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# YOU CAN TAKE THEM WITH YOU: RECRUITING COWORKERS TO ONE'S OWN NEW FIRM

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## ABSTRACT

New firms do not yet have employees who can aid recruiting by referrals, but entrepreneurs can recruit workers they know to their startups—in effect making their own referrals. We consider new firms in Brazil's formal sector founded between 2002 and 2014, for which at least one founding owner can be traced to previous formal employment. We find that 35.1 percent of new firms with at least five employees hire one or more coworkers from a founding owner's last employer in their first year of operation, and that 9.2 percent of first-year hires at new firms were coworkers at a founding owner's last employer. The former coworkers most likely to join a founding owner's new firm are those who, at their last employer, worked in the same plant as a founding owner, had long overlap with a founding owner, were classified in the same industry or occupation as a founding owner, and were hired at roughly the same time as a founding owner. Controlling for observable human capital and new firm fixed effects, former coworkers earn eight percent higher initial wages at new firms and are six percentage points less likely to separate before a new firm's second year of operation. We find that the coworker wage premium diminishes with tenure by 0.5 percentage points per year and the coworker separation premium diminishes with tenure by 2.0 percentage points per year.



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# 1 Introduction

The ability to hire employees for their new firms is crucial to realizing the contribution of entrepreneurs to economic growth. For existing firms it is common to hire employees using referrals.[1] Many large existing U.S. firms have programs that specifically encourage employees to make referrals. This method of recruiting is not available to new firms, however, because they do not yet have employees who can make referrals.

A potential entrepreneur does have the ability to make his own referrals: he can recruit people he knows to his new firm. This has at least one advantage and one disadvantage relative to employee referrals to existing firms. An advantage is that the entrepreneur is likely to know the needs of his firm, and the fit of a worker to those needs, at least as well as any employee. A disadvantage is that the needs of a new firm are likely to be less clear than the needs of an existing firm.

We consider new firms in the formal sector of Brazil founded during the period 2002-2014, for which at least one founding owner can be traced to previous formal sector employment. For these firms we examine recruitment of coworkers from the founding owners' last employers. At their last employers, founding owners are likely to have begun planning their new firms and thus begun interacting with their coworkers having firm-startup plans in mind. Moreover, prospective founders may have gotten the ideas for their new firms from activities at their last employers (Bhidé 2000, Klepper and Sleeper 2005, Muendler, Rauch and Tocoian 2012), so their current coworkers are more likely to have relevant skills than coworkers at any previous employers.[2]

We will address three broad questions using our Brazilian data. First, how common is it for entrepreneurs to recruit coworkers from their last employers to their new firms? Second, which coworkers from the last employers join the entrepreneurs' new firms? Third, how does the performance of former coworkers at the new firms compare to that of other founding employees?

We find that 35.1 percent of new firms with five or more employees in their first year of operation have at least one founding worker who is a former coworker of a founding owner. For this subset of firms, we find that 23.3 percent of all founding workers are former coworkers of a founding owner. Considering all founding workers of all new firms in our sample, 9.2 percent are former

[1] Topa (2011) reports, "A consensus estimate, based on studies that span the past three decades and use a variety of data sources both from the U.S. and from other countries, is that at least half of all jobs are typically found through informal contacts rather than through formal search methods."

[2] Entrepreneurs may also recruit workers they met in the informal sector or outside the workplace, including at suppliers, clients, and other new firms. This recruitment is beyond the scope of our paper.

coworkers of founding owners. Former coworkers from the same plant of the last employer as a founding owner of a new firm are far more likely to join the new firm than former coworkers from different plants, controlling for last employer-new firm fixed effects. Within a given plant, former coworkers of a founding owner are substantially more likely to join the founder's new firm if their employment overlap with the founder was long, if they were classified as working in the same two-digit industry as the founder, if they were hired at roughly the same time as the founder, and if they held the same one-digit occupation as the founder. Controlling for observable human capital and new firm fixed effects, former coworkers earn eight percent higher initial wages at new firms and are six percentage points less likely to separate from the firm before a new firm's second year of operation. We find that the coworker wage premium diminishes with tenure by 0.5 percentage points per year and the coworker separation premium diminishes with tenure by 2.0 percentage points per year.

In the job referral literature, referrals from former coworkers are typically inferred rather than observed (Cingano and Rosolia 2012, Hensvik and Skans 2016, Glitz 2017, Saygin, Weber and Weynandt 2021). We can be reasonably certain that the founding owners were involved in hiring and thus made the referrals, because the vast majority of new firms hire a small number of employees at startup: the mean founding-year employment of new firms in the sample we use to analyze recruitment is 4.2, and the median is 2.0. Certain explanations for referral productivity, such as working hard so the referrer will not be punished (Heath 2018), are irrelevant in our context. We cannot, however, narrow the explanations to the same extent as some of the experimental referral literature. The founding owner may have discovered at his previous employer that he and the former coworker work well together, and they continue this teamwork at the new firm (Pallais and Glassberg Sands 2016).[3] The founder may have correctly projected that the former coworker is a good match for the needs of his new firm (Jovanovic 1979). The former coworker might have specialized skills developed at the last employer that are also well suited to the new firm, or he might have high generic ability. An advantage of the teamwork and match quality explanations over the specialized skills and generic ability explanations is that the former explanations clarify why a startup can poach a worker without necessarily having an advantage relative to the previous employer in technology or product demand.

Our findings on wages and separations of former coworkers resemble previous evidence in

[3]The productivity benefits of "team specific human capital" accumulated through past shared work experience have recently been demonstrated by Chen (2021).

Simon and Warner (1992), who document facts consistent with the idea that referrals from current employees are more informative about match quality than direct applications or applications through intermediaries. More recent papers by Brown, Setren and Topa (2016), Burks et al. (2015), Dustmann et al. (2016), and Glitz and Vejlin (2021) update, confirm and extend the earlier findings by Simon and Warner (1992). Our results are consistent with the (extensions of the) Jovanovic (1979) model used in these papers and in Muendler and Rauch (2015), though other explanations are possible.

Since the new firms we examine are all founded by former employees, they meet a minimal criterion for being labeled as employee spinoffs from the founders' former employers. However, in the literature a new firm must take more than just its owner from the "parent" firm in order to be considered an employee spinoff. It might take product ideas (Franco and Filson 2006), market leads (Muendler and Rauch 2018), or staff (Eriksson and Kuhn 2006).[4] We do not wish to restrict our analysis to employee spinoffs, and therefore cover all new firms (with listed owners) started by former employees of formal sector firms.

