e-04)	(3.77e-04)	(3.53e-04)
occ group 5				0.00464**	0.00383**	0.00410**
				(3.03e-04)	(4.02e-04)	(3.73e-04)
occ group 6				−0.00183**	8.87e-04*	9.04e-04**
				(2.44e-04)	(3.66e-04)	(3.39e-04)
occ group 7				−0.00146**	−0.00164**	−0.00162**
				(2.33e-04)	(3.48e-04)	(3.20e-04)
occ group 9				0.00228**	0.00165**	0.00180**
				(2.47e-04)	(3.38e-04)	(3.17e-04)
Mean probability	0.0122	0.0114	0.0114	0.0114	0.0114	0.0114
R^2	0.00692	0.150	0.156	0.158	0.161	0.162
N	52012430	51936097	51936097	51936097	51936097	51936097

Sources: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot)

Notes: Dependent variable is indicator for whether former worker becomes a founding owner. All columns include constant. Columns (2)-(6) include origin firm × year fixed effects. Columns (3)-(6) include lag indicators for 1 through 12 years (0 lag is omitted category). Columns (5)-(6) include indicators for 10 education categories (illiterate is omitted category). Column (6) includes cause of separation fixed effects, with "special retirement without termination" as the omitted category. Real wages are provided in 1994 levels, using the inflation rate from December of each worker's last job. Tenure is provided in months and age in years. 76,333 founding owners are dropped from the sample in columns (2)-(6) because no workers leave the owner's last firm in the same year. Standard errors in parentheses, clustered at origin firm level. ** Significance at one, * five percent levels.

ing coefficients is that if a worker disappears from the formal sector for years only to reappear, there is a substantial chance that he was running an informal sector firm that he chose to formalize. This explanation is consistent with the negative association of lag years with firm size that we find below. The coefficients on the managerial occupation indicators are virtually unchanged. In the fourth column we add indicators for the nine major CBO occupation groups.[7] Directors and managers belong to group 1, "Senior members of the government, leaders of organizations of public interest and companies and managers." Supervisors belong mainly to group 4, "Workers in administrative services." The coefficients on the director and manager indicators fall substantially, both by between one-half and two-thirds of the coefficient on the indicator for occupation group 1, suggesting that some of the association of former directors and managers with entrepreneurship can be ascribed to generic "leadership." We postpone our main discussion of the coefficients on the major occupation group indicators themselves to Section 4, after we add indicators for more specific non-managerial former occupations.

In the fifth column of Table 2 we add various measures of human capital. Perhaps the most important is the log wage of the worker at his last job. This wage includes all compensation that is taxable income or subject to Brazilian social security contributions; see Hirakawa, Muendler and Rauch (2010, Appendix A) for complete details. It should be a good proxy for generic worker ability.[8] We also add indicators for the eleven educational attainment categories reported in RAIS (coefficients not shown), log age, log months of tenure in last job, and gender, which can affect a worker's propensity to become a founding owner in ways other than through his generic ability. The signs of all coefficients are as expected.[9] The coefficients on the managerial occupation indicators fall 12, 9, and 48 percent, respectively, for directors, managers, and supervisors. The coefficient on the indicator for the major CBO occupation group to which directors and managers belong falls 41 percent. The coefficients on the indicators for the other high human capital occupation groups, 2 ("professionals of sciences and the arts") and 3 ("middle-level technicians"), are similarly reduced.

In the last column of Table 2 we add indicators for the 27 causes reported in RAIS for separation of workers from their last jobs (coefficients not shown), omitting the last reported cause, "special retirement without termination." The concern here is that managers are less likely to have been fired from their last jobs than other workers, so their greater propensity to become founding owners could reflect selection.

[7] There are actually ten major groups, but groups 7 and 8 have the same title, "Workers producing industrial goods and services." We let group 8 be the omitted category.

[8] Choi et al. (2021, p. 2) follow a similar procedure. They write, "Leveraging the longitudinal structure of the matched employer-employee data, we use each founding team member's most recent earnings prior to joining the startup as a proxy for their human capital."

[9] We omitted the lowest educational attainment category, and all coefficients for the other education categories are positive and significant, with the highest coefficients for some college and college graduate.

Managers are also more likely to have retired from their last jobs than other workers, and retirement could encourage entrepreneurship by providing a pension. Despite these concerns, inclusion of cause of separation dummies slightly increases the coefficients on the managerial occupation indicators. It may be that by only considering workers who remain in the formal sector as employees or founding owners we have taken care of most potential selection effects.

The last column of Table 2 is our preferred specification. Having been a director, manager, or supervisor respectively increases the probability of becoming a founding owner by 4.8, 3.0, and 0.8 percentage points. These effects imply that former directors, managers, and supervisors are, respectively, roughly five times, four times, and two times more likely than former non-managerial workers to become founding owners.

Another way to quantify the impacts of having held a managerial occupation is to compare them to the increase in the probability of becoming a founding owner attributable to standard human capital variables. We compute the latter by multiplying the coefficients in the last column of Table 2 on log age, education, female, log tenure, and log wage by the differences between the means of these variables for former managers (the most common former managerial occupation among founders) and former holders of non-managerial occupations. This computation yields a value of 0.0111, 97 percent of the mean of the dependent variable but only 37 percent of the coefficient on manager in the last column of Table 2. We interpret this result to show that the managerial talent of former managers has an impact on the probability they will become entrepreneurs nearly three times greater than does their higher generic ability relative to former holders of non-managerial occupations.

Our regression sample of 632,037 founding owners actually consists of 588,685 unique individuals. Of these unique individuals, 6.1 percent are "serial entrepreneurs," founding more than one firm during our sample period. We might expect that, just as former managers are more likely than former non-managers to start their own firms, among those who start their own firms they are also more likely to be serial entrepreneurs. Table 3 confirms this expectation. The dependent variable is an indicator for whether an individual who founded at least one firm founded more than one, and the explanatory variables are the same as those in the last column of Table 2.[10] Among founding owners, having been a director, manager, or supervisor respectively increases the probability of becoming a serial entrepreneur by 4.9, 1.5, and 1.3 percentage points. These effects imply that former directors, managers, and supervisors are, respectively, 80, 24, and 21 percent more likely than former non-managerial workers to be serial entrepreneurs among founding owners.

