Who Creates Stable Jobs? Evidence from Brazil *

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Abstract

A popular perception of the US economy is that small businesses create most of the private sector jobs. However, recent work showed that firm age is a more important determinant of job creation than firm size (Haltiwanger, Jarmin, & Miranda, 2013). The authors show that young firms and start-ups contribute more to job creation in the US economy than do small firms. However, young firms and start-ups are inherently volatile, potentially leading to high employment turnover and lower levels of job stability. In this paper, we first replicate the Haltiwanger, Jarmin, and Miranda analysis using data from Brazil, and then compare the results to the US. Consistent with the results for the US, we find that firm age is a more important determinant of job growth in Brazil than is firm size. We then condition the job creation analysis on stable jobs to determine what types of firms are creating stable jobs in Brazil. We find that young firms and large firms create the most stable jobs in Brazil.

JEL classifications: L25, J23, J325

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1 Introduction

The view that small businesses fuel job creation remains a popular belief in most developed and emerging economies. Early empirical research supported this view by finding an inverse relationship between firm growth rates and firm size (Birch, 1981). However, more recent research identified statistical issues with the earlier analyses and went on to show that firm age is a more important determinant of job creation than firm size (Davis, Haltiwanger, & Schuh (1996); Davidsson, Lindmark, & Olofsson (1998); Ayyagari, Demirguc-Kunt, & Maksimovic (2014)). That is, young firms and start-ups contribute more to job creation in the US economy than do small firms. (Haltiwanger, Jarmin, and Miranda, 2013; hereafter HJM). However, young firms and firm start-ups are inherently volatile. While that volatility is a natural part of business dynamics, it also provides a note of caution about job creation policies and programs. If policies designed to create jobs target young firms, it could lead to an increase in job turnover in the economy. While job turnover can help improve the match between a worker and their employer, it is also costly for both the worker and the firm. Therefore, we aim to identify what types of firms are creating stable jobs and analyze the relationship between job stability and job creation in the context of an emerging economy.

Job creation is especially important in the context of an emerging economy. Formal sector jobs provide a steady source of good income, serve as a primary pathway out of poverty, and provide access to legally mandated rights and benefits (Dix-Carneiro and Kovak, 2015). It is also reasonable to expect that job stability is even more important for workers in emerging economies as these workers often do not have access to generous safety nets, and the loss of a job could have serious negative consequences for workers and their families. Thus, it is important for researchers and policy analysts to have a better understanding of how labor markets work in these countries, specifically in the creation of stable jobs.

This project extends the literature in two primary ways. First, this paper compares job creation in the United States to job creation in Brazil. Second, this paper extends the job creation analysis to include a measure of job stability. Brazil currently has several policies

in place to promote the formation of new, small businesses (often called microbusinesses). Determining what types of firms are creating stable jobs will have direct implications for Brazil by ensuring policies aimed at promoting job creation and growth in the economy target the types of firms actually creating stable jobs.

The first part of the project compares job creation in Brazil to job creation in the US. The results indicate that the distribution of employment, job creation, and job destruction significantly differ between the US and Brazil. Young, small firms dominate the distribution of employment, job creation, and job destruction in Brazil while large, mature firms dominate the three distributions in the US. However, the results for Brazil also confirm HJM's results for the US that firm age, compared to firm size, is likely a more important determinant of employment growth. Young firms create relatively more jobs in Brazil, but they also have relatively higher exit rates in comparison to older firms. The second part of the project analyzes employment volatility, using two measures of employment turnover to capture volatility. This part of the project shows that young firms exhibit higher levels of employment turnover relative to older firms. The third part of the project identifies what types of firms create stable jobs in Brazil, whether it be young or small or large firms. The results show that both firm age and firm size are important determinants of stable employment growth, with young firms and large firms having high stable employment growth rates. So while young firms have high levels of employment turnover, they are still an important generator of stable jobs to the Brazilian economy.

The rest of the paper proceeds as follows. In section 2, we provide background information on the existing literature for job creation, job destruction, and job stability. Section 3 describes the general methodology used for the project. Section 4 describes the data, the RAIS (*Relação Anual de Informações Sociais*). Section 5 presents the main empirical results for the project; section 5.1 compares job creation in Brazil to job creation in the US, section 5.2 analyzes employment turnover in Brazil, and section 5.3 discusses what types of firms create stable jobs in Brazil. Finally, section 6 offers concluding remarks.

2 Literature Review

There is a wide array of literature on job creation and job destruction, particularly in the context of the United States. Gibrat's Law (or Gibrat's Law of Proportionate Effect), defined by Robert Gibrat in 1931, indicated that employment growth rates are independent of firm size. Numerous studies have tested the validity of Gibrat's Law, but the results are mixed. David Birch (1981) discovered an inverse relationship between firm size and firm growth, leading to the still popular perception that small businesses contribute most to job creation in the United States. Birch's seminal work fueled the continued study of job creation and employment growth. Kirchoff and Phillips (1988) studied the impact of new firm formation on economic growth in the United States. They found that for the years 1976-1984, small firms accounted for over 60% of net new jobs and new firms accounted for almost 75% of new jobs created, emphasizing the important role new firms and small firms play in the US economy. Moscarini and Postel-Vinay (2012) supported the claim that small firms are the engine of job creation, but only in times of high unemployment, emphasizing the importance of the business cycle when analyzing job creation.

However, Davis, Haltiwanger, and Schuh (1996) examined the shortcomings of several previous studies regarding small businesses and job creation. The authors pointed out the regression fallacy inherent to using the base-year size methodology, which most previous studies used to measure firm size. The base-year size methodology calculates firm base size in year t as firm size in year t for new firms and firm size in year *t-1* for all other firms. Relying solely on the base-year size methodology subjects the analysis to the regression-to-the-mean bias, ultimately overestimating the results in favor of small firms. HJM (2013) explain, "On average, firms classified as large in the base year are more likely to have experienced a recent transitory increase in employment. Since transitory movements reverse themselves, firms that are large in the base year are relatively likely to contract" (p. 305). Further, most prominent studies which support the inverse relationship between employment growth and firm size analyzed either only establishment- or only firm-level data. Davis et al. (1996)

pointed out the limitations of using either only establishment- or only firm-level data. They emphasized the importance of using a longitudinal linked employer-employee data set with both establishment- and firm-level data to ensure that employment dynamics are accurately captured.

Davidsson, Lindmark, and Olofsson (1998) examined the magnitude of the regression-to-the-mean bias from using the base-year size methodology to determine the extent that small firm job creation is overestimated. The authors combined four different data sets from Statistics Sweden for the years 1989 to 1994 and attributed every employment change to the size class the establishment belonged to at the time the employment change occurred (because Davis et al. (1996) argued that the regression fallacy occurred largely because all employment changes are attributed to the starting size class). Overall, Davidsson et al. (1998) conceded that the regression-to-the-mean bias exists, is small in magnitude, and occurs in both directions. They estimated that approximately 3.6% to 7.9% of job gains in small firms (less than 200 employees) due to expansion should partially be attributed to large firms; similarly, approximately 2.5% to 3.6% of job losses in small firms due to contraction should partially be attributed to large firms. Davidsson et al. (1998) determined that using alternative size methodologies or attributing employment changes to different size classes to correct for the regression-to-the-mean bias does not lead to a qualitative change in results. The authors concluded that firm age is likely a more important determinant of employment growth, noting that new firms are often also relatively small firms.