In the next section we describe our data. Our answers to the question as to how common it is for entrepreneurs to recruit coworkers from their last employers to their new firms are in Section 3. We address the question as to which coworkers from the last employers join the entrepreneurs' new firms in Section 4. In Section 5, we answer the question as to how the performance of former coworkers at the new firms compares to that of other founding employees. 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

[4]Note that the papers that use worker flows from parents to "offspring" to identify employee spinoffs (Eriksson and Kuhn 2006, Muendler, Rauch and Tocoian 2012) do not have ownership data, that is, they do not establish that the spinoffs were founded by former employees of the parents.

digits of the 14-digit firm-plant ID CNPJ 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.[5] 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 reports 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.[6] 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.[7]

[5]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 (Brasileiro de Geografia e Estatística 2024) 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.

[6]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.

[7]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 a 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.

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 workers at Brazil's central bank. The year 2002 is the first year of our estimation 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 final year of our sample period.

We identify new firms as firms with eight-digit CNPJ IDs that did not appear in RAIS prior to 2002 (we search back to 1986 in RAIS, the first year available to us).[8] 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. 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 proprietor 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. Muendler and Rauch (2021) find 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 a lack of owner attention compared to firms founded by owners who leave their jobs.

# 3 Frequency of Hiring Former Coworkers

In this section we assess how common it is for firm founders to employ former coworkers at their new firms. To make it easy to interpret our results, we begin by defining terms. Three terms were already defined, explicitly or implicitly, in the previous section. A *new firm* is a firm with limited

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

liability legal form that first appears in RAIS during the period 2002-2014. The year in which a new firm first appears in RAIS is the *founding year*. An individual who is listed as an owner of a new firm in its founding year, or earlier, is a *founding owner*. To these we add three more definitions. A *founding worker* is an employee who works at a new firm in a spell of at least three months during the twelve-month period beginning with the first month of the first employee spell at the new firm in its founding year. An *origin firm* is a firm at which a founding owner previously worked in a spell of at least three months during the year he or she founds a new firm, or earlier, without any intervening (formal sector) employment. In other words, an origin firm is a firm at which a founding owner held his last job. Finally, an employee at an origin firm whose employment spell overlapped for at least one month with the employment spell of a founding owner at the origin firm is a *former coworker*.

We need to focus on the subset of new firms for which it is feasible to identify the former coworkers of the founding owners. This requirement means we only consider new firms for which all founding owners can be traced to previous jobs. We also require that RAIS reports the characteristics of those owners at their last jobs that will be important in the analysis of the next section, such as age, education, gender, and occupation. We call these owners "traceable." During the period 2002-2014 there are 606,375 new firms whose founding owners are each traceable, with December employment of 2,579,455.[9]

We add one final restriction to this set of new firms: all founding owners must have separation codes from their origin firms. That is, they must have separated from their last employers, and reasons must have been reported for their separations. This restriction is important for two reasons. First, when founding owners continue to work at their last employers the coworkers they recruit may be current as well as former, and the recruiting process may be qualitatively different than for founding owners who separate from their last employers. Second, a separation code specifies the month of separation, facilitating computation of employment overlap between founding owners and their (former) coworkers.[10] This restriction yields a sample of 354,435 new firms with December employment of 1,491,020.

[9]We exclude new firms with zero founding workers from these counts and from our subsequent analysis. New firms can have positive December employment yet zero founding workers because no worker spell lasts at least three months during the first twelve months of the firm's operation.

[10]Of the 74 percent of founding owners of new firms (all of whose founding owners are traceable) that separated from their origin firms, 87 percent have codes for cause of separation. The other 13 percent are not recorded as having separated but are also no longer recorded as employed in their previous jobs.

For this sample of new firms, we consider three measures of frequency with which former coworkers are hired by founding owners. First, how often do founding owners hire at least one former coworker among their founding workers? This is the extensive margin of former coworker hiring and tells us how common it is for recruitment of former coworkers to play at least some role in firm startup. Second, what is the former coworker share in hiring of new firms that hire former coworkers of the founding owners? This is the intensive margin of former coworker hiring and indicates how important a role recruitment of former coworkers plays for this subset of new firms. Third, what is the share of former coworkers in all founding workers?

Intuition suggests, and the data confirm, that the larger is a firm at founding, the more likely it is that at least one founding worker is a former coworker of a founding owner. As measured by employment in December of its founding year, the median new firm size is two workers and the mean is 4.2 workers. The modal new firm has only one worker. These comprise 40.8 percent of all new firms, and in only 9.1 percent of them is the one worker a former coworker of a founding owner. Firms with five or more workers comprise 21.2 percent of all new firms and 66.7 percent of new firm December employment. As we see from the right-most column of Table 1, 35.1 percent of these firms have at least one founding worker who is a former coworker of a founding owner. For this subset of firms, we find that 23.3 percent of all founding workers are former coworkers of a founding owner. Considering all founding workers of all new firms in our sample, 9.2 percent are former coworkers of founding owners.

In Table 1 we also compare the frequency of hiring former coworkers of founding owners between new firms in the same versus different two-digit industries as their origin firms.[11] We see from the last row of Table 1 that new firms in the same two-digit industries as their origin firms account for roughly one-third of all new firm employment. We might expect founders of these new firms to be more likely to hire their former coworkers, and this is confirmed by Table 1. The former coworker share of employment in new firms in the same two-digit industries as their origin firms is two and one-half times greater than for new firms in different two-digit industries from their origin firms. Considering new firms with at least five employees, more than half of those in the same two-digit industries as their origin firms hire at least one former coworker. Even when the new firm is in a different two-digit industry from its origin firm, however, a quarter of these larger new firms have at least one founding worker who is a former coworker of a founding owner.

[11] A firm is assigned the industry that is most frequently assigned to its workers.

Table 1: Employment of Former Coworkers by New Firms

| | Same industry as origin firm | Different industry from origin firm | Total |
|---|---|---|---|
| **New firms with at least five employees** | | | |
| Share of new firms with former coworker | 56.9 | 25.0 | 35.1 |
| (Share of new firms) | (31.7) | (68.3) | (100.0) |
| Former coworker share of employment | 25.4 | 21.0 | 23.3 |
| (Share of employment) | (53.1) | (46.9) | (100.0) |
| **All new firms** | | | |
| Former coworker share of employment | 15.6 | 6.1 | 9.2 |
| (Share of employment) | (32.8) | (67.2) | (100.0) |

*Sources*: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot).
*Notes*: Share of new firms with former coworker is the fraction of new firms with at least five employees that also employ at least one former coworker. Former coworker share of employment is the fraction of former coworkers in the total employment at these new firms, or at all new firms. Shares in parentheses are the fraction of a column entry in the row total. Numbers in percent. Industries at *CNAE* 2-digit level.