We can infer from Table 3 that part of the overrepresentation of former managers in founding owners shown in Figure 1 is due to their greater likelihood of founding more than one firm. This may also be

[10] In 7.7 percent of cases, a serial entrepreneur held a job after founding a first firm and before founding a subsequent firm. We used serial entrepreneurs' characteristics from their former jobs at their first firms as the explanatory variables in Table 3.

Table 3: Determinants of serial entrepreneurship

Director	0.0492^{**}
	(0.00386)
Manager	0.0150^{**}
	(0.00278)
Supervisor	0.0128^{**}
	(0.00153)
Log deflated wage	0.00745^{**}
	$(4.28e\text{-}04)$
Log tenure	0.00364^{**}
	$(3.29e\text{-}04)$
Log age	-0.0387^{**}
	(0.00135)
Female founder	-0.0129^{**}
	$(6.99e\text{-}04)$
occ group 0	-0.0309
	(0.0195)
occ group 1	0.0325^{**}
	(0.00347)
occ group 2	0.0267^{**}
	(0.00250)
occ group 3	0.0193^{**}
	(0.00242)
occ group 4	0.0228^{**}
	(0.00233)
occ group 5	0.0212^{**}
	(0.00233)
occ group 6	-0.00110
	(0.00410)
occ group 7	-0.00159
	(0.00235)
occ group 9	-0.00376
	(0.00283)
Mean probability	0.0613
R^2	0.0120
N	588685

Notes: Dependent variable is indicator for whether an individual who founded at least one firm founded more than one. Explanatory variables are same as those in the last column of Table 2 except origin firm $\times$ year fixed effects. Standard errors in parentheses. ** Significance at one, * five percent levels.

reflected in the coefficients on director, manager, and supervisor in Table 2. We estimated the last column of Table 2 dropping all observations associated with serial entrepreneurs founding firms subsequent to their first. Relative to the mean probability of becoming a founding owner, the coefficient on director fell by 13 percent, but the coefficients on manager and supervisor were nearly unchanged.

3.2 Managerial occupations and firm size

The results of the previous subsection are consistent with the hypothesis that former managers are more likely to start their own firms because their managerial talent will make their firms more productive, but are also consistent with former managers having personal traits such as high self-esteem (Levine and Rubinstein 2017) that increase their propensities to become firm owners but do not necessarily make their firms more productive. In this subsection we examine the association of former managerial occupations with new firm size as measured by employment. This should increase with firm productivity, and is also of interest because it measures new job creation. Our focus on initial firm size is supported by Sterk, Sedláček and Pugsley (2021), who find that ex ante heterogeneity is the main determinant of subsequent firm differences.

New firms may have more than one traceable founder. We will consider firms for which all founders are traceable so that we know the former occupation, demographic characteristics, and other relevant information for every founder. We do not require founders to have separated from their former employers because we are not comparing them to individuals who separated from their former employers and remained workers. Our criteria yield a sample of 609,752 new firms, of which 68.5 percent have one traceable founder, 28.2 percent have two, 2.7 percent have three, and 0.6 percent have four or more. 1.0 percent of the firms in our sample also have one or more Brazilian legal entities (presumably firms) as founding owners, of which 17.3 percent are the origin firms of one or more of the individual founding owners. In the latter case it seems highly likely that the new firms are divestitures or corporate spinoffs from the origin firms, so we can expect them to be much larger than typical new firms. This may also be true when the founding firms are not origin firms of the founding individuals, but in this case it seems equally plausible that the founding individuals recruited the founding firms.

With these considerations in mind we compute mean and median new firm sizes for the 417,686 firms in our sample with only one traceable founder, so that we can classify them unambiguously by the (former) occupation of the single individual founder. We also allow firm founding owners to override individual founding owners, so that new firms with firm founding owners are not included in the computations for new firms with individual founding owners. Table 4 shows that, as we could anticipate from Figure 1, new firms founded by former managers are larger on average than new firms founded by workers who held non-

managerial positions, and that this size difference increases with managerial rank. However, median new firm size mostly does not differ across managerial versus non-managerial founders. Evidently superior managerial talent of former managers mainly reveals itself in the right tail rather than throughout the distribution. Table 4 also shows that new firms with at least one existing firm founder are far larger than new firms with only individual founders, especially if the individual founder came from one of these existing firms.

Table 4: Mean and median sizes of firms with only one trackable founder

	No. of workers		
Owner	Mean	Median	Obs
All	4.5	2	417686
Non-management	4.0	2	333622
Directors	8.8	3	6810
Managers	5.6	2	53504
Supervisors	5.1	2	19462
Existing firm	19.9	4	3652
Existing origin firm	38.8	9	636

We now turn to regressions to further explore the determinants of new firm size. In light of the skewness of the distribution of new firm sizes indicated by Table 4, we use the log of firm size as our dependent variable. Since we do not know the ownership shares when there is more than one founding owner, we use the averages of the individual owner characteristics as our explanatory variables. For example, if there are two individual founders and only one is a supervisor, the value of the supervisor indicator is one-half. All regressions were repeated using new firms with only one individual founder as in Table 4, but there were no qualitative differences in the results (these regressions are available on request).

Table 5 reports means (and medians for non-categorical variables) of the regressors used to explain new firm size.[11] A comparison with Table 1 shows that the mean wages, tenure, age, and post-high school education at their former jobs are higher for founding owners than for all workers who left the origin firms. Means for cause of separation are not directly comparable to Table 1 because founding owners who have no cause of separation are included – together the indicators for causes of separation, retains previous job, and no cause of separation but job disappears are mutually exclusive and exhaustive.[12] The mean of the firm share of founding owners who started firms in the same year or year subsequent to the calendar year

[11] After we add "meso" region fixed effects to the firm size regressions we lose firms founded in 2014 because region identifiers are missing for that year. Since these fixed effects are included in our preferred specification we show the summary statistics for the remaining 546,698 firms instead of the full sample of 609,752 firms.

[12] The most plausible explanation for the last category is that these founding owners left their jobs and their causes of separation were incorrectly coded as 0. Another explanation is that the former employers of these founding owners exited. We find this was the case for 18.8 percent of these founding owners compared to 7.1 percent of the employers of founding owners with causes of separation.

in which they left their last jobs is 66.9 percent.[13] A somewhat surprising fact is that the mean of the firm share of founding owners who started firms in the same industries as their previous jobs is only 26.4 percent, even though same industry is defined at the two-digit level, a fairly high level of aggregation.[14] This fact is consistent with a number of findings that suggest that workers move relatively easily between industries (Kambourov and Manovskii 2009, Traiberman 2019).