Ayyagari, Demirguc-Kunt, and Maksimovic (2014) investigated what types of firms created jobs in developing countries using data for 104 developing countries through the World Bank Enterprise Surveys. The authors used data on a small sample of firms with at least 5 employees in the formal labor market for each of the 104 developing countries surveyed during the time period 2006-2010 to examine the role of firm age conditional on firm size. Overall, the authors found that small, young firms (less than 20 employees and at least 5 years old) contributed most to job creation while large firms (greater than 100 employees) exhibited

the highest productivity rates, which also holds when controlling for firm age. Ayyagari et al. (2014) also noted that their findings are consistent with HJM's (2013) results for job creation in the US.

Numerous studies exist which examine the relationship between firm size and employment growth, and later studies often control for firm age. However, the literature is lacking an analysis of job creation and employment growth conditioned on job stability. While Kirchoff and Phillips (1988) found that small firms account for over 50% of net new jobs, they also found that small firms account for over 50% of jobs lost from firm exit. This highlights the volatile nature of firm start-ups and young firms, many of which are small in size. Davis et al. (1996) pointed out that almost all analytic studies on the role of small firms in job creation ignore the durability of a job. This is a real policy concern since it is well documented that large firms have lower employment turnover rates (Brown and Medoff, 1989; Bergemann and Mertens, 2011; Haltiwanger, Hyatt, and McEntarfer, 2015).

Bergemann and Mertens (2000) analyzed job stability trends for West Germany using the German Socio-Economic Panel from 1984-1997. The authors measured job stability as elapsed tenure of those currently employed and relied largely on survival-analysis methods to analyze job stability. Bergemann and Mertens (2000) used the semi-parametric Cox model and determined that job stability declined in Germany since the 1980's, but the declines are not distributed equally across different sub-populations. Heisz (2005) also used the elapsed tenure of those currently employed to analyze job stability in Canada for the 1980's and 1990's. However, Heisz pointed out that average in-progress tenure is inappropriate for measuring job stability over time because the measure is affected "by the level of inflows in all previous periods in which someone currently without a job became employed and all the survival rates in those periods" (p. 109). Therefore, Heisz used retention rates to analyze job stability in Canada. Retention rates measure the probability that a worker with a particular level of tenure today will have an additional t years of tenure t years hence. Heisz determined that retention rates in Canada increased, an indication of increasing job

stability, during periods of labor market slack and retention rates in Canada decreased during periods of labor market boom.

Diebold, Neumark, and Polsky (1994) also used retention rates to analyze job stability in the US for the 1980's. Overall, the authors found that retention rates remained stable over the time period. Marcotte (1999) utilized the PSID (Panel Study of Income Dynamics) to analyze the job stability of male head of households from 1976 - 1992 in the US. The author found that job stability declined in the US over the time period and highlighted the heterogeneous nature of job stability for different groups of workers in the US. For example, black males, males who dropped out of high school, and males with only some college experienced the largest decline in job stability over the sample period.

Recent work emphasizes the importance of business cycle dynamics in the analysis of employment growth and job stability. Cravo (2011) determined that small businesses are more sensitive to business cycle dynamics than large firms in Brazil using a monthly data set from 2000 to 2009. García and van Soest (2015) analyzed the stability of new job matches in Spain before and during the financial crisis, 2005 and 2009 respectively, using administrative data. The authors used a mixed proportional hazard model, which allows for different transitions (job-to-job, job-to-unemployment, and other transitions), to analyze job stability by worker, job, and firm characteristics. The authors found a positive relationship between firm size and job stability for new job matches. The relationship was stronger during the 2009 recession in comparison to new job matches before the crisis in 2005.

The majority of research to date on job stability has analyzed how job stability varies with worker characteristics and how job stability changes within a country over a given period of time. However, the current literature lacks information regarding the characteristics of the firms creating stable jobs.

3 Methodology

In order to directly compare job creation and destruction patterns in Brazil to those in the US, we follow HJMs (2013) empirical approach as closely as possible. HJM use eight firm size classes (1-4, 5-9, 10-19, 20-49, 50-99, 100-249, 250-499, 500+) and nine firm age classes (0, 1-2, 3-4, 5-6, 7-8, 9-10, 11-12, 13-15, 16+) to estimate one-way and two-way models of employment growth rates, job destruction, and job creation. Their methodology works well to determine the relationship between employment growth and firm age and firm size because it allows each size and age class to have a heterogeneous effect on employment growth rates. First, we estimate a series of one-way models to analyze employment growth by firm size class or firm age class only. Then, we estimate a series of two-way models to analyze employment growth by firm size class, firm age class, and all possible interactions. The two-way models are equivalent to calculating employment-weighted cell means using a nonparametric cell-based regression approach (see HJM 2013 for a more detailed discussion). A comparison of the results from the one-way models with the two-way models easily shows the relationship between employment growth, firm size, and firm age, as well as the importance of accounting for firm age in the analysis.

HJM limit the maximum size threshold to 500 employees and the maximum age threshold to 16 years. These ranges for size and age classes account for the fact that some areas of the joint size and age distribution have very few, if any, data observations, such as firm start-ups with over 10,000 employees. Since it is known that the base-year size methodology leads to regression-to-the-mean effects, HJM use two methods to measure firm size in their analysis. Firm size and firm size classes are calculated once using the base-year size methodology and a second time using the average size methodology. The base-year size methodology, the more traditional size classification methodology, calculates firm size for year t as firm size in year t for new firms and firm size in year *t-1* for all other firms (both continuing and destroyed). The average, or current, size methodology calculates firm size for year t as the average of firm size in year t and year *t-1* for all firms (new, continuing, and destroyed).

The main dependent variable in the replication analysis is the employment growth rate, either at the establishment level or the firm level. An establishment is a single location where business is conducted (for example, a storefront) and a firm is the parent company with ownership over one or more establishments (for example, a retail corporate headquarters). We again follow HJM to calculate the establishment- and firm-level employment growth rates. The establishment growth rates, made popular by Davis, Haltiwanger, and Schuh (1996), are calculated as follows:

$$g_{it} = \frac{E_{it} - E_{it-1}}{0.5 * (E_{it} + E_{it-1})}$$

where E_{it} is the level of employment for establishment i in December of year t. The growth rate measure is symmetric around zero and bounded between -2 (destroyed establishments) and 2 (new establishments). Firm growth rates are then calculated as the employment-weighted average of the establishment growth rates to ensure that firm growth rates only capture true employment growth rather than growth due to legal changes, such as mergers and acquisitions. Since firm growth rates are a weighted average of establishment-level growth rates, they share the same properties as the establishment growth rates (symmetric around zero and bounded between -2 and 2).

The one-way models require that one size class or one age class be omitted as a baseline comparison group. Following HJM, the largest firm size class (500+ employees) or the oldest firm age class (16+ years) is left out as the omitted category. In order to report an estimate for the omitted categories, the omitted category is reported at its unconditional mean for each one-way model. Since the method focuses on the relative differences between size and age classes, the unconditional mean of the baseline group is added to the other estimates to re-scale the estimates for each size and age class. All of the results are reported in figures at the end of the paper and the results are discussed in section 5.1.