In sum, recruitment of former coworkers accounts for a substantial fraction of startup hiring for a substantial share of larger new firms. Recruitment of former coworkers accounts for a non-trivial share of all startup hiring for all new firms with founding owners who have a formal sector work history, but appears to be clearly below the range of estimates for share of jobs in existing firms that are filled through referrals.

# 4 Former Coworkers Joining New Firms

In this section we continue to restrict our sample to former coworkers of founding owners who have separation codes from their origin firms. In considering which former coworkers become founding workers of these entrepreneurs' new firms, we impose a further restriction to workers who have separation codes from their origin firms before the ends of the new firms' twelve-month founding periods. We have two reasons for imposing this restriction. First, the factors leading workers to accept employment at new firms may be qualitatively different between those who separate from their previous employers and those who do not. Second, our analysis will consider the length of former coworker employment overlap with the founding owner(s). This will be positively correlated with tenure at the origin firms, which in turn we expect to be negatively

correlated with the probability of separation from the origin firms.[12] We are not interested in analyzing why workers separate from the origin firms, only which workers find employment with new firms founded by their former co-workers, as opposed to other possible employers.

In our first regressions analyzing which former coworkers join the founding owners' new firms, we will report our results without and with origin firm-new firm pair fixed effects. From our sample of 354,435 new firms, 19.7 percent have founding owners from multiple origin firms. We consider multiple sets of former coworkers (hence multiple fixed effects) for each of these new firms. A new firm may also have multiple founding owners from the same origin firm; this occurs for 5.5 percent of our sample.[13] For 31.3 percent of these new firms the owners left the origin firm in the same year, in which case we average over the multiple owners any explanatory variables for former coworkers, such as length of employment overlap. For the other 68.7 percent of these new firms the owners left the origin firm in different years, in which case we treat each origin firm-year as a separate group of observations instead of averaging, leading to origin firm-year-new firm fixed effects. If multiple new firms have the same founding owner, the former coworkers of that owner are observed multiple times.[14] Our sample of new firms has 423,875 founding owners, of whom 4.8 percent founded more than one firm.

When origin firms have more than one plant, we expect former coworkers who overlapped with the founders at the same plants to be much more likely to join the new firms than former coworkers who overlapped with the founders at different plants. Overlap at the same plant yields much greater opportunities for interactions with founding owners, and may entail skills more relevant to the new firm. Since workers may change plants within a firm, it is possible for former coworkers to overlap with founders at both same plants and different plants. We create indicators for same-plant overlap and different-plant overlap for every former coworker with each founding owner of a new firm. For each worker corresponding to a given origin firm-year-new firm combination we then derive from these indicators the variables "same-plant overlap" and "different-plant overlap." As a result of averaging across multiple owners who left the origin firm in the same year, these variables take on fractional values (rather than zero or one) for 0.04 and 0.03 percent of observations, respectively.

[12]Farber (1999) states that one of the "central facts" that "describe inter-firm worker mobility in modern labor markets" is that "the probability of a job ending declines with tenure."

[13]Note that the multiple founding owners may be former coworkers in this case. We remove founders from all calculations involving former coworkers.

[14]In 0.4 percent of these cases the founding owners are associated with multiple origin firms, each with its own set of former coworkers. These rare cases occur when a founding owner returns to employee status at a different origin firm, then separates and founds another new firm.

Table 2: Former Coworkers Who Separated from Multi-plant Origin Firms

| | Overlap with Founding Owners of New Firms | | |
|---|---|---|---|
| | Same Plant | Different Plant | Both |
| Share of Total | 14.1 | 82.9 | 2.9 |
| Share of Subset that Joined the New Firms | 61.5 | 24.8 | 13.6 |

*Sources*: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot).
*Note*: Numbers in percent.

Table 2 shows that former coworkers with positive different-plant overlap and zero same-plant overlap are nearly six times as numerous as former coworkers with positive same-plant overlap and zero different-plant overlap, yet the latter make up 62 percent of new firm joiners compared to 25 percent of the former. The small minority of workers with positive same- and different-plant overlap are the most over-represented among new firm joiners. In Table 3 we examine the impacts of same-plant overlap and different-plant overlap on the probability of becoming a founding worker in a regression framework. The dependent variable is an indicator for whether a former coworker joined a new firm. There are nearly 1.8 billion observations, and the mean probability of joining is 56 per million. The coefficient on same-plant overlap in the first column of Table 3 is four times this mean. When we add origin firm-year-new firm fixed effects in column (2), this coefficient increases slightly. The coefficient on different-plant overlap is statistically insignificant without or with fixed effects.

A concern is that the effect of same-plant overlap reflects the impact of working or living in the same place rather than working in the same plant. To address this concern, in columns (3) and (4) of Table 3 we add a variable indicating whether the plant in which a former coworker was employed when overlapping with a founding owner was in the same municipality as the founding owner's plant. This is identically equal to one when same-plant overlap equals one. We also add a variable indicating whether the plant in which a former coworker was employed when overlapping with a founding owner was in a different municipality from the founding owner's plant, because same and different municipality, like same- and different-plant overlap, are not mutually exclusive. Addition of these variables reduces the coefficient on same-plant overlap from four times the mean probability of joining in column (1) to three times the mean probability of joining in column (3). When we add origin firm-year-new firm fixed effects in column (4), this coefficient increases to three and one-half times the mean probability of joining. The different municipality variable has

Table 3: Probability That Coworkers from Multi-plant Origin Firms Join New Firms

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Same-Plant Overlap | 0.000228** | 0.000239** | 0.000171** | 0.000200** |
| | (1.89e-05) | (1.62e-05) | (1.82e-05) | (1.75e-05) |
| Different-Plant Overlap | -5.30e-08 | 2.32e-05 | -9.74e-06 | -1.54e-06 |
| | (1.90e-05) | (1.52e-05) | (1.97e-05) | (1.57e-05) |
| Plant in Same Municipality | | | 7.83e-05** | 7.68e-05** |
| | | | (1.27e-05) | (1.15e-05 ) |
| Plant in Different Municipality | | | 2.27e-05 | 6.23e-05** |
| | | | (1.51e-05) | (1.21e-05) |
| Origin Firm-Year-New Firm FE | – | 257,251 | – | 257,251 |
| Mean Probability | | 5.60e-05 | | |
| $N$ | | 1,784,205,322 | | |
| $R^2$ | 0.00013 | 0.08908 | 0.00014 | 0.08908 |

*Sources*: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot).
*Notes*: All columns include constant. Standard errors in parentheses, clustered at new firm level. ** Significance at one, * five percent levels.

an anomalous positive coefficient in this last column.