Table 6 reports our regressions for log new firm size, where firm size is measured by number of employees in December of the founding year. As in Table 2, the first column includes no covariates other than indicators for the three levels of managerial occupations. The coefficients on these indicators imply that firms founded by former directors, managers, and supervisors are respectively 82, 32, and 19 percent larger than other new firms. These are somewhat smaller than the percentage differences in means in Table 4, not because of differences with the coefficients estimated using new firms with only one individual founder but because the skewness of the distribution of new firm sizes causes the differences between the means of log sizes to be smaller than between the logs of mean sizes.

In the second column of Table 6 we add fixed effects for year of firm founding, 59 two-digit industries, and 137 "meso" regions in which new firms are located. We identify firm locality by the mode locality assigned to its employees in its founding year. The coefficients on the director and supervisor indicators shrink somewhat. In the third column of Table 6 we add indicators for two, three, and four or more individual founders, for at least one firm founder, and for at least one origin firm founder. As expected from Table 4, having at least one firm founder and especially having at least one origin firm founder are associated with much larger new firm sizes. Having four or more individual founders is associated with a 18 percent larger new firm. Having two (three) individual founders is associated with a slightly smaller (larger) new firm size. (The association of two founders with a slightly smaller new firm is a puzzle and does not reappear when we restrict our sample to manufacturing firms in Section 5.) Including these five indicators leads to a substantial reduction in the coefficient on the director indicator, mainly because former directors are much more likely to found new firms in partnership with existing firms.

Indicators for one-digit occupation categories are added in the fourth column of Table 6. The coefficients on the director and manager indicators fall substantially, both by just over 40 percent of the coefficient on the indicator for occupation group 1. This is similar to what we saw in Table 2 and again suggests that

[13] A founder who retains his last job is coded as lag = 0. A founder with no cause of separation but his job disappears is assigned a lag equal to the difference between the calendar year in which he started his firm and the calendar year in which his job was last observed, as is also the case for founders with causes of separation.

[14] We identify firm industry by the mode industry assigned to its employees in its founding year. We use version 1.0 of the CNAE (Classificação Nacional de Atividade Econômica) industry classification, which unlike version 2.0 is consistently reported in our data. The indicator for same industry takes the value one when the two-digit industry assigned to the founding owner at his last job equals the mode two-digit industry of the employees of his new firm.

Table 5: Summary statistics for variables used in new firm size regressions

Number of workers	4.436
Median	2.000
Deflated wage (in reals)	815.825
Median	404.809
Tenure (in months)	52.129
Median	28.878
Age (in years)	36.313
Median	35.000
Director	0.018
Manager	0.123
Supervisor	0.046
Two founders	0.276
Three founders	0.025
Four+ founders	0.005
Brazil firm founder	0.009
Origin firm is founder	0.002
Female founder	0.381
Less than high school	0.230
High school graduate	0.361
Some college	0.088
College graduate	0.315
Graduate degree	0.006
Fired	0.503
Quit	0.101
Other cause of separation	0.015
Holds previous job	0.287
Lag (years)	1.485
Lag share = 0 or 1	0.669
Prop same industry	0.264
Multiple founder same pis	0.018
occ group 0	0.002
occ group 1	0.164
occ group 2	0.180
occ group 3	0.121
occ group 4	0.219
occ group 5	0.154
occ group 6	0.007
occ group 7	0.112
occ group 8	0.017
occ group 9	0.024
Observations	546698

Notes: Each observation of a founding individual owner characteristic is the mean over the characteristics of the founding individual owners when there is more than one. The table reports the means over all observations, except where the medians are indicated. Real wages are provided in 1994 levels using the inflation rate from December of each founding owner's last job. Less than high school includes founding owners who are illiterate, primary school dropouts or graduates, middle school dropouts or graduates, or high school dropouts.

Table 6: Determinants of new firm size

	(1)	(2)	(3)	(4)	(5)	(6)
Director	0.601**	0.556**	0.442**	0.397**	0.384**	0.334**
	(0.0131)	(0.0135)	(0.0131)	(0.0156)	(0.0156)	(0.0156)
Manager	0.274**	0.281**	0.271**	0.224**	0.222**	0.163**
	(0.00418)	(0.00433)	(0.00432)	(0.00957)	(0.00960)	(0.00966)
Supervisor	0.174**	0.157**	0.157**	0.150**	0.140**	0.130**
	(0.00655)	(0.00668)	(0.00668)	(0.00679)	(0.00691)	(0.00685)
Two founders			−0.0337**	−0.0330**	−0.0323**	−0.0319**
			(0.00267)	(0.00267)	(0.00267)	(0.00266)
Three founders			0.0295**	0.0277**	0.0255**	0.0238**
			(0.00801)	(0.00800)	(0.00800)	(0.00797)
Four+ founders			0.165**	0.162**	0.157**	0.150**
			(0.0191)	(0.0191)	(0.0191)	(0.0190)
Firm founder			0.634**	0.626**	0.614**	0.601**
			(0.0222)	(0.0222)	(0.0222)	(0.0221)
Origin firm founder			0.416**	0.415**	0.415**	0.385**
			(0.0522)	(0.0522)	(0.0522)	(0.0520)
Log deflated wage					0.0100**	0.0223**
					(0.00182)	(0.00185)
Log tenure					0.00397**	0.00225
					(0.00128)	(0.00134)
Log age					−0.0226**	−0.00321
					(0.00562)	(0.00568)
Female founder					−0.0432**	−0.0334**
					(0.00291)	(0.00291)
Prop same industry						0.172**
						(0.00321)
Holds previous job						−0.0970**
						(0.00542)
Multiple founder same pis						0.0797**
						(0.00970)
occ group 0				0.0547	0.0406	0.0566
				(0.0299)	(0.0300)	(0.0299)
occ group 1				0.110**	0.114**	0.129**
				(0.0129)	(0.0131)	(0.0131)
occ group 2				0.0930**	0.0980**	0.0930**
				(0.0100)	(0.0105)	(0.0105)
occ group 3				0.0390**	0.0483**	0.0525**
				(0.0101)	(0.0103)	(0.0103)
occ group 4				0.116**	0.135**	0.135**
				(0.00990)	(0.0100)	(0.0100)
occ group 5				0.0163	0.0317**	0.00931
				(0.00995)	(0.0100)	(0.00999)
occ group 6				0.0864**	0.0763**	0.103**
				(0.0191)	(0.0192)	(0.0192)
occ group 7				0.0298**	0.0312**	0.0246*
				(0.0103)	(0.0103)	(0.0103)
occ group 9				−0.0496**	−0.0514**	−0.0662**
				(0.0122)	(0.0122)	(0.0122)
Mean	0.831	0.832	0.832	0.832	0.832	0.832
R^2	0.0148	0.0969	0.103	0.104	0.105	0.113
N	609752	546698	546698	546698	546698	546698