The second part of the project analyzes employment volatitlity by firm size and firm age classes. Analyzing measures of employment volatility helps motivate the need to include

a measure of job stability when analyzing employment growth. We capture employment volatility with two measures of employment turnover, a churn rate and a separation rate, at both the establishment and firm levels. The churn rate is a more comprehensive measure of employment turnover since it accounts for both incoming and outgoing employees. It is calculated at the establishment level as follows:

$$ChurnRate_{it} = \frac{Accessions_{it} + Separations_{it}}{Establishment\ Size_{it}}$$

where $Accessions_{it}$ is the number of employees hired in year t at establishment i, $Separations_{it}$ is the number of employees who separated from establishment i in year t, and $Establishment\ Size_{it}$ is a point in time measure of employment in December of year t at establishment i. The second measure of employment turnover, the separation rate, only accounts for employees separating from an establishment or firm. The establishment-level separation rate is calculated as follows:

$$SeparationRate_{it} = \frac{Separations_{it}}{Establishment\ Size_{it}}.$$

Similar to the employment growth rates, we take an employment-weighted average of establishment churn rates and establishment separation rates to calculate firm-level churn rates and separation rates. Both employment turnover measures are bounded below by zero, with lower numbers indicating lower levels of employment turnover. The results for employment turnover by firm size and firm age are presented in figures at the end of the paper and the results are discussed in section 5.2.

For the third phase of the project, we condition the analysis of job creation on a measure of job stability to determine what types of firms are creating stable jobs. We rely on two definitions of job stability to determine if each individual job is stable and then compare the results under the two definitions of stability. The first definition of job stability, a current measure, uses the tenure of each worker to determine if each job in the sample is stable. We

define a job as stable if the worker has worked at the same firm for at least two years, or the worker's firm-level tenure is greater than or equal to two. We calculate the worker's tenure by taking the difference in the year of observation and the hire date for each worker, which is provided in the data. We calculate tenure at the firm level to account for the fact that workers often move between establishments in order to climb the corporate ladder within a given firm. We also calculate the worker's establishment-level tenure and find that it does not significantly alter the results. By construction, using the worker's current tenure to define a stable job does not allow any firm less than two years in age to create any stable jobs. Therefore, we use a second definition of a stable job, one that is forward looking, to give all firms the opportunity to create stable jobs.

The second definition of a stable job uses the concept of retention rates to measure job stability. A k-year retention rate measures the probability that workers employed today will have an additional k years of tenure k years hence. The k-year retention rates are calculated as the ratio of the number of workers with an additional k years of tenure in k years hence, $N_{0+k}(t)$, to the number of workers employed in the current year t, $N_0(t)$:

$$R_k(t) = \frac{N_{0+k}(t)}{N_0(t)}.$$

At the worker level, the two-year retention rate for year t is a dummy variable equal to 1 if the worker remains employed at the same firm in year *t+2* or equal to 0 if the worker is no longer employed at the same firm in year *t+2*. We define a job as stable if the worker still works at the same firm in two additional years, or the worker's two-year retention rate is equal to one. In order to give all firms the opportunity to create stable jobs, the retention rates are not restricted to a particular level of tenure already acquired by the worker. We also calculate retention at the firm level to account for employees switching establishments to move up within a given firm. The results do not significantly differ when we calculate the worker's retention at the establishment level instead. The establishment- and firm-level retention rates are bounded below by zero (indicating zero employees retained for two years)

and bounded above by one (indicating all employees retained for two years). For destroyed firms, the two-year retention rate is undefined for the year of destruction, year *t*, undefined for the year prior to destruction, year *t-1*, and equal to zero for the year two years prior to destruction, year *t-2*. However, if a firm fails to survive for at least two years, the two-year retention rate is undefined for the year of destruction, year *t*, equals zero for the year prior to destruction, year *t-1*, and is undefined for the year two years prior to destruction, year *t-2*. As a robustness check, we also calculate the one- and three-year retention rates for each worker, establishment, and firm and do not find any qualitative change in the results.

In order to determine what types of firms are creating stable jobs (using the two measures of job stability previously defined), we calculate two firm-level measures of job stability. The first measure, the stable employment growth rate, is augmented from the employment growth rate used in the replication analysis to account for firm size as well as the number of stable jobs created. It captures how many stable jobs are created at each firm relative to that firms size. We calculate stable employment growth rates twice for each firm, once using the worker's tenure to determine job stability and again using the worker's retention to determine job stability. The firm-level stable employment growth rate using the worker's tenure is calculated as follows:

$$Stable\ Growth\ Tenure_{it} = \frac{Stable\ Jobs\ Tenure_{it} - Stable\ Jobs\ Tenure_{it-1}}{0.5 * (Firm\ Size_{it} + Firm\ Size_{it-1})}.$$

where $Stable\ Jobs\ Tenure_{it}$ is the number of stable jobs using the worker's tenure at firm i in year t. In other words, $Stable\ Jobs\ Tenure_{it}$ is the number of worker's who have worked at firm i for at least two years in year t. By construction, the stable growth rate using the worker's tenure is undefined for all firms less than two years of age. We therefore also calculate the stable employment growth rate using the worker's two-year retention rate instead of the worker's tenure to define a stable job. Due to the fact that the two-year retention measure

is forward looking, we are unable to calculate two-year retention rates for the last two years in our sample. The stable employment growth rates are bounded below by -2 and bounded above by 2, with higher numbers indicating a higher growth rate of stable jobs. In order to account for the high number of young firms that exit the market, all destroyed firms have a stable growth rate equal to -2, regardless of whether the firm created any stable jobs. For the analysis of stable employment growth rates, we continue with the same methodology used in the replication section. This allows us to easily compare the initial job creation results with the job creation results conditioned on a measure of job stability. The results for stable growth rates by firm size and firm age, using both measures of stability, are presented in figures at the end of the paper and discussed in section 5.3.

4 Data

The data for this paper comes from the *Relação Anual de Informações Sociais* (hereafter, RAIS) collected by the Labor Ministry (MTE - *Ministerio do Trabalho e Emprego*) in Brazil. The data is collected for all formal establishments in Brazil as part of a program where workers receive a bonus at the end of the year equal to one month's salary (or a prorated amount if the worker worked less than 12 months). This 13th month salary is paid by the employer but facilitated by the MTE. Hence, employees have great interest in making sure their employers report correct information to the MTE. For this project, we use RAIS for years 2004 through 2013. RAIS has unique identifiers for workers, establishments, and parent firms, resulting in a linked employee-employer data set that allows researchers to track firms, establishments, and workers across time. An establishment represents a single location of a business while the parent firm represents all establishments under common ownership. The ability to track both establishments and their parent firms over time allows for more consistent measures of employment growth, firm entry, and firm exit (HJM, 2013). RAIS also has a substantial amount of information about each worker, including age, tenure, sex,

educational attainment, and data on the workers type of accession to the establishment (ex. first job, transfer from another plant, or general hire).