Next we look inside plants to examine which former coworkers in a given plant join the founder(s) at his new firm. In light of our results on the probabilities of joining new firms of coworkers who overlapped with founders at the same versus different plants, we will focus on coworkers who overlapped only at the same plants. To reinforce this decision, in the Appendix we examine the three percent of workers from multi-plant origin firms who overlapped with founders at both same and different plants. This allows us to simultaneously include explanatory variables measured at same and different plants. For all but one explanatory variable the association with the probabilities of joining new firms has the expected sign and is statistically significant when measured for same plants, and has the wrong sign or is statistically insignificant when measured for different plants.

Table 4 examines the determinants of the probability of joining a new firm for former coworkers from the same plants as founding owners. Of the sample of coworkers covered in this table, 58.5 percent are from the same plants as the new firm founders by virtue of being from single-plant origin firms, and the remaining 41.5 percent are from the same plants of multi-plant origin firms. (The three percent of workers from multi-plant origin firms who overlapped with founders at both same and different plants are excluded.)

The first explanatory variable we examine is the (logarithm of the) months of overlap between former coworkers and founding owners. The longer the overlap of a coworker with a founder, the more opportunities there will have been for the founder to learn about the coworker. As mentioned in the introduction, the founder could have learned that he and the former coworker work well together, or that the former coworker is likely to be a good match for the needs of his new firm (assuming these are not identical to the needs of the origin firm), or that the former coworker has high generic ability.[15] Longer overlap will also be correlated with a shorter period of separation between the coworker and founder, hence less time for founder familiarity with the former coworker to erode. We exclude any effect of shorter separation by restricting the coworker sample to those present in the month the founder leaves the origin firm. We will thus estimate the impact of length of overlap on the probability that departing coworkers will join the new firm, where the new firm's founder(s) has separated from all the departing coworkers for the same length of time and all the coworkers are from the same former employer in the same year (we include former employer-year-new firm fixed effects).

In the first column of Table 4 we regress an indicator for whether a coworker joined the founding owner's new firm on the logarithm of his months of (same-plant) employment overlap with the founder and controls for the coworker's age group, education group, gender, nationality, and one-digit occupation at the origin firm (coefficients on the controls are not reported).[16] As in Table 3, origin firm-year-new firm fixed effects are included to control for factors that affect the likelihood that any coworker at a given origin firm in a given year will move to a given new firm. We see that the impact of length of overlap on the probability that a coworker joins the founder's new firm is not only positive but quantitatively large relative to the mean probability. Compared to the minimum overlap of one month, the mean overlap of roughly 20 months increases the probability that a coworker joins the new firm by 0.04 percentage points, where the mean probability is 0.046 percent.

[15]The founder could have learned something negative instead, but this can only reduce a negligible probability of an offer to zero, whereas learning something positive can increase a negligible probability of an offer to as high as one. As noted in the introduction, an advantage of the teamwork and match quality explanations over the generic ability (or specialized skills) explanation is that they can show how the new firm can poach a worker without necessarily having an edge relative to the previous employer in technology or product demand.

[16]The one-digit occupation groups are 0, "Armed forces, police and military firefighters;" 1, "Senior members of the government, leaders of organizations of public interest and companies and managers;" 2, "Science and arts professionals;" 3, "Mid-level technicians;" 4, "Workers in administrative services;" 5, "Service workers, sales workers in stores and markets;" 6, "Agricultural, forestry, hunting and fishing workers;" 7 and 8, "Workers producing industrial goods and services;" and 9, "Maintenance and repair workers."

Table 4: Determinants of Probability That Same-plant Coworkers Join New Firms

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| Log Months of Overlap | 0.00013** | 0.00013** | 0.00151** | 0.00149** |
| | ( 3.90e-06) | (3.84e-06) | (3.18e-05) | (3.23e-05) |
| Same Hiring Cohort | | 0.00012** | | 0.00075** |
| | | (1.03e-05) | | (7.65e-05) |
| Same Age Group | | -2.78e-06 | | 0.00017** |
| | | (3.68e-06) | | (3.87e-05) |
| Same Education Group | | 2.29e-05** | | 0.00024** |
| | | (4.36e-06) | | (3.95e-05) |
| Same Gender | | 4.46e-05** | | 0.00044** |
| | | (3.99e-06) | | (3.79e-05) |
| Same Industry | | 0.00032** | | 0.00171** |
| | | (4.79e-05) | | (0.00025) |
| Same Nationality | | 2.06e-05 | | -0.00240** |
| | | (2.32e-05) | | (0.00021) |
| Same Occupation | | 0.00010** | | 0.00068** |
| | | (5.15e-06) | | (4.57e-05) |
| Log Months of Overlap × Log Plant Size | | | -0.00013** | -0.00013** |
| | | | ( 2.75e-06) | (2.79e-06) |
| Same Hiring Cohort × Log Plant Size | | | | -7.56e-05** |
| | | | | (7.10e-06) |
| Same Age Group × Log Plant Size | | | | -1.37e-05** |
| | | | | (3.39e-06) |
| Same Education Group × Log Plant Size | | | | -2.05e-05** |
| | | | | (3.43e-06) |
| Same Gender × Log Plant Size | | | | -3.78e-05** |
| | | | | (3.28e-06) |
| Same Industry × Log Plant Size | | | | -0.00017** |
| | | | | (2.56e-05) |
| Same Nationality × Log Plant Size | | | | 0.00025** |
| | | | | (2.09e-05) |
| Same Occupation × Log Plant Size | | | | -5.52e-05** |
| | | | | (3.94e-06) |
| Origin Firm-Year-New Firm FE | 354,053 | | 351,686 | |
| Mean Probability | 0.00046 | | 0.00045 | |
| $N$ | 188,178,549 | | 187,248,327 | |
| $R^2$ | 0.27740 | 0.27740 | 0.27702 | 0.27705 |

*Sources*: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot).
*Notes*: All columns include constant; indicators for 25-29, 30-39, 40-49, 50-64 and over-65 age groups, with 18-24 age group omitted category; indicators for some high school, some college, and college degree or more, with middle school or less omitted category; indicator for female; indicators for previous one-digit occupation code. Plant size is employment. Standard errors in parentheses, clustered at new firm level. ** Significance at one, * five percent levels.