Notes: Dependent variable is log of December employment in the firm's founding year. Each observation of a founding individual owner characteristic is the mean over the characteristics of the founding individual owners when there is more than one. All columns include constant. Columns (2)-(6) include fixed effects for the firm start year, two-digit industry, and meso region. Columns (5)-(6) include indicators for 10 education categories (illiterate is omitted category). Column (6) includes lag indicators for 1 through 12 years (0 lag is omitted category) and indicators for 27 causes of separation, with job disappears but no cause of separation as the omitted category. Real wages are provided in 1994 levels, using the inflation rate from December of each worker's last job. Tenure is provided in months and age in years. Robust standard errors in parentheses. ** Significance at one, * five percent levels.

some of the impact of directors and managers can be ascribed to generic "leadership." In the fifth column of Table 6 we add the same measures of human capital as in Table 2: log wage in last job, indicators for the eleven educational attainment categories reported in RAIS, log age, log months of tenure in last job, and gender. Wage and tenure are associated with larger new firm size, age and female with smaller firm size. The education coefficients (not reported) show a weak tendency for higher education to be associated with smaller firm size. The coefficients on the director and supervisor indicators fall slightly.

In the last column of Table 6 we add other variables pertaining to firm founders. The most important is an indicator for whether the founder's last job was in the same two-digit industry as the firm he starts. New firms in the same two-digit industries as their founders' last jobs are 19 percent larger, all else equal. This result is consistent with Azoulay et al. (2020), who find that previous work experience of founding owners in the same two-digit industry as the firms they start is associated with various measures of firm success. We also add a complete set of indicators for cause of separation from last job and remains employed in last job, with last job disappears but no cause of separation as the omitted category. We report the coefficient on the indicator for retains last job, which is of special interest and is economically and statistically significant. New firms whose founding owners retain their last jobs are nine percent smaller, all else equal. This negative effect could occur because the new owners are not devoting their full attention to these firms or because they do not expect these firms to generate enough income for them to leave their jobs. (Only 1.0 percent of new firms in the last column of Table 6 employ at least one of their founding owners, so the negative effect is not due to non-employment of founding owners at new firms whose founding owners retain their last jobs.[15]) We also include indicators for the number of years between the calendar year in which the founder was last observed in his previous job and the calendar year in which he founded his firm, with zero years as the omitted category. The coefficients on all of these indicators (not shown) are negative, with a peak in absolute value at two to three years associated with 11 percent smaller new firms. Finally, we include an indicator for when two or more founding owners have the same identification number in RAIS.[16] This occurs for less than two percent of new firms, and is associated with eight percent larger new firm size, all else equal.

Column (6) is our preferred specification. Inclusion of the additional variables causes the coefficients on the director and manager occupation indicators to shrink substantially. The coefficients on the three

[15]If we add to the last column of Table 6 an indicator for at least one founding owner is an employee, all regression coefficients are virtually unchanged and the coefficient on the indicator is slightly smaller than implied by increasing mean new firm size by one employee.

[16]This appears to happen when one or more founding owners has no employment record in RAIS but is related to another founding owner, and probably indicates a husband-and-wife founding partnership. However, it seems unlikely that this indicator captures a majority or even a large minority of husband-and-wife founding partnerships.

managerial occupation levels now imply that firms founded by former directors, managers, and supervisors are respectively 40, 18, and 14 percent larger than other new firms.

As we did at the end of the previous subsection, we can also quantify the impacts of having held a managerial occupation by comparing them to the impacts of standard human capital variables. We will compute the increase in firm size attributable to these variables by first computing the means of log age, education, female, log tenure, and log wage for the founders of the new firms in the Table 6 sample who are former managers or former holders of non-managerial occupations, and then multiplying the differences between these means by the corresponding coefficients in the last column of Table 6. This computation yields a value of 0.0158, less than one tenth of the coefficient on the manager indicator in the last column of Table 6. We interpret this result to show that the greater managerial talent of former managers has more than ten times the impact on new firm size than does their greater generic ability relative to former holders of non-managerial occupations. This is a much larger relative impact than we found for the probability of entrepreneurship. The reason is not that the human capital coefficients are relatively smaller but that the differences in means between former managers and former holders of non-managerial occupations are smaller. This occurs because we are now comparing former managers who became founding owners to former holders of non-managerial occupations who also became founding owners, instead of comparing all former managers to all former holders of non-managerial occupations.

Our results support the view that generic ability is more highly rewarded in entrepreneurship than in wage employment, so that individuals with greater generic ability select into entrepreneurship and found larger firms (Murphy, Shleifer and Vishny 1991). At the same time our results indicate that managerial talent is distinct from generic human capital, as in Lucas (1978), and is in fact a more powerful factor in leading individuals to become entrepreneurs and in making their firms more productive, as reflected in their sizes. Former managers have more human capital by every conventional measure, but the effects of this human capital on their propensities to become entrepreneurs and the sizes of their new firms are small relative to the effects of managerial talent as proxied by their former occupation.

4 Demand- and Supply-Side Occupations, Entrepreneurship, and Firm Size

We now consider whether the skills associated with some non-managerial occupations have impacts on entrepreneurship and new firm size comparable to those of managerial talent. We employ the same strategy of estimating the effects of former occupations controlling for measures of generic human capital, especially previous earnings. As explained in our Introduction, we focus on non-managerial occupations connected to firm productivity and developing a customer base. For convenience we will refer to these as supply- and

demand-side occupations, respectively.