The unit of observation in RAIS is the individual worker, each with a unique personal identification number. Each worker-year record in RAIS has an establishment identification number associated with it. Further, the first eight digits of the establishment identification number identify the parent firm of the establishment. The establishment and firm identification numbers are used to construct establishment- and firm-level characteristics for each entry such as establishment or firm size and establishment or firm age. In order to compare the job creation results for Brazil to HJM's results for the US, we restrict our analysis to private, for-profit firms only. Further, at the worker-level, we drop observations that are not usable for the analysis: those with zero wages, observations without a personal identification number, and observations without an establishment identification number. Last, in the event that the worker-establishment pair appears more than once in a given year, we keep the highest paying job for the worker at the establishment that year. Ultimately, we drop 25% of the observations leaving 340,684,232 worker-year observations for the ten-year panel. We aggregate the worker-level data up to the establishment level, keeping one observation per establishment per year, a total of 21,731,898 establishment observations. Then, we aggregate the establishment-level data up to the firm-level, keeping one observation per firm per year, a total of 19,152,247 observations. For the employment turnover and stability analysis we also include establishments and firms that entered and exited the market in the same year in the sample. Inclusion of these establishments and firms helps to further capture the volatility of firm start-ups. This gives us 22,461,078 establishment observations and 19,896,133 firm observations for the employment turnover and stability analysis.

The summary statistics for the establishment- and firm-level data are presented in Table 1. The summary statistics reveal that the average establishment and average firm are relatively small (10 to 12 employees) and relatively young (4 to 5 years in age). The job creation and destruction analysis relies on a point in time measure of establishment size

and firm size to ensure that the size measures are not overestimated. HJM use March of each year as their point in time measure of employment size because their data, the Census Bureau's Longitudinal Business Database (LBD), is collected annually in March. Therefore, since RAIS is collected annually in December, we use December of each year as our point in time measure for both establishment size and firm size. Establishment size was calculated as the number of workers employed at the establishment in December of each year. We then aggregate establishment size for all establishments under common ownership (under control of the same parent firm) to calculate firm size.

RAIS data does not provide information on establishment age or firm age, so we exploit the rich information in the data set, particularly the hire date of each worker and the panel data structure, to construct the age variables. To calculate establishment age, we begin with the year the establishment first appeared in the panel. We calculate establishment age for the first year as the difference in the first year and the earliest hire date of any employee working at the establishment in that year. For example, if the establishment first appears in the panel in the year 2004, establishment age is calculated as the difference in the year (2004) and the earliest hire date of any employee working at the establishment in 2004. For each additional year an establishment identification number appears in the data, we allow the establishment to age naturally. For example, if establishment age is calculated to be 2 in the first year, 2004, then establishment age for the year 2007 equals 2 + (2007-2004), or 5. To calculate firm age, we take the maximum age of all establishments controlled by the firm in the first year and then allow the firm to age naturally by one year for each additional year the firm appears in the panel. For example, if a firm controls three establishments in year 2004, its first year in the panel, with establishment ages of 5, 10, and 2, then firm age for 2004 equals 10, the maximum age of the three establishment ages. For the year 2007, firm age equals 10 + (2007-2004), or 13.

However, these constructed measures of establishment age and firm age variables could be subject to measurement error. Establishment age could underestimate true establishment

age if all of the original workers at the establishment are no longer employed in 2004. It is also possible that our establishment age and firm age variables overestimate true establishment and firm age. For example, establishment identification numbers first appearing in the panel in the year 2005 or later should be new establishments. However, we observe several establishments first entering the panel in 2005 or later with an earliest hire date prior to 2005. If the establishment or firm is new but the hire date variable is prone to measurement error, then the measures of establishment and firm age could also overestimate true establishment and firm age. We therefore perform a consistency check on the constructed age variables to determine how significant an issue the measurement error is. We calculate the observed establishment age for establishments first appearing in the panel in 2005 or later as the difference in the current year and the first year. Then, we compare this to the establishment age calculated as the tenure of the longest serving employee. The results for this age consistency check are shown in Table 2. We find that our method for calculating establishment age based on employee tenure overestimates observed establishment age for approximately 9.0% of establishments. We repeat the age consistency check for firm age, rather than establishment age, and find that our method for calculating firm age overestimates observed firm age for approximately 6.7% of firms. In theory, establishments that first appear in the data set in the year 2005 are new establishments. However, it is possible that establishments first appearing in 2005 are simply missing data for the year 2004 and thus are not truly new establishments. Establishments first appearing in the data set in 2006 or later, rather than 2005 or later, are more likely to truly be new establishments as they did not have any data for 2004 or 2005. Repeating the establishment and firm age consistency checks assuming an establishment is new if it first appeared in the data in 2006 or later yields very similar results to those presented in Table 2. Our establishment and firm age variables overestimate observed age for approximately 8.2% of establishments and 6.0% of firms. Using age classes, rather than pure establishment or firm age, helps minimize the measurement errors inherent to the establishment age and firm age variables.

5 Results

5.1 Job Creation and Destruction: Brazil v. United States

Table 3 shows the number of net new jobs by firm size and firm age for the year 2005, the first year in the panel that both firm size measures and employment growth are defined. HJM also created a table for net job creation for the year 2005 for the US. Using 2005 also allows us to directly compare net job creation between the US and Brazil. The upper panel uses the base-year size methodology and the lower panel uses the average size methodology. Approximately 1.5 million net new jobs are created in the Brazilian economy in the year 2005, compared to approximately 2.5 million net new jobs in the US. The last column of each panel of the table shows that all firm age categories contribute positively to net job creation in 2005, but firm start-ups account for an overwhelming amount of net job creation, over 75%, in Brazil. For the US, only firm start-ups and the most mature firms (age 26+) contribute positively to net job creation, with new firms also accounting for the vast majority of net job creation, almost 3.5 million jobs. While the results for the US overlap with the results for Brazil in regards to the importance of young firms, the results regarding the oldest firms for the US significantly contrast with the results for Brazil. However, as HJM state, "It would be misleading to say that it is only firm start-ups...that contributed to job gains. In both panels there are large positive numbers in many cells but also large negative numbers in other cells" (p. 350).

Focusing on firm size, rather than firm age, the bottom row of each panel in Table 3 shows that all firm size categories also contribute positively to net job gains in Brazil in 2005. Net job creation is most concentrated in the smallest firms (size 1-4). Generally, the positive net job gains are smaller for each firm size category using base-year size relative to average size in Brazil. For the US, all size classes (with the exceptions of base size 20-49 and average size 10-19) contribute positively to net job creation. Net job creation is most concentrated in the smallest firms (size 1-4) using base size and the largest firms (size 10,000+) using

average size. Again, the results for the US and Brazil by firm size are similar but do not align perfectly. For the US, net job creation is concentrated in the smallest and the largest firms (or just the largest firms using average size), but for Brazil, net job creation is solely concentrated in the smallest firms.

Figure 1 summarizes the patterns for employment, job creation, and job destruction for Brazil for the years 2005-2013 by two size classes and three age classes (using the base-year size methodology). The figure shows the share of employment, share of job creation, and share of job destruction for small firms (less than 500 employees) in the left panel and large firms (500 employees and above) in the right panel by firm births, young firms (less than ten years old), and mature firms (10 years and above). HJM calculated a similar figure for the US for the years 1992-2005. Figure 1 shows that small, young firms (the middle three columns in the left panel) account for the highest share of employment (37%), job creation (40%), and job destruction (44%) in Brazil. In Brazil, small-firm births create a higher percentage of jobs (18%) relative to their share of employment (3%) and small, mature firms create a lower percentage of jobs (18%) relative to their share of employment (30%). By construction, firm births can only create jobs and cannot destroy jobs. We also see that most firm births and young firms are also small firms, likely due to the large size threshold used to define small firms. For large-young firms, employment, job creation, and job destruction are relatively proportional. For large-mature firms, we see a slightly higher share of employment (24%) relative to job creation (17%) and relatively proportional share of job destruction (23%) to employment (24%).