A number of variables in addition to length of overlap should affect the probability that a former coworker joins a founding owner at his new firm. We can think of a founder as having formed a network of relationships at his origin firm. One of the most robust features of social networks is "homophily," the tendency for people to be linked to others who are similar to them along observable dimensions (McPherson, Smith-Lovin and Cook 2001). We therefore add indicators for homophily between former coworkers and founders, indicating whether a former coworker and the founder of a new firm are in the same age group, the same education group, the same two-digit industry,[17] the same one-digit occupation, have the same gender, or have the same nationality. Chen-Zion and Rauch (2020) predict that mutual openness to new work relationships will lead members of the same hiring cohort to link to each other, so we add an indicator for whether a former coworker and the founder of a new firm were hired at the origin firm within two months of each other. Positive values of any of these indicators might also increase the probability that the former coworker is a good match for the founder's new firm.

All of these indicators are included in the second column of Table 4. Being in the same two-digit industry, the same hiring cohort, and the same one-digit occupation have the largest impacts on the probability that a coworker will join the founder's new firm, with the probability respectively increasing by 70, 26, and 22 percent relative to the mean. The coefficient on log months of overlap remains virtually unchanged relative to the first column of Table 4.

Muendler and Rauch (2021) find that the number of workers that were in the origin firm from which the founder(s) of a new firm separated is not a determinant of the number of workers hired by the new firm. This is important in the context of Table 4 because, if the number of workers hired by the new firm does not increase with the number of workers present at the origin firm plant when the founder(s) separates, the mean probability that a former coworker from the origin firm plant will join the new firm will tend to fall with the size of the origin firm plant.[18] Indeed, a regression of this mean probability for origin firm-year-new firm groups on the logarithm of origin firm plant size yields a coefficient of -0.00691 (with a standard error of 0.00007). Since the coefficients on the right-hand side variables in Table 4 tend to scale with this mean probability, they tend to be smaller (in absolute value) for larger origin firm plants. To capture this tendency we add an interaction of log origin firm plant size with each right-hand side variable to the regressions in Table 4. (The

[17]Workers in the same origin firm can be classified in different industries, but this is rare: the mean of the same industry indicator is 0.97.

[18]By definition, all workers present at the origin firm plant in the last month of the founder's employment are former coworkers.

direct effect of plant size is captured by the origin firm-year-new firm fixed effects.) As expected, the estimated interaction effects all shrink the impacts of the explanatory variables as origin firm plant size increases, as seen in the fourth column of Table 4. The coefficients on the explanatory variables themselves give the impacts on the probability that a former coworker will join the new firm when there is only one worker at the origin firm plant when the new firm founder separates.[19]

We can summarize our answers to the question asked by the title of this section as follows. At a multi-plant origin firm, former coworkers from the same plant as the founding owner of a new firm were far more likely to join the new firm than former coworkers from different plants. Within a given plant, former coworkers of a founding owner were substantially more likely to join the founder's new firm if their employment overlap with the founder was long, if they were classified as working in the same two-digit industry as the founder, if they were hired at roughly the same time as the founder, and if they held the same one-digit occupation as the founder. The impacts of all these determinants are stronger, the smaller is the number of workers at the origin firm plant when the founder(s) leaves.

# 5 Performance of Former Coworkers at New Firms

In the previous section we contrasted former coworkers of founding owners who joined the owners' new firms with former coworkers who did not join. In this section we contrast former coworkers who joined the new firms with non-former coworkers who also joined the new firms. Similar to the job referral literature (Hensvik and Skans 2016, Glitz and Vejlin 2021), we expect that former coworkers referred by founding owners to their own new firms will have higher mean match quality than other workers and therefore receive higher initial wages and be less likely to separate from the firms (Jovanovic 1979). Column (1) of Table 5 shows means for log initial deflated wages and separation before second year of firm operation, along with various measures of human capital, for all founding workers hired at the new firms during their first nine months of hiring. (Because founding workers must stay at the new firms for at least three months by definition, the separation indicators for workers hired after the first nine months must equal zero.) Column (2) shows means for the subset of founding workers who cannot be traced to previous jobs (i.e., jobs in Brazil's formal sector in 1986 or later). For the traceable workers in columns (3) and (4), we additionally

[19]Same Nationality is statistically insignificant without an interaction effect but negative and significant with an interaction effect. This variable may be unreliable given that it equals zero for only 0.3 percent of the sample.

Table 5: Characteristics of Founding Workers of New Firms

| | (1) All Workers | (2) Non-Traceable Workers | (3) Traceable Non-Coworkers | (4) Former Coworkers |
|---|---|---|---|---|
| Log Initial Deflated Wage | 5.3972 | 5.2074 | 5.4441 | 5.5887 |
| Separation | 0.3813 | 0.4386 | 0.3793 | 0.2562 |
| Less than high school | 0.4534 | 0.4645 | 0.4455 | 0.4757 |
| High school graduate | 0.4624 | 0.4718 | 0.4645 | 0.4302 |
| Some college | 0.0325 | 0.0311 | 0.0330 | 0.0325 |
| College graduate | 0.0509 | 0.0323 | 0.0563 | 0.0609 |
| Graduate degree | 0.00066 | 0.00035 | 0.00078 | 0.00068 |
| Potential Experience (Years) | 20.8344 | 14.6722 | 22.2650 | 24.1241 |
| Female | 0.3442 | 0.4416 | 0.3173 | 0.2641 |
| Previous Tenure (Months) | | | 24.7809 | 39.5534 |
| Same Previous Industry | | | 0.3918 | 0.6287 |
| Previous Job Occ Group 0 | | | 0.00032 | 5.19e-05 |
| Previous Job Occ Group 1 | | | 0.0230 | 0.0310 |
| Previous Job Occ Group 2 | | | 0.0280 | 0.0330 |
| Previous Job Occ Group 3 | | | 0.0543 | 0.0699 |
| Previous Job Occ Group 4 | | | 0.1548 | 0.1458 |
| Previous Job Occ Group 5 | | | 0.3304 | 0.2001 |
| Previous Job Occ Group 6 | | | 0.0395 | 0.0309 |
| Previous Job Occ Group 7 | | | 0.3010 | 0.3981 |
| Previous Job Occ Group 8 | | | 0.0378 | 0.0443 |
| Previous Job Occ Group 9 | | | 0.0308 | 0.0470 |
| Observations | 1,844,236 | 420,326 | 1,175,966 | 173,338 |

*Sources*: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot).
*Notes*: Deflated Wage is mean monthly wage in calendar year, transforming RAIS reported multiples of monthly minimum wage into nominal wage, using prevailing minimum wage and deflating to August 1994. Less than high school includes illiterate workers, primary school dropouts or graduates, middle school dropouts or graduates, and high school dropouts. Potential Experience is age less years of education. Occupation groups as defined in footnote 16. Workers hired in months 10-12 excluded.

report the means for tenure at their previous jobs, an indicator for whether their previous jobs were in the same two-digit industries as their new firms, and indicators for the one-digit occupations held at their previous jobs. One or more of these additional variables is missing for about five percent of the observations of traceable workers.