On the supply side we consider four types of occupations: engineers (*engenheiro*), technologists (*tecnólogo*), technicians (*técnico*), and purchasing (occupation titles with the root *compra*). Engineers are drawn entirely from major occupation group 2 (professionals) and technologists are drawn almost entirely from that group, whereas technicians are drawn almost entirely from major occupation group 3 (mid-level technicians) and purchasers are drawn entirely from that group. On the demand side we considered occupation titles with the root *vend*. These are about evenly divided between major occupation group 3 and major occupation group 5, "service workers, salespeople in stores and markets." In the latter group are several occupations that would seem to employ skills with little potential for founding successful limited liability firms, such as street vendors. We therefore created three subsets: wholesalers (*vendedors em comercio atacadista*), retailers (*vendedors de comercio varejista*), and sales, where the latter are drawn entirely from major occupation group 3 and include "autonomous commercial representatives," which does not have the root *vend*.

Table 7 adds indicators for the occupation types we have created to our preferred specifications of the regressions for entrepreneurship and firm size (columns (6) of Tables 2 and 6). Purchasing immediately stands out for coefficients that are larger than the coefficient for supervisors in the entrepreneurship regression and the coefficient for managers in the firm size regression. No other non-managerial occupation type has coefficients in both regressions that are as large as those for supervisors.

The indicator for major occupation group 1 ("Senior members of the government, leaders of organizations of public interest and companies and managers") has coefficients in Table 7 that are slightly larger than those for the indicator for supervisor. A natural interpretation is that former holders of these occupations have leadership ability that increases their effectiveness as entrepreneurs independently from the impact of talent in managing a for-profit enterprise. Notably, occupation group 1 includes (in principal subgroup 13) "directors and managers of personal, social, and cultural enterprises," "directors and managers of health service enterprises," and "directors and managers of educational service institutions." The coefficients in Table 7 on the indicator for major occupation group 2, though below those for group 1, are also relatively large in both regressions, yielding an impact on the probability of becoming an entrepreneur slightly below the mean probability and a nine percent increase in new firm size. This result for professionals is consistent with the findings of Levine and Rubinstein (2017) that "nonroutine cognitive abilities" predict selection of workers into incorporated self-employment.

As noted in our Introduction, a distinguishing characteristic of a purchasing occupation is that it is necessarily a business-to-business (B2B) activity. We can explore the impact of B2B connections further

Table 7: Additional occupational determinants of entrepreneurship and new firm size

	(1) Founding owner	(2) Log firm size
Director	0.0483^{**}	0.336^{**}
	(0.00186)	(0.0156)
Manager	0.0314^{**}	0.163^{**}
	(0.00180)	(0.00967)
Supervisor	0.00884^{**}	0.124^{**}
	$(4.18e\text{-}04)$	(0.00693)
Engineer	0.00891^{**}	0.0632^{**}
	$(8.78e\text{-}04)$	(0.0115)
Technologist	-0.00183	-0.162^{*}
	(0.00157)	(0.0814)
Technician	$-7.60e\text{-}04^{**}$	-0.00925
	$(1.91e\text{-}04)$	(0.00766)
Purchasing	0.0122^{**}	0.202^{**}
	$(7.92e\text{-}04)$	(0.0242)
Sales	$1.68e\text{-}04$	0.0373^{*}
	$(5.17e\text{-}04)$	(0.0158)
Wholesale	0.00612^{**}	-0.00407
	$(8.28e\text{-}04)$	(0.0171)
Retail	$-2.75e\text{-}04$	-0.0535^{**}
	$(4.71e\text{-}04)$	(0.0121)
Vend	0.00680^{**}	-0.0105
	$(4.65e\text{-}04)$	(0.0114)
Log deflated wage	0.00385^{**}	0.0214^{**}
	$(1.08e\text{-}04)$	(0.00186)
Log tenure	0.00294^{**}	0.00250
	$(9.94e\text{-}05)$	(0.00134)
Log age	0.0133^{**}	-0.00468
	$(2.26e\text{-}04)$	(0.00569)
Female founder	-0.00318^{**}	-0.0309^{**}
	$(8.69e\text{-}05)$	(0.00293)
occ group 0	0.0114^{**}	0.0560
	(0.00179)	(0.0299)
occ group 1	0.0120^{**}	0.128^{**}
	$(4.98e\text{-}04)$	(0.0131)
occ group 2	0.00929^{**}	0.0850^{**}
	$(5.17e\text{-}04)$	(0.0106)
occ group 3	0.00691^{**}	0.0485^{**}
	$(4.04e\text{-}04)$	(0.0115)
occ group 4	0.00719^{**}	0.133^{**}
	$(3.81e\text{-}04)$	(0.0100)
occ group 5	0.00211^{**}	0.0369^{**}
	$(4.43e\text{-}04)$	(0.0106)
occ group 6	$4.69e\text{-}04$	0.104^{**}
	$(3.59e\text{-}04)$	(0.0192)
occ group 7	-0.00175^{**}	0.0255^{*}
	$(3.45e\text{-}04)$	(0.0103)
occ group 9	0.00160^{**}	-0.0663^{**}
	$(3.38e\text{-}04)$	(0.0122)

Two founders		-0.0320^{**}
		(0.00266)
Three founders		0.0239^{**}
		(0.00797)
Four+ founders		0.150^{**}
		(0.0190)
Brazil firm founder		0.598^{**}
		(0.0221)
Origin firm is founder		0.387^{**}
		(0.0520)
Prop same industry		0.174^{**}
		(0.00324)
Holds previous job		-0.0974^{**}
		(0.00542)
Multiple founder same pis		0.0799^{**}
		(0.00970)
Mean	0.0114	0.832
R^2	0.162	0.113
N	51936097	546698

Notes: All columns include constant. Column (1) includes all controls in Column (6) of Table 2. Column (2) includes all controls in Column (6) of Table 6. In Column (1), standard errors clustered at the origin firm level in parentheses. In Column (2), robust standard errors in parentheses. ** Significance at one, * five percent levels.

with the help of an industry assignment created by Delgado and Mills (2020). Using U.S. input-output accounts, they divided industries into "supply chain" (equivalent to B2B) and "B2C" based on whether the share of industry value sold to Personal Consumption Expenditure fell below 35 percent. We hypothesize that workers in demand-side occupations in industries that primarily sold to businesses will have formed customer relationships that are more valuable for starting their own firms than workers in demand-side occupations in industries that primarily sold to consumers.