While the overall patterns are similar for the US and Brazil, the most noticeable difference is where employment, creation, and destruction are concentrated. For the US, the share of employment, job creation, and job destruction is concentrated in large, mature firms, 45%, 35%, and 40% respectively. For Brazil, young, small firms account for the highest percentages of each category. While a glimpse at the raw data is certainly worthwhile, a more thorough analysis of employment growth rates will determine the similarities and differences of job

creation and destruction between the US and Brazil.

Figure 2 shows the relationship between employment growth rates and firm size. Figure 2 plots the estimated coefficients for both the one-way and two-way models of employment growth rates by firm size, using both the base size and average size, with and without age controls. The upper panel, panel A shows the estimates for the regressions for all firms while the lower panel, panel B, shows the estimates when the regressions are restricted to continuing firms only. Beginning with all firms, the plotted estimates for the one-way model using firm base size without age controls (diamond markers) show an inverse relationship between firm size and employment growth. The average employment growth rate for the smallest firms (base size 1 to 4) is about 23 percentage points higher than that for the largest firms (base size of 500 or more). The average growth rate for the second smallest firm size class (base size 5 to 9) is approximately 6 percentage points higher than that of the largest firms. The growth rate monotonically declines with firm size. The plotted estimates for the one-way model using firm average size without age controls (square markers) show a relatively constant relationship between firm size and employment growth. The employment growth rate of the smallest size class (average size 1 to 4) is approximately 3 percentage points higher on average than that for the largest firms (average size greater than or equal to 500). Estimates for the two-way models, which include controls for both firm size and firm age, are significantly different from the estimates for the one-way models. Including controls for firm age changes the relationship between employment growth and firm base size and firm average size. The plotted curves of the two-way model estimates show an increasing relationship between employment growth and both size measures. Once age controls are included, small firms no longer have the highest employment growth rates.

The lower panel of Figure 2 restricts the analysis of employment growth rates by firm size to continuing firms only. The plotted coefficients for the one-way models without age controls for continuing firms only are very similar to the plotted estimates for the one-way models for all firms. Employment growth and firm base size are inversely related and employment

growth rates are relatively constant with firm average size. However, including firm age in the analysis, for either size measure, does not dramatically alter the relationship between employment growth rates and firm size. With age controls, an inverse relationship between employment growth and firm base size still exists, although it is no longer monotonic, and a relatively constant relationship between growth and firm average size still remains.

Next, we look at the relationship between firm exit and firm size, which are excluded from the lower panel of Figure 2. Figure 3 plots the estimated coefficients for the one-way and two-way models of job destruction due to firm exit by firm size, without and with age controls respectively. As HJM noted, "Job destruction from firm exit is directly interpreted as an employment-weighted firm exit rate" (p. 356). Firm exit rates decrease monotonically with firm base size and firm average size, with and without age controls. Small firms are more likely to shut down and exit, regardless of whether age controls are included. The smallest firms have average exit rates approximately 10 percentage points higher using base size and at least 15 percentage points higher using average size relative to the largest firms, with and without age controls.

The results for job creation and destruction by firm size in Brazil closely mirror HJM's results for job creation and destruction in the US. Employment growth rates decrease with base size and are relatively constant with average size in the absence of firm age controls. When age controls are included, employment growth and both firm size measures have an increasing relationship. The results for firm exit in Brazil (Figure 3) also align with HJM's results for firm exit in the US. Firm average size and firm base size have an inverse relationship with firm exit rates, with and without age controls. Despite the differences in the distributions of employment, job creation, and job destruction,the overall analysis of job creation and destruction by firm size leads to strikingly similar results for the two countries. The one-way models indicate that small firms create the most jobs, but when age controls are included, the two-way models reveal that small firms no longer create relatively more jobs in either the US or Brazil. Small firms are also more likely to exit the market in both

the US and Brazil.

Figure 4 plots the estimated coefficients for the one-way and two-way models of employment growth rates by firm age, without and with firm size controls respectively. The top panel, panel A, of Figure 4 plots the coefficients for the regressions for all firms while the lower panel, panel B, plots the coefficients for the regressions restricted to continuing firms only. Note that the estimated coefficients for firm start-ups are excluded in the figure since the coefficients are much higher and equal to exactly two for the two way models (by construction of the growth measure). First, we look at coefficients for the one-way model of employment growth rates by firm age without size controls. The upper panel of Figure 4 (all firms) shows that in the absence of firm size controls, the youngest firms (aged one to two) have the highest employment growth rates. The relationship is initially decreasing, but eventually stabilizes. The plotted coefficients for the two-way models, which control for firm age and either firm base size or firm average size, indicate that the youngest firms still have the highest employment growth rates. However, the relationship between employment growth and firm age stabilizes using firm base size controls controls and continually decreases using firm average size controls.

The lower panel of Figure 4, panel B, plots the estimated coefficients for the one-way and two-way models of employment growth by firm age for continuing firms only. The patterns are extremely similar to those in the upper panel, panel A. However, the estimates from both the one-way and two-way models show that employment growth rates are monotonically decreasing with firm age, regardless of firm size controls. This provides evidence that conditional on survival, young firms exhibit the highest rates of employment growth. The upper panel of Figure 4 excludes the estimated coefficient for firm start-ups because the estimated coefficients are much larger and exactly equal to 2 by definition of the employment growth rate. The lower panel of Figure 4 also excludes firm start-ups because the analysis is restricted to continuing firms only. Therefore, the difference in the sample of firms analyzed in the upper and lower panels of Figure 4 is destroyed firms. Destroyed firms are included in

the regressions for all firms, panel A, but excluded from the regressions for continuing firms only, panel B. Figure 5 analyzes only destroyed firms and plots the estimated coefficients for the one-way and two-way models of job destruction from firm exit by firm age, with and without firm size controls respectively. The coefficients for both the one-way and two-way models of firm exit by firm age show similar relationships. Without firm size controls, firm exit rates decrease monotonically with firm age. With firm size controls, firm exit rates initially decrease with firm age and eventually stabilize (with a slight increase for the oldest firms using firm base size controls). Together, Figures 4 and 5 show that while young firms have higher employment growth rates than more mature firms, young firms are also more likely to shut down and exit the market than more mature firms.