Comparing former coworkers in column (4), who are traceable by definition, to traceable non-coworkers in column (3), we see that the mean initial wages received at the new firms by former coworkers were about 14 percent higher than the mean initial wages received by other traceable

Table 6: Coworkers' Initial Wage Premia at New Firms

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | All Workers | | Traceable Workers | |
| | Log Wage | Log Wage | Log Wage | Log Wage |
| Coworker | 0.15777** | 0.11688** | 0.13357** | 0.08378** |
| | (0.00267) | (0.00241) | (0.00289) | (0.00257) |
| Potential Experience | | 0.04387** | | 0.03986** |
| | | (0.00072) | | (0.00092) |
| Squared Potential Experience | | -0.00153** | | -0.00138** |
| | | (4.09e-05) | | (4.87e-05) |
| Cubic Potential Experience | | 2.49e-05** | | 2.20e-05** |
| | | (9.45e-07) | | (1.06e-06) |
| Quartic Potential Experience | | -1.51e-07** | | -1.32e-07** |
| | | (7.51e-09) | | (8.14e-09) |
| Same Previous Industry | | | | 0.05533** |
| | | | | (0.00106) |
| Log Months of Tenure at Previous Job | | | | 0.02119** |
| | | | | (0.00055) |
| New Firm FE | 254,413 | 254,402 | 202,602 | 202,587 |
| Mean Log Initial Wage | 5.39727 | 5.39727 | 5.46267 | 5.46269 |
| $N$ | 1,839,560 | 1,839,386 | 1,345,745 | 1,345,572 |
| $R^2$ | 0.63408 | 0.68385 | 0.63461 | 0.69234 |

*Sources*: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot).
*Notes*: Dependent variable log initial deflated wage at new firm. Deflated Wage is mean monthly wage in calendar year, transforming RAIS reported multiples of monthly minimum wage into nominal wage, using prevailing minimum wage and deflating to August 1994. Potential Experience is age less years of education. All columns exclude workers hired in months 10–12 and include indicators for gender as well as month of hiring. Columns (3) and (4) exclude workers without previous jobs recorded in RAIS and include indicators for previous one-digit occupation code. Columns (2) and (4) include indicators for 9 education categories. Standard errors in parentheses, clustered at new firm level. ** Significance at one, * five percent levels.

workers, and former coworkers were about 12 percentage points less likely to separate before the beginning of the new firms' second years of operation. Former coworkers generally have higher human capital than other traceable workers, including being more likely to have held jobs as leaders/managers (group 1), professionals (group 2), and technicians (group 3), and it is much more likely that their previous jobs were in the same industries as their new firms. We see from column (2) that non-traceable workers have the lowest initial wages and are the most likely to separate from the new firms, have the least education and potential experience, and are the most likely to be female.

Table 6 reports regressions for the log of initial deflated wages of founding workers at new firms. Columns (1) and (2) include all founding workers and columns (3) and (4) only include founding workers who can be traced to previous jobs in RAIS. All columns contain new firm fixed effects so that differences between coworkers and non-coworkers are identified only by variation within the firms that hired them. All columns also contain indicators for month of hiring (first, second, ..., eighth, with ninth the omitted category).

Column (1) shows that former coworkers earn initial wages that are 16 percent higher than those of non-coworkers, including non-coworkers who cannot be traced to previous jobs. This gap is reduced to 12 percent in column (2), which controls for standard demographic characteristics. Column (3), which only includes founding workers who can be traced to previous jobs in RAIS and does not control for worker characteristics, shows that former coworkers earn initial wages that are 13 percent higher than those of non-coworkers. This is reduced to eight percent in column (4), which controls for standard demographic characteristics and variables linked to the workers' previous jobs. Particularly notable among the controls is that workers with previous jobs in the same two-digit industry as the new firm earned six percent higher initial wages.

Table 7 reports regressions for the separation of founding workers from new firms before the second year of a firm's existence. The differences between columns (1), (2), (3), and (4) parallel those in Table 6. As in Table 6, all columns contain new firm fixed effects and indicators for month of hiring. Column (1) shows that former coworkers are nine percentage points less likely to separate than non-coworkers, reduced to eight percentage points in column (2), relative to a mean separation rate for all founding workers of 38 percent. Column (3) shows that former coworkers are eight percentage points less likely to separate than non-coworkers who can be traced to previous jobs in RAIS, reduced to six percentage points in column (4), relative to a mean separation rate for founding workers who can be traced to previous jobs of 36 percent. Again, notable among the controls is that workers with previous jobs in the same two-digit industry as the new firm were three percentage points less likely to separate.

We can ask how these benefits of referring former coworkers to one's own new firm compare to the benefits of referrals by employees to existing firms. Table 8 lists the results of six published studies. The estimated wage premia received by referred workers range from -2.7 to 6.7 percent, with a mean of 2.0 or 2.4 percent, depending on whether we treat the Burks et al. (2015) results as three independent studies or one study with a mean of 0.6 percent. Our result of 8.4 percent

Table 7: Coworkers' Separation Premia at New Firms

| | (1) | (2) | (3) | (4) |
|---|---|---|---|---|
| | All Workers | | Traceable Workers | |
| | Separation | Separation | Separation | Separation |
| Coworker | -0.09138** | -0.08223** | -0.08365** | -0.06384** |
| | (0.00209) | (0.00207) | (0.00221) | (0.00218) |
| Potential Experience | | -0.00130* | | -0.00238* |
| | | (0.00063) | | (0.00089) |
| Squared Potential Experience | | -8.20e-05* | | 4.28e-05 |
| | | (3.49e-05) | | (4.78e-05) |
| Cubic Potential Experience | | 1.47e-06 | | -1.43e-06 |
| | | (7.65e-07) | | (1.04e-06) |
| Quartic Potential Experience | | -5.77e-09 | | 1.51e-08 |
| | | (5.74e-09) | | (7.74e-09) |
| Same Previous Industry | | | | -0.02534** |
| | | | | (0.00122) |
| Log Months of Tenure at Previous Job | | | | -0.03082** |
| | | | | (0.00056) |
| New Firm FE | 254,652 | 254,641 | 202,800 | 202,785 |
| Mean Separation Rate | 0.38126 | 0.38126 | 0.36347 | 0.36347 |
| $N$ | 1,844,236 | 1,844,061 | 1,349,304 | 1,349,130 |
| $R^2$ | 0.39857 | 0.40129 | 0.42197 | 0.42741 |