Delgado and Mills used the NAICS 2012 industry classification, whereas industries in our data are classified using CNAE 1.0 (see footnote 14). We created a crosswalk between these two classifications, which was facilitated by the rough equivalence between CNAE and the International Standard Industrial Classification (ISIC). However, we were unable to assign some industries to B2B or B2C for two reasons. First, Delgado and Mills did not assign raising crops or animals, aquaculture, government, or private households to B2B or B2C. Second, Delgado and Mills were able to assign industries at the 6-digit level whereas CNAE 1.0 is only available at the 5-digit level, so that our crosswalk did not produce a clear assignment for some industries.

In columns (1) and (3) of Table 8 we add to the specifications of the entrepreneurship and firm size regressions in Table 7 an indicator for whether the previous employment of the founding owner(s) was in a B2B industry and the interactions of this indicator with demand-side occupations. The estimated coefficients on the interactions do not support our B2B hypothesis for demand-side occupations overall (*Vend*) nor for

Table 8: Impacts of B2B industry on entrepreneurship and new firm size

	(1) Founding owner	(2) Founding owner	(3) Log firm size	(4) Log firm size
Director	0.0648^{**}	0.0506^{**}	0.330^{**}	0.350^{**}
	(0.00319)	(0.00398)	(0.0235)	(0.0283)
Director × B2B		0.0246^{**}		-0.0361
		(0.00531)		(0.0277)
Manager	0.0254^{**}	0.0235^{**}	0.142^{**}	0.146^{**}
	(0.00225)	(0.00325)	(0.0192)	(0.0195)
Manager × B2B		0.00439		-0.0137
		(0.00318)		(0.00934)
Supervisor	0.0103^{**}	0.0119^{**}	0.142^{**}	0.165^{**}
	(4.50*e*-04)	(8.37*e*-04)	(0.00766)	(0.0108)
Supervisor × B2B		-0.00264^{*}		-0.0419^{**}
		(0.00103)		(0.0140)
Engineer	0.00721^{**}	0.00434^{**}	0.0688^{**}	0.0535^{*}
	(8.94*e*-04)	(0.00134)	(0.0124)	(0.0236)
Engineer × B2B		0.00343^{*}		0.0135
		(0.00174)		(0.0251)
Technologist	-0.00340^{*}	-0.00797^{**}	-0.159	-0.254^{*}
	(0.00161)	(0.00243)	(0.0835)	(0.116)
Technologist × B2B		0.00644^{*}		0.137
		(0.00315)		(0.155)
Technician	-0.00142^{**}	-0.00127^{**}	-0.0144	-0.0103
	(2.57*e*-04)	(2.82*e*-04)	(0.00937)	(0.0106)
Technician × B2B		$-2.53e$-04		-0.0107
		(3.08*e*-04)		(0.0104)
Purchasing	0.0112^{**}	0.0170^{**}	0.206^{**}	0.299^{**}
	(8.32*e*-04)	(0.00162)	(0.0255)	(0.0367)
Purchasing × B2B		-0.00926^{**}		-0.169^{**}
		(0.00187)		(0.0459)
Sales	$-8.79e$-04	-0.00115	0.0127	0.0106
	(9.19*e*-04)	(9.22*e*-04)	(0.0255)	(0.0256)
Sales × B2B	3.35*e*-04	7.28*e*-04	0.0237	0.0288
	(0.00103)	(0.00106)	(0.0309)	(0.0314)
Wholesale	0.00318^{*}	0.00324^{*}	-0.0988^{**}	-0.0965^{**}
	(0.00129)	(0.00129)	(0.0272)	(0.0273)
Wholesale × B2B	0.00466^{**}	0.00468^{**}	0.141^{**}	0.136^{**}
	(0.00165)	(0.00164)	(0.0337)	(0.0341)
Retail	-0.00239^{**}	-0.00242^{**}	-0.0956^{**}	$-0.0932**$
	(7.64*e*-04)	(7.67*e*-04)	(0.0186)	(0.0188)
Retail × B2B	0.0102^{**}	0.0103^{**}	0.127^{**}	0.121^{**}
	(0.00117)	(0.00116)	(0.0250)	(0.0254)
Vend	0.00737^{**}	0.00733^{**}	0.0276	0.0277
	(7.39*e*-04)	(7.55*e*-04)	(0.0181)	(0.0182)
Vend × B2B	0.00102	0.00116	-0.0467^{*}	-0.0487^{*}
	(8.75*e*-04)	(9.05*e*-04)	(0.0220)	(0.0223)
B2B	$-9.98e$-04*	-0.00110^{*}	0.0250^{**}	0.0320^{**}
	(4.26*e*-04)	(4.59*e*-04)	(0.00336)	(0.00392)
Mean	0.0128	0.0128	0.848	0.848
R^2	0.175	0.175	0.115	0.115
N	39171879	39171879	449419	449419

Notes: All columns include constant. Columns (1)-(2) include all controls in Column (6) of Table 2. Columns (3)-(4) include all controls in Column (6) of Table 6. In Columns (1)-(2), standard errors clustered at the origin firm level in parentheses. In Columns (3)-(4), robust standard errors in parentheses. ** Significance at one, * five percent levels.

demand-side occupations in the mid-level technician category (Sales), but are strongly supportive for the more specific occupations of wholesaling and retailing. That is, although the coefficients on all interactions except *Vend* in the firm size regression are positive in both regressions, these positive coefficients are only economically and statistically significant for Wholesale and Retail. The increases in probability of becoming a firm founder for workers who were previously employed in wholesaling and retailing in a B2B industry are both 0.8 percentage points, compared to an increase of 0.3 percentage points and a decrease of 0.2 percentage points, respectively, for workers in those occupations who were not previously employed in a B2B industry. Firms started by founders previously employed in wholesaling or retailing in a B2B industry are respectively 27 and 25 percent larger than firms started by founders in those previous occupations who were not employed in a B2B industry.

We have argued that advantages for founding a firm of having worked in an industry that primarily sells to businesses should accrue to workers who were involved in facilitating those sales. If our hypothesis is correct then workers in other occupations should benefit less relative to their counterparts in B2C industries or not at all. In columns (2) and (4) of Table 8 we add interactions with the B2B industry indicator of the remaining specific occupations in Table 7 to the regressions in columns (1) and (3). In the firm size regressions none of the coefficients on the interaction terms for other occupations is positive and statistically significant. In the entrepreneurship regressions the coefficients on the interaction terms are positive (negative) and significant for three (two) of the other occupations. Two of the three positive and significant coefficients affect the probability of becoming a firm founder less relative to their counterparts who were employed in B2C industries than do the coefficients on the interaction terms for Wholesale and Retail.