These patterns for job creation and destruction by firm age for Brazil are similar to the US. For Brazil, the estimates from the one-way models of employment growth by firm age without firm size controls are initially decreasing with firm age, but quickly stabilize. For the US in contrast, the one-way models initially show a weak, decreasing relationship between firm age and employment growth, but the relationship quickly becomes positive. Restricting the analysis to continuing firms only shows that both countries' employment growth rates monotonically decrease with firm age, for both the one-way models without firm size controls and the two-way models with firm size controls. The patterns of the estimates for job destruction from firm exit by firm age are also extremely similar for the US and Brazil. The estimates for the one-way models indicate that firm exit rates are strictly decreasing with firm age without size controls. However, the estimates for the two-way models show that when firm size controls are included, the relationship between firm exit and firm age eventually stabilizes for Brazil while the relationship between firm exit and firm age continually decreases for the US. As HJM (2013) summarize, "Each wave of firm start-ups creates a substantial number of new jobs. In the first years following entry, many start-ups fail, but the surviving young businesses grow very fast" (p. 358). This idea reflects the "up-or-out pattern" (as described by HJM) of young firms in both Brazil and the US.

It is clear that firm start-ups and young firms play an important role in the Brazilian economy. Overall, the replication shows that the distributions of employment, job creation, and job destruction are significantly different for Brazil and the US. But, the estimated coefficients from the empirical analysis indicate that Brazil and the US have very similar patterns of job creation and job destruction. Initially small firms have relatively higher growth rates when firm age controls are excluded, but estimates for the two-way models show that employment growth rates are increasing with firm size once firm age controls are included. The "up-or-out pattern" for young firms is very strong for both the US and Brazil. While firm start-ups and young firms contribute substantially to job creation, young firms also have the highest firm exit rates. But, conditional on survival, young firms have the highest levels of employment growth in both countries. These results contradict the traditional perception that small businesses fuel job creation. But, it should be noted that most young firms also tend to be small in size (as illustrated in Figure 1). Ultimately, our analysis further supports HJM's findings that firm age is an important determinant of employment growth. Controlling for firm age alters the relationship between employment growth and firm size (Figure 2), but controlling for firm size does not substantially change the relationship between employment growth and firm age (Figure 4).

5.2 Young Firms and Employment Volatility

Thus far, the analysis for job creation and destruction in Brazil follows HJM's methodology to analyze job creation and destruction in the US by firm size and firm age. Figure 1 shows that small, young firms have the highest shares of employment, job creation, and job destruction in Brazil while large, mature firms have the highest shares of each in the US. The empirical results highlight the significant role that firm start-ups and young firms play in the Brazilian economy and the similar patterns of job creation and destruction across the US and Brazil. However, young firms may not provide very stable jobs, partly due to the higher exit rates shown in figure 5, but also due to new firms searching for the right workers.

To explore the stability of jobs created in Brazil, we analyze churn rates and separation rates by firm age and firm size. A higher churn rate or separation rate indicates higher levels of employment turnover, which is costly to both the worker and the firm.

Similar to the job creation and destruction results, we present the estimated coefficients from the one-way and two-way models in figures. Figure 6 shows the coefficients from the analysis of firm churn rates by firm size, with and without age controls. The upper panel, panel A, shows the estimated coefficients for all firms while the lower panel, panel B, shows the estimated coefficients for continuing firms only. For both panels, the patterns for churn rates by firm size are nearly identical so only the results for panel A are discussed. The results for the one-way models show that firm churn rates are increasing with both firm size measures for firm size less than 250 employees. The relationship between firm churn rates and firm size begins to decrease for firms with at least 250 employees. The estimates for the two-way models with firm age controls show very similar patterns; the relationship between churn rates and firm size initially increases, but eventually becomes a decreasing relationship. The results are extremely similar regardless of which size measure is used.

The analysis of churn rates by firm age is of more interest for exploring the "up-or-out dynamic" of firm start-ups and young firms. Figure 7 shows the estimated coefficients for the one-way and two-way models of firm churn rates by firm age, without and with firm size controls respectively. The upper panel shows the coefficients for the analysis of churn rates by firm age for all firms while the lower panel shows the coefficients from the analysis of continuing firms only. The results for all firms are nearly identical to the results for continuing firms only. The estimates for the one-way models indicate that firm churn rates are decreasing with firm age without firm size controls. The relationship does not significantly change when firm size controls are included in the analysis. The estimates for the two-way models show that churn rates are decreasing with firm age when firm size controls are included. The figures for employment turnover indicate that employment turnover is relatively high for firm start-ups and young firms in Brazil. The lower panel of Figure 7 shows that surviving

young firms continue to have relatively higher levels of employment turnover.

To ensure that the relatively high levels of employment turnover are not driven by a high number of accessions, newly hired workers, we also analyze firm separation rates, an alternative measure of employment turnover, by firm size and firm age. The results for firm churn rates by firm size and firm age are robust to using the firm's separation rate to measure employment turnover. Analyzing employment turnover by firm size and firm age motivates the need to investigate what types of firms are creating stable jobs since firm start-ups and young firms create the most jobs but have the highest employment turnover rates in Brazil.

5.3 Job Stability and Job Creation in Brazil

So far, the analysis indicates that firm start-ups and young firms have higher employment growth rates relative to more mature firms in Brazil. We've also shown that firm start-ups and young firms have higher levels of employment turnover, measured by the firm's churn rate and the firm's separation rate. Considering the volatile nature of firm start-ups and young firms, we now condition the job creation analysis on a measure of job stability to determine what types of firms create stable jobs in Brazil. Figure 8 plots the estimated coefficients for the one-way and two-way models of stable employment growth rates by firm size, with and without firm age controls, using worker tenure to define stability. The results for the top panel, which shows the estimates from the regressions for all firms, and the results for the bottom panel, which restricts the analysis to continuing firms only, are nearly identical. The estimates for the one-way models for stable growth using tenure show that stable growth monotonically decreases with firm size without firm age controls. The coefficients from the two-way models show that the relationship between stable growth using tenure and firm size becomes positive when firm age controls are included. Using worker tenure to define stability, larger firms have relatively higher stable employment growth rates when age controls are included. The inclusion of firm age controls significantly alters the relationship between stable employment growth and firm size.

Figure 9 also plots the coefficients for the one-way and two-way models for stable employment growth rates by firm size, but uses worker retention to measure job stability rather than tenure. For the upper panel (all firms), the one-way models show that stable employment growth rates are decreasing with firm size without age controls, but again the two-way models show that the relationship becomes positive when age controls are included. When the regressions are restricted to continuing firms only, the estimates from the one-way and two-way models indicate that stable growth rates using retention are increasing with firm size, regardless of age controls or size methodology. For all firms, stable growth rates increase with firm size when age controls are included using both tenure and retention to measure job stability. The patterns for continuing firms differ without age controls, but are very similar when age controls are included. Larger firms have relatively higher stable employment growth rates.

To investigate the "up-or-out" dynamic of young firms and firm start-ups, we also analyze stable employment growth rates by firm age. Figures 10 and 11 show the results for the one-way and two-way models of stable employment growth rates by firm age, with and without size controls, using the worker's tenure and the worker's retention to measure stability, respectively. Figure 10 shows that stable employment growth rates, using tenure to measure stability, are decreasing with firm age for both the one-way and two-way models. The results are very robust to including firm size controls. The lower panel shows that when the analysis is restricted to continuing firms only, the relationship between stable employment growth using tenure and firm age remains strictly decreasing for the one-way and two-way models. Figure 10 excludes the estimates for firm ages zero to two because, due to our definition of a stable job, firms can only create stable jobs if they are at least two years in age. Figure 11 shows the coefficients for the one-way and two-way models for stable employment growth and firm age using retention to measure stability. The results for all firms, seen in panel A, are somewhat different from the results for continuing firms only, seen in panel B. For all firms, stable growth rates using retention are decreasing with firm age, but become relatively

stable, regardless of size controls. For continuing firms only, the estimates for the one-way models of stable employment growth rates initially decrease,but quickly begin to increase with firm age. The estimates for the two-way models show that the relationship between stable employment growth using retention and firm age also initially decreases, but quickly begins to increase and is relatively noisy. The "up-or-out" dynamic present in the job creation and destruction results in section 5.1 is also prevalent in the results for stable employment growth rates. Conditional on survival, young firms are creating relatively more stable jobs in Brazil. The analysis continues to support the idea that firm age is an important determinant of employment dynamics in Brazil.