*Sources*: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot).
*Notes*: Dependent variable indicator of separation. Potential Experience is age less years of education. All columns exclude workers hired in months 10–12 and include indicators for gender as well as month of hiring. Columns (3) and (4) exclude workers without previous jobs recorded in RAIS and include indicators for previous one-digit occupation code. Columns (2) and (4) include indicators for 9 education categories. Standard errors in parentheses, clustered at new firm level. ** Significance at one, * five percent levels.

in column (4) of Table 6 is somewhat above the high end of this range. The estimated reductions in the probability of separation vary much more, from 2.2 to 26 percent, with a mean of 11.9 or 10.2 percent, again depending on how we treat the results of Burks et al. (2015). The main cause of the greater range of estimates for the separation premium than the wage premium is probably the greater variation in estimation techniques. The 6.4 percentage point reduction in separation probability that we find in column (4) of Table 7 is toward the low end of this range.

We offer a speculative interpretation of these quantitative comparisons between our results and the results of employee referral studies. The founding owners know the needs of their new firms, as they initially conceive them, better than employees of existing firms know the needs of their employers. However, as time rolls forward from startup the needs of a new firm are more likely

Table 8: Results of Six Employee Referral Studies

| Data | Source of referral | Wage premium (percent) | Separation premium (percent) |
|---|---|---|---|
| **Burks et al. (2015):** United States | | | |
| 7 Large call center firms, 2009–13 | Any employee | zero[a] | 11[b,c] |
| Large trucking firm, 2003–09 | Any employee | zero[d] | 11[b,e] |
| Large high-tech firm, 2003–08 | Any employee | 1.7[f] | 26[b,g] |
| **Brown, Setren and Topa (2016)**: United States | | | |
| Mid-sized corporation, 2000–11 | Any employee | 2.1[h] | 18[i] |
| **Dustmann et al. (2016)**: Germany | | | |
| Munich metro area, 1980–2001 | Employees from own minority group | 6.7[j] | 5.3[j] |
| **Hensvik and Skans (2016)**: Sweden | | | |
| Economy, 2000–05 | Former coworkers | 3.6[k] | – |
| **Glitz and Vejlin (2021)**: Denmark | | | |
| Economy, 1980–2005 | Former coworkers | 4.4[ℓ] | 2.2[m] |
| **Eliason et al. (2023)**: Sweden | | | |
| Economy, 1985–2009 | Family members, former coworkers, former classmates, current neighbors | -2.7[n] | 9.7[o] |

[a]Table VII, column (1). [b]Reduction in probability of quitting in Cox proportional hazard model. [c]Table VI, column (1). [d]Table VII, column (3). [e]Table VI, column (3). [f]Table VII, column (5). [g]Table VI, column (5). [h]Table 6, column (1). [i]Table 7, column (1), reduction in probability of separation in discrete time proportional hazard model. [j]Table 6, column (1). [k]Table 7, column (4). [ℓ]Table 3, column (3). [m]Table 3, column (6). [n]Table 8, first column. [o]Table 8, third column, increase in probability of staying with employer three years after entry.

*Notes*: Wage premium for initial or first year wage. Separation premium for first year (or similar start period), except as indicated. Zero stands for lack of statistical significance.

to change than the needs of an existing firm, causing what initially looked like a good match to dissolve. Relative to workers referred to existing firms, then, founding owners offer higher initial wages to workers whom they know well but also experience greater turnover with these workers. Since the workers separate when match quality is revised downward, the lower wages are not observed.

Brown, Setren and Topa (2016), Dustmann et al. (2016), and Glitz and Vejlin (2021) all argue that the differences between referred and non-referred employees of existing firms should decay with worker tenure. All find that wages of referred and non-referred employees converge with

their tenure, and Dustmann et al. (2016) and Glitz and Vejlin (2021) also find that separation probabilities of referred and non-referred employees converge with tenure. Their argument should also apply to the differences between founding former coworkers and founding non-coworkers hired for one's own new firm. Because workers who are not former coworkers of the founder(s) or were not referred to existing firms are more likely to be bad matches, they are more likely to separate from the hiring firm. This proportionately greater weeding out of bad matches will shrink the difference between the remaining non-coworkers or non-referrals and the remaining former coworkers or referrals.

Because our wage data are only available annually, we estimate the potential decay of the wage differences between founding former coworkers and founding non-coworkers on an annual basis. For comparability, we do the same for differences in separation probabilities. To further enhance comparability, we use the fact that, in addition to reporting monthly remuneration averaged over the calendar year (used in Tables 5 and 6), RAIS reports December monthly remuneration. We use this December wage to create an annual panel for log wage, and create an annual panel for separation by letting a separation indicator equal one for a given worker in a given year if a December wage is not reported for the worker in that year, and zero otherwise.

We follow every founding worker for five years. After five years, worker separation and firm exit cause the number of observations to fall to less than ten percent of its initial value. Similar to Dustmann et al. (2016) and Glitz and Vejlin (2021), we add an interaction between the former coworker indicator and years of employee tenure in linear models of log wages and a separation indicator. In the resulting panel regressions, reported in Table 9, we keep the worker samples and right-hand side variables in columns (4) of Tables 6 and 7. We include firm by firm age fixed effects, thereby controlling for every firm's overall performance in each year. Since we are examining wages and separation of founding employees, these fixed effects are collinear with employee tenure, so we can estimate the interaction of tenure with the former coworker indicator but not the direct effect of tenure. We find that the coworker wage premium diminishes with tenure by 0.5 percentage points per year and the coworker separation premium diminishes with tenure by 2.0 percentage points per year. Relative to their initial values, the separation premium decays more than three times as fast as the wage premium. The more rapid decay of the separation premium may reflect the evolution of some new firms away from their founders' initial conceptions in addition to the standard Jovanovic (1979) learning process.