A comparison of Table 8 with Table 7 shows that missing values for the B2B variable cause us to lose 25 percent of our observations for founding owner and 18 percent of our observations for log firm size. Our inability to assign government (a two-digit industry) to B2B or B2C accounts for 58 and 64 percent of the missing observations for founding owner and log firm size, respectively. Three of the 59 CNAE 1.0 two-digit industries are unassigned, and another seven CNAE 1.0 two-digit industries have at least one unassigned component at a more disaggregated level.

We would like our results to be robust to assignment of any of the industries with missing values of the B2B variable to B2B or B2C. We therefore re-estimated Table 8 assigning each two-digit industry (or part of two-digit industry) with missing values to B2B or B2C consecutively, and examined the results for qualitative differences in the coefficients on the demand-side occupations and their interactions with the B2B industry indicator. To keep our exercise at the two-digit level, when there is more than one unassigned

component within a two-digit industry we assign all of these components to B2B or B2C simultaneously. We thus conduct our exercise a total of ten times. The only qualitative differences in the coefficients under examination are obtained for the exercise using Trade and Repair of Motor Vehicles and Motorcycles and Retail Trade of Fuel, for which the components Retail and Wholesale Trade of Motor Vehicles, Retail and Wholesale Trade of Parts and Accessories for Motor Vehicles, and Retail and Wholesale Trade of Motorcycles, Parts, and Accessories are too aggregated to assign to B2B or B2C. When we simultaneously assign these components to B2B as opposed to B2C, we substantially reduce the coefficient on Retail x B2B in the entrepreneurship regression and the coefficients on Retail, Retail x B2B, and *Vend* x B2B in the firm size regression. This probably occurs because these industry components are dominated by B2C activity, so incorrectly classifying them as B2B reduces the estimated impacts of having worked in a B2B industry for Retail and *Vend*.

5 Robustness and Extensions

Bloom and Van Reenen (2007, p. 1371) report finding "a strong and positive correlation between firm size and management practices" using a sample of 732 medium-sized manufacturing firms in the United States, the United Kingdom, France, and Germany. Their paper is typical of much of the literature in its focus on manufacturing firms, so our results for new firms in Brazil will relate better to this literature if we restrict new firms to manufacturing. We would also like to know whether our results are robust to this restriction. In Table 9 we repeat the regressions in Table 7, letting the dependent variable in the entrepreneurship regression equal one only if the former worker founds a manufacturing firm (CNAE with first two digits 15-37) and restricting the sample for the new firm size regression to manufacturing firms. We add to the entrepreneurship regression an indicator for whether the industry assigned to the worker at his last job was in the manufacturing sector. There is little qualitative change in our results for the impacts of former managerial and former non-managerial occupations. In the entrepreneurship regression the coefficients on the former managerial occupations continue to be ranked director, manager, supervisor, and all of them are larger relative to the mean of the dependent variable than they were for the full sample. In the firm size regression the coefficient on director is substantially larger and the coefficients on manager and supervisor essentially exchange places relative to the full sample regression. Purchasing is still the only former non-managerial occupation with larger coefficients in both regressions than the smallest coefficients for former managerial occupations.

In all our regressions we have entered our measures of generic human capital linearly, but the literature does not necessarily predict that propensity to become an entrepreneur in particular increases monotonically

Table 9: Occupational determinants of entrepreneurship and new firm size in manufacturing

	(1)	(2)
	Founding owner	Log firm size
Director	0.0133^{**}	0.495^{**}
	$(7.03e\text{-}04)$	(0.0582)
Manager	0.00845^{**}	0.137^{**}
	$(4.41e\text{-}04)$	(0.0371)
Supervisor	0.00263^{**}	0.157^{**}
	$(1.52e\text{-}04)$	(0.0201)
Engineer	$8.15e\text{-}04^{**}$	0.0486
	$(2.60e\text{-}04)$	(0.0424)
Technologist	$-1.54e\text{-}04$	-0.0403
	$(9.12e\text{-}04)$	(0.232)
Technician	$-3.36e\text{-}04^{**}$	0.00858
	$(7.56e\text{-}05)$	(0.0270)
Purchasing	0.00519^{**}	0.292^{**}
	$(5.50e\text{-}04)$	(0.0783)
Sales	$6.05e\text{-}04^{*}$	0.0726
	$(2.77e\text{-}04)$	(0.0572)
Wholesale	$7.93e\text{-}04^{*}$	0.0824
	$(3.76e\text{-}04)$	(0.0644)
Retail	$-7.69e\text{-}04^{**}$	0.0455
	$(2.41e\text{-}04)$	(0.0446)
Vend	0.00232^{**}	-0.00838
	$(2.09e\text{-}04)$	(0.0413)
Manufacturing	0.00855^{**}	
	$(2.94e\text{-}04)$	
Mean	0.00211	1.107
R^2	0.128	0.108
N	51936097	60581

Notes: All columns include constant. Column (1) includes all controls in Column (6) of Table 2. Column (2) includes all controls in Column (6) of Table 6. In Column (1), standard errors clustered at the origin firm level in parentheses. In Column (2), robust standard errors in parentheses. ** Significance at one, * five percent levels.

with worker ability. Poschke (2013), for example, predicts a U-shaped relationship between entrepreneurship and ability. We experimented with consecutively adding to both regressions in Table 7 the second, third, and fourth powers of the previous log wage, probably our best proxy for generic worker ability. These experiments left our results for the impacts of former managerial and former non-managerial occupations qualitatively unchanged. It is worth noting that in the quadratic specifications for previous log wage the coefficient on the linear term remains positive and statistically significant in both the entrepreneurship and firm size regressions, and the coefficient on the squared term is negative and statistically significant in the

entrepreneurship regression and statistically insignificant in the firm size regression.

We have interpreted the economically large impacts of former managerial occupations on propensity to become a founding owner and on new firm size as evidence for the importance of managerial "talent" or aptitude. One could argue that a better term would be "experience." Recall, however, that we control for log months of tenure in the worker's previous job. An increase in tenure from the minimum of three months to the sample mean in the entrepreneurship regression of Table 7 increases the probability of becoming a founding owner by 0.7 percentage points compared to the mean probability of 1.1 percent, and an increase in tenure from the minimum to the sample mean in the log firm size regression of Table 7 increases firm size by 0.7 percent (tenure is significant at only the ten percent level in this regression). There are many reasons why tenure in any previous job would, conditional on leaving that job and independent of generic ability, have a positive impact on probability of becoming an entrepreneur and on new firm size. The founders of successful firms interviewed by Bhide (2000, p. 32) "typically imitated someone else's ideas that they often encountered in the course of a previous job." Presumably the longer was a worker's tenure in his previous job, the more ideas he encountered and the better he learned them. Muendler, Rauch and Koyama (2024) provide evidence that workers who become entrepreneurs recruit their co-workers to their new firms. The longer their tenure the more co-workers they will have gotten to know.