The analysis of stable employment growth rates shows that both firm size and firm age are key determinants of stable employment growth in Brazil. The results for the one-way and two-way models indicate that larger firms and younger firms create relatively more stable jobs in Brazil, seen through higher estimated stable employment growth rates. However, measuring job stability is difficult in nature. We used two measures of job stability, worker tenure and worker retention, to define whether each job in the data set was stable. Worker tenure, a current measure, requires an employee to have worked at their current firm for at least two years to have a stable job. By definition, this excludes all firms less than two years of age from creating any stable jobs, but allows us to utilize the full data set. Worker retention rates, a forward measure, require an employee to remain at their current firm for at least two addition years to have a stable job. Retention rates provide every firm the opportunity to create stable jobs, but do not allow us to exploit the full panel of data.

The distributions of employment, job creation, and job destruction are significantly different in the US and Brazil. For the US, large, mature firms have the highest shares of employment, job creation and job destruction. For Brazil, small, young firms have the highest shares of employment, job creation, and job destruction as shown in Figure 1. While the distribution results differ between the two countries, Figure 2 through Figure 5 indicate that the empirical results for employment growth rates and job destruction due to firm exit by

firm age and firm size lead to similar patterns between the US and Brazil. Figure 2 shows that large firms exhibit higher employment growth rates than small firms once firm age controls are included in the models. Young firms and firm start-ups are also heavy contributors to job creation, shown in Figure 4, but young firms have higher exit rates, shown in Figure 5. This aligns with the "up-or-out" dynamic of young firms described by HJM. The analysis of employment turnover by firm age, shown in Figure 7, indicates that younger firms have relatively higher firm churn rates. We then condition the job creation analysis on a measure of job stability and the results indicate that both firm size and firm age are important determinants of stable employment growth in Brazil. Stable employment growth rates are increasing with firm size for both stability measures, seen in Figures 8 and 9. Figures 10 and 11 show that stable employment growth rates are also higher for younger firms in Brazil. Large firms and young firms create the most stable jobs in Brazil.

6 Conclusion

This project analyzes job creation and job destruction in Brazil by firm size and firm age following the work of Haltiwanger, Jarmin, and Miranda (2013). The project also conditions the job creation analysis on a measure of job stability to determine what types of firms create stable jobs in Brazil. We analyze the RAIS data set for Brazil and show that firm age is a more important determinant of employment growth than firm size. Including firm age controls significantly alters the relationship between employment growth and firm size. However, including firm size controls does not change the relationship between employment growth and firm age. The results indicate that firm start-ups and young firms create a disproportionately high number of jobs in Brazil, which matches the results HJM found for young firms in the US. However, young firms also experience much higher exit rates relative to more mature firms. The "up-or-out" dynamic of young firms described by HJM for the US is also present in Brazil. Firm start-ups and young firms create a disproportionate number of

jobs initially, but a large number of firm start-ups and young firms fail and exit the market. The young firms that survive experience relatively high employment growth rates. The fact that young firms exit the market at a disproportionately high rates suggests that young firms are inherently volatile. Therefore, we analyze a measure of employment turnover, the firm churn rate, by firm size and firm age. The results indicate that young firms do have higher levels of employment turnover.

To account for young firms' high levels of employment turnover, we condition the employment growth analysis on two measures of job stability, one using worker tenure, a current measure, and one using worker retention, a future measure, to define a stable job. We define a job as stable using worker tenure if the worker was employed for at least two years at the same firm. We use a second measure of stability, retention, and define a job as stable if the worker is still employed at the same firm in two additional years. Using retention to measure stability does not allow us to exploit the full panel of data. Both measures of job stability have appealing and unappealing characteristics for trying to capture the stability of jobs at new and young firms. Requiring worker tenure to be at least two years excludes all firms less than two years in age from creating stable jobs. But, using retention to measure stability does not allow us to exploit the full panel of data. This makes it necessary to calculate stable growth rates under both stability definitions. The analysis of stable growth rates indicates that both firm size and firm age are important determinants of stable employment growth in Brazil. Not only are young firms creating a relatively higher number of jobs in Brazil, but young firms also have relatively higher stable employment growth rates. Large firms also have relatively higher stable employment growth rates. These results are consistent under both measures of stability. It is clear that both firm size and firm age are important determinants of stable job creation in Brazil.

Overall, using data from the RAIS(*Relação Anual de Informações Sociais*) for years 2004 - 2013, our analysis confirms the important role firm age plays when analyzing job creation and destruction. Haltiwanger, Jarmin, and Miranda (2013) analyzed job creation and job

destruction in the United States and determined the importance of firm age, rather than firm size. This contradicts the popular perception that small businesses fuel job creation. Our analysis for Brazil supports HJM's results for the US and reveals the importance of firm age for job creation and destruction in Brazil as well. Young firms and firm start-ups contribute to job creation and job destruction at a disproportionately high rate. Further, we find that both firm size and firm age are important determinants of stable employment growth in Brazil. Policymakers simply cannot afford to focus on only firm size or firm age when creating policies to promote employment growth, particularly when promoting the creation of stable jobs. Policies promoting dominantly small firms ignore firm age, a crucial determinant of employment growth and stable employment growth. But, policies promoting dominantly new firms ignore the volatility inherent to new and young firms. When designing policies to increase job creation, policymakers should also consider the stability of the jobs firms create. Therefore, future research should explore alternative measures of job stability and firm characteristics that improve the likelihood of survival for new and young firms.

7 Tables & Figures

Table 1: Summary Statistics

Establishment Level	count	mean	sd	min	max
New Establishment	21,731,898	0.14	0.34	0	1
Continuing Establishment	21,731,898	0.73	0.44	0	1
Destroyed Establishment	21,731,898	0.13	0.33	0	1
Employment	21,731,898	10.77	78.06	1	28,885
Base Size	21,731,898	10.72	76.87	1	28,885
Average Size	21,731,898	10.09	74.69	.5	26,687.5
Age	18,521,577	4.41	5.77	0	1,002
Employment Growth Rate	21,731,898	0.02	1.11	-2	2
Churn Rate	18,951,560	1.84	21.90	0	26,706
Separation Rate	18,951,560	0.90	13.53	0	14,536
Stable Employment Growth Rate (Tenure)	22,461,078	0.71	1.42	-2	2
Stable Employment Growth Rate (Retention)	14,023,367	-0.17	1.07	-2	2
Firm Level	**count**	**mean**	**sd**	**min**	**max**
New Firm	19,152,247	0.13	0.34	0	1
Continuing Firm	19,152,247	0.74	0.44	0	1
Destroyed Firm	19,152,247	0.12	0.33	0	1
Employment	19,152,247	12.22	192.06	1	118,532
Base Size	19,152,247	11.92	185.56	1	117,914
Average Size	19,152,247	11.53	186.28	.5	114,350
Age	19,152,247	5.86	5.87	0	903
Employment Growth Rate	19,152,247	0.03	1.10	-2	2
Churn Rate	19,896,133	1.60	13.02	0	14,833
Separation Rate	19,896,133	0.84	8.06	0	10,806
Stable Employment Growth Rate (Tenure)	19,896,133	0.38	1.33	-2	2
Stable Employment Growth Rate (Retention)	11,931,851	-0.10	1.02	-2	2

Table 2: Establishment and Firm Age Consistency Check

Establishment Level	count	mean	sd	min	max
Establishment Age (Hire Date)	10,895,240	2.41	2.95	0	903
Establishment Age (True)	10,895,240	2.03	1.99	0	8
Establishment Age Difference	976,955	4.32	5.88	1	901
Percent Overestimated	(9.0%)				
Firm Level	**count**	**mean**	**sd**	**min**	**max**
Firm Age (Hire Date)	9,349,625	2.30	2.59	0	903
Firm Age (True)	9,349,625	2.06	2.01	0	8
Firm Age Difference	631,632	3.52	5.16	1	901
Percent Overestimated	(6.7%)				

Table 3: Net Job Creation by Firm Size and Firm Age, Brazil, 2005

	1-4	5-9	10-19	20-49	50-99	100-249	250-499	500-999	1,000-2,499	2,500-4,999	5,000-9,999	10,000+	All
0	389,499	165,334	128,833	114,034	53,335	38,912	18,836	9,168	13,377	2,841	89,15	0	943,084
1	97,435	27,309	17,192	13,362	7,858	9,973	3,259	2,242	1,089	-2,167	0	0	177,552
2	3,8197	3,675	2,325	5,033	-888	689	1,255	5,514	3,864	537	0	-2,739	57,462
3	22,610	530	-739	1,999	-1914	-1502	-475	656	2,156	-489	602	0	23,434
4	15,821	-1,494	-702	609	-2,822	-995	1,404	2,999	547	1,584	-614	3,790	20,127
5	8,604	-1,931	-901	-3,043	2,027	-380	5,631	1,223	-1,650	-2,929	0	-438	6,213
6-10	18,702	-2,338	-4,265	-5,691	-7,602	-94	24,451	3,287	26,658	-6,766	8,305	11,247	65,894
11-15	2,742	187	-2,164	1,780	1,738	8,921	9,842	10,174	2,702	-1,944	7,672	13,510	55,160
16-20	2,584	-1,104	-2,086	-1,637	11,895	7,742	3,869	2,811	10,890	7,675	5,387	1,775	49,801
21-25	-162	-701	-855	-627	-1,495	2,615	9,897	-1,170	4,898	-5,063	9,224	2,239	18,800
26+	-112	-561	17,069	-1,648	14	-3,566	4,487	20,336	-9,102	11,418	8,412	8,622	55,369
All	595,920	188,906	153,707	124,171	62,146	62,315	82,456	57,240	55,429	4,697	47,903	38,006	1,472,896
0	532,288	143,189	97,020	77,944	30,471	27,871	9,168	11,006	5,212	8,915	0	0	943,084
1	1,566	38,107	36,780	41,930	21,072	20,275	8,690	6,180	5,119	-2,167	0	0	177,552
2	-32,370	12,469	15,128	15,364	12,770	9,909	8,265	9,429	5,737	3500	0	-2739	57,462
3	-29,001	4,585	9,090	11,897	7,191	4,473	4,119	8,712	2,255	-489	602	0	23,434
4	-23,912	-101	4,534	6,443	3,065	5,714	9,720	3,859	4,569	3060	-614	3790	20,127
5	-18,861	-4,334	731	2,183	3,664	4,966	11,284	-526	6,960	584	0	-438	6,213
6-10	-44,112	-16,854	-4,752	3,163	1,791	18,877	15,434	28,101	14,747	27943	2932	18624	65,894
11-15	-10,844	-7,562	-6,100	-1,261	4,859	14,764	13,902	7,830	13,850	4540	2652	18530	55,160
16-20	-4,307	-4,441	-4,305	-5,729	-4	6,567	4,073	13,393	17,728	16814	8237	1775	49,801
21-25	-1,749	-1,459	-2,336	-5,269	-1,603	-413	5,221	2,387	10,581	1335	9866	2239	18,800
26+	-1,200	-1,344	-1,854	-5,812	-6,180	-5,359	-911	-968	9,621	20628	13618	35130	55,369
All	367,498	162,255	143,936	140,853	77,096	107,644	88,965	89,403	96,379	84,663	37,293	76,911	1,472,896

Figure 1: Shares of Employment, Job Creation, and Destruction by Broad Firm Size and Age Classes: Brazil, 2005-2013

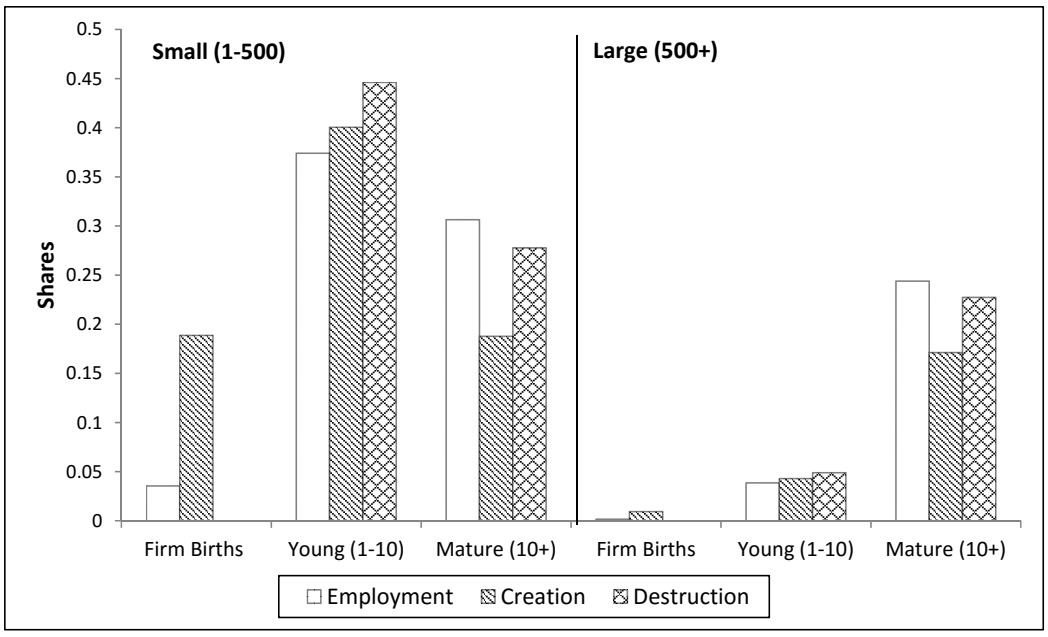


Figure 2: Employment Growth Rate and Firm Size