Table 9: Decay of Coworker Premia with Tenure

| | (1) Log Wage | (2) Separation |
|---|---|---|
| Coworker | 0.08120** | -0.09823** |
| | (0.00273) | (0.00286) |
| Coworker × Tenure | -0.00461** | 0.02078** |
| | (0.00132) | (0.00131) |
| Potential Experience | 0.04193** | -0.00018 |
| | (0.00057) | (0.00067) |
| Squared Potential Experience | -0.00141** | -0.00017** |
| | (2.95e-05) | (3.39e-05) |
| Cubic Potential Experience | 2.19e-05** | 3.41e-06** |
| | (6.22e-07) | (6.99e-07) |
| Quartic Potential Experience | -1.30e-07** | -1.67e-08** |
| | (4.59e-09) | (5.06e-09) |
| Same Previous Industry | 0.05513** | -0.02640** |
| | (0.00069) | (0.00069) |
| Log Months of Tenure at Previous Job | 0.02436** | -0.03829** |
| | (0.00034) | (0.00032) |
| New Firm × Firm Age FE | 769,703 | 700,499 |
| Mean Log Wage, Mean Separation Rate | 5.57186 | 0.42755 |
| $N$ | 4,280,099 | 4,091,459 |
| $R^2$ | 0.69587 | 0.37802 |

*Sources*: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot).
*Notes*: Dependent variable log deflated wage in Column (1) and indicator of separation in Column (2). Deflated Wage is mean monthly wage in calendar year, transforming RAIS reported multiples of monthly minimum wage into nominal wage, using prevailing minimum wage and deflating to August 1994. Potential Experience is age less years of education. All columns exclude workers without previous jobs recorded in RAIS, include indicators for gender, include indicators for month of hiring (January through December), for previous one-digit occupation code and for 9 education categories. Standard errors in parentheses, clustered at new firm x firm age level. ** Significance at one, * five percent levels.

# 6 Conclusions

We considered new firms in the formal sector of Brazil founded during the period 2002-2014 for which at least one founding owner can be traced to previous formal sector employment. More than one-third of the larger of these new firms hire at least one former coworker of a founder at startup, and recruitment of these former coworkers accounts for nearly one-quarter of startup hiring by this subset of larger firms. Recruitment of former coworkers accounts for a substantial share of all startup hiring for all new firms with founding owners who have a formal sector work history,

but appears to be clearly below the range of estimates in the literature for share of jobs in existing firms that are filled through referrals.

The former coworkers of founding owners most likely to join their new firms are those who, at their last employer, worked in the same plant as a founding owner, had long overlap with a founding owner, were classified in the same industry or occupation as a founding owner, and were hired at roughly the same time as a founding owner. At the new firms, the wage premium we estimate for former coworkers relative to non-former coworkers is slightly above the range of estimates in the literature for workers referred to existing firms by their employees relative to non-referrals. The reduction in the probability of separation (separation premium) is toward the low end of this range. Both of these premia for former coworkers decay with employee tenure, faster for the separation premium than for the wage premium.

On May 7, 2024, the United States Federal Trade Commission (FTC) published a "Non-Compete Clause Rule" that, if enforced, would make it impossible for workers' former employers to enforce contracts preventing them for working for competitors (https://www.federalregister.gov/documents/2024/05/07/2024-09171/non-compete-clause-rule). We saw in Table 1 that, of new firms with at least five employees founded by workers leaving formal sector firms, nearly one-third enter the same two-digit industries as their former employers, and more than half of these hire at least one former coworker from their former employers. These are the new firms most likely to be affected by regulations pertaining to non-compete contracts. The FTC noted the role of non-compete clauses in "suppressing earnings for workers across the labor force" and "suppressing new business formation and innovation." Our results are entirely consistent with these motivations, but also show that the ability to recruit former coworkers is an important source of competitive advantage for new firms: it "levels the playing field" with incumbent firms by substituting for the lack of referrals by existing employees.

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# Appendix

## A Former Coworkers Who Overlapped With Founding Owners at Both Same and Different Plants

In Table 4 we considered determinants of the probability of joining new firms of former coworkers who overlapped with the founding owners of the new firms at the same plants of the origin firms. In this Appendix we examine the 2.9 percent of former coworkers from multi-plant origin firms who overlapped with founding owners at both same and different plants. This allows us to include the explanatory variables in Table 4 measured at both the same and different plants, to see if the different plant variables are associated with joining the new firms when controlling for the same plant variables.

The first and second columns of Table A1 contain the same explanatory variables as the first and second columns of Table 4 except for the variables based on characteristics that should not change across plants: same age group, same education group, same gender, and same nationality. We omit these variables because they will be almost perfectly collinear for same and different plants.[20] In Table A1 we see that for every explanatory variable except Same Industry the association with the probabilities of joining new firms is positive and statistically significant when measured for same plants, as in Table 4, and is negative or statistically insignificant when measured for different plants.

[20]Perfect collinearity is prevented by the extremely rare observations when new firms have multiple founding owners who leave the same origin firms in the same years but from different plants, and former coworkers overlap with some owners at same plants and other owners at different plants. It is also possible for same age group and same education group to differ from same plant to different plant if owners or workers changed age or education sufficiently between when they were employed at the same and different plants of the origin firms.

Table A.1: Probability That Coworkers With Same and Different Plant Overlaps Join New Firms

| | (1) | (2) |
|---|---|---|
| Log Months of Overlap in Same Plant | 3.36e-06** | 2.79e-06** |
| | (9.40e-07) | (8.69e-07) |
| Log Months of Overlap in Different Plant | -2.14e-07* | -2.05e-07* |
| | (8.88e-08) | (8.92e-08) |
| Same Hiring Cohort in Same Plant | | 0.001321** |
| | | (0.000341) |
| Same Hiring Cohort in Different Plant | | -0.000582 |
| | | (0.000299) |
| Same Industry in Same Plant | | 0.000788 |
| | | (0.000438) |
| Same Industry in Different Plant | | 0.000718 |
| | | (0.000792) |
| Same Occupation in Same Plant | | 0.000755** |
| | | (0.000178) |
| Same Occupation in Different Plant | | -0.000207 |
| | | (0.000187) |
| Origin Firm-Year-New Firm FE | 19,086 | 19,086 |
| Mean Probability | 0.00198 | 0.00198 |
| $N$ | 4,436,820 | 4,436,820 |
| $R^2$ | 0.21225 | 0.21237 |

*Sources*: RAIS (2002-2014), RAIS entry (1986-2014), Receita Federal (October 2022 snapshot).
*Notes*: Sample restricted to coworkers who overlap with the founding owner at the same plant within the origin firm and at a different plant within the origin firm. All columns include constant; indicators for 25-29, 30-39, 40-49, 50-64 and over-65 age groups, with 18-24 age group omitted category; indicators for some high school, some college, and college degree or more, with middle school or less omitted category; indicator for female; indicators for previous one-digit occupation code. Standard errors in parentheses, clustered at new firm level. ** Significance at one, * five percent levels.