The question is whether tenure in managerial occupations is more important for entrepreneurial productivity than tenure in other occupations. We investigate this question by adding interactions between log months of tenure and the eleven indicators for former managerial, demand- and supply-side occupations to the regressions in Table 7. As seen in Table 10, the coefficients on these interactions are all positive and are statistically significant for eight of the eleven occupations in the entrepreneurship regression, including the three managerial occupations. In the firm size regression the coefficients on the interactions are positive and statistically significant for directors and managers, negative and statistically significant for supervisors, and statistically insignificant for the other occupations. In the entrepreneurship regression the coefficient on the tenure interaction for supervisors is the smallest of the eight statistically significant interactions, so the evidence from both regressions is clearly against greater importance of tenure for entrepreneurial productivity of supervisors than for other occupations. The opposite is true for directors, the rarest of the three managerial occupations. The coefficient on the tenure interaction for directors is by far the largest in the entrepreneurship regression, and a director with minimum tenure would realize only about two-thirds of the increase in new firm size achieved by a director with the average director tenure. For managers, the most common of the three managerial occupations, the evidence is mixed. The coefficient on the tenure interaction for managers in the entrepreneurship regression is similar to the coefficients for purchasers, wholesalers,

Table 10: Impacts of tenure on entrepreneurship and new firm size

	(1) Founding owner	(2) Log firm size
Director	0.00320	0.186**
	(0.00401)	(0.0454)
Director × Tenure	0.0137**	0.0404**
	(0.00140)	(0.0118)
Manager	0.0128**	0.124**
	(0.00377)	(0.0173)
Manager × Tenure	0.00585**	0.0112**
	(0.00141)	(0.00415)
Supervisor	0.00596**	0.219**
	(9.99e-04)	(0.0221)
Supervisor × Tenure	9.88e-04**	−0.0270**
	(3.68e-04)	(0.00593)
Engineer	0.00341	0.0529
	(0.00242)	(0.0344)
Engineer × Tenure	0.00182	0.00303
	(9.29e-04)	(0.00931)
Technologist	−0.00368	−0.282
	(0.00435)	(0.254)
Technologist × Tenure	6.89e-04	0.0387
	(0.00149)	(0.0839)
Technician	−0.00382**	−0.0313
	(3.43e-04)	(0.0172)
Technician × Tenure	0.00106**	0.00624
	(0.00010)	(0.00439)
Purchasing	−0.00553**	0.244**
	(0.00204)	(0.0802)
Purchasing × Tenure	0.00561**	−0.0121
	(6.68e-04)	(0.0212)
Sales	−0.00224	−0.00497
	(0.00147)	(0.0496)
Sales × Tenure	7.19e-04	0.0136
	(5.61e-04)	(0.0150)
Wholesale	−0.00756**	−0.0434
	(0.00220)	(0.0557)
Wholesale × Tenure	0.00476**	0.0126
	(9.83e-04)	(0.0170)
Retail	−0.0130**	−0.0261
	(0.00176)	(0.0374)
Retail × Tenure	0.00462**	−0.00874
	(7.17e-04)	(0.0117)
Vend	5.07e-04	0.00686
	(9.09e-04)	(0.0347)
Vend × Tenure	0.00245**	−0.00536
	(3.93e-04)	(0.0108)
Log tenure	0.00229**	0.00191
	(8.28e-05)	(0.00157)
Mean	0.0114	0.832
R^2	0.162	0.113
N	51936097	546698

Notes: All columns include constant. Column (1) includes all controls in Column (6) of Table 2. Column (2) includes all controls in Column (6) of Table 6. In Column (1), standard errors clustered at the origin firm level in parentheses. In Column (2), robust standard errors in parentheses. ** Significance at one, * five percent levels.

and retailers, and a manager with minimum tenure would realize more than 80 percent of the increase in new firm size achieved by a manager with the average manager tenure. Our interpretation of the evidence in Table 10 on directors and managers is that managerial experience is subordinate to managerial talent as the explanation for the exceptional entrepreneurial productivity of managers but dominant as the explanation for directors.

Larger firms tend to have more layers of hierarchy (Caliendo, Monte and Rossi-Hansberg 2015). Larger firms are therefore more likely to employ supervisors, managers, and especially directors. If experience at a large firm helps a worker to make the firm he founds larger, this could account for some of the association of former managerial occupations with new firm size. To control for this possibility we added the log of origin firm size to the right-hand side of the firm size regression in Table 7. Its coefficient was statistically insignificant and the coefficients on the occupation indicators were virtually unchanged.

6 Concluding Remarks

We investigated creation of new jobs in limited liability firms in Brazil by firm founders who were previously employees in the formal sector. Managers are five percent of former job holders but their startups account for 27 percent of new firm employment. Our regression analyses support the interpretation that managerial talent rather than generic human capital is responsible for most of former managers' overrepresentation as firm founders and the larger size of their startups. Among non-managerial former occupations, we found that individuals previously employed in purchasing supplies from or selling products to other businesses were substantially more likely to become firm founders and started substantially larger firms.

Our investigation leaves open the question of the extent to which managerial talent can be quantified by the good management practices identified by Bloom and Van Reenen (2007). This will inform the degree to which managerial "talent" can be taught, and thus the emphasis that policy should place on such training. Iacovone, Maloney and McKenzie (2022) show that relatively low cost management consulting can increase employment, sales, and profits of existing firms in Colombia. Gonzalez-Uribe and Leatherbee (2018) find that participation in an entrepreneurship school provided by a business accelerator in Chile leads to an increase in the mean number of startup employees from 0.9 to 1.8. Regarding business relationships, Cai and Szeidl (2018) show experimentally that organizing meetings can stimulate formation of relationships between existing businesses in China, with benefits for employment, profits, and sales. Similar ideas to foster business relationships that would help startups have, to our knowledge, yet to be experimentally

explored.

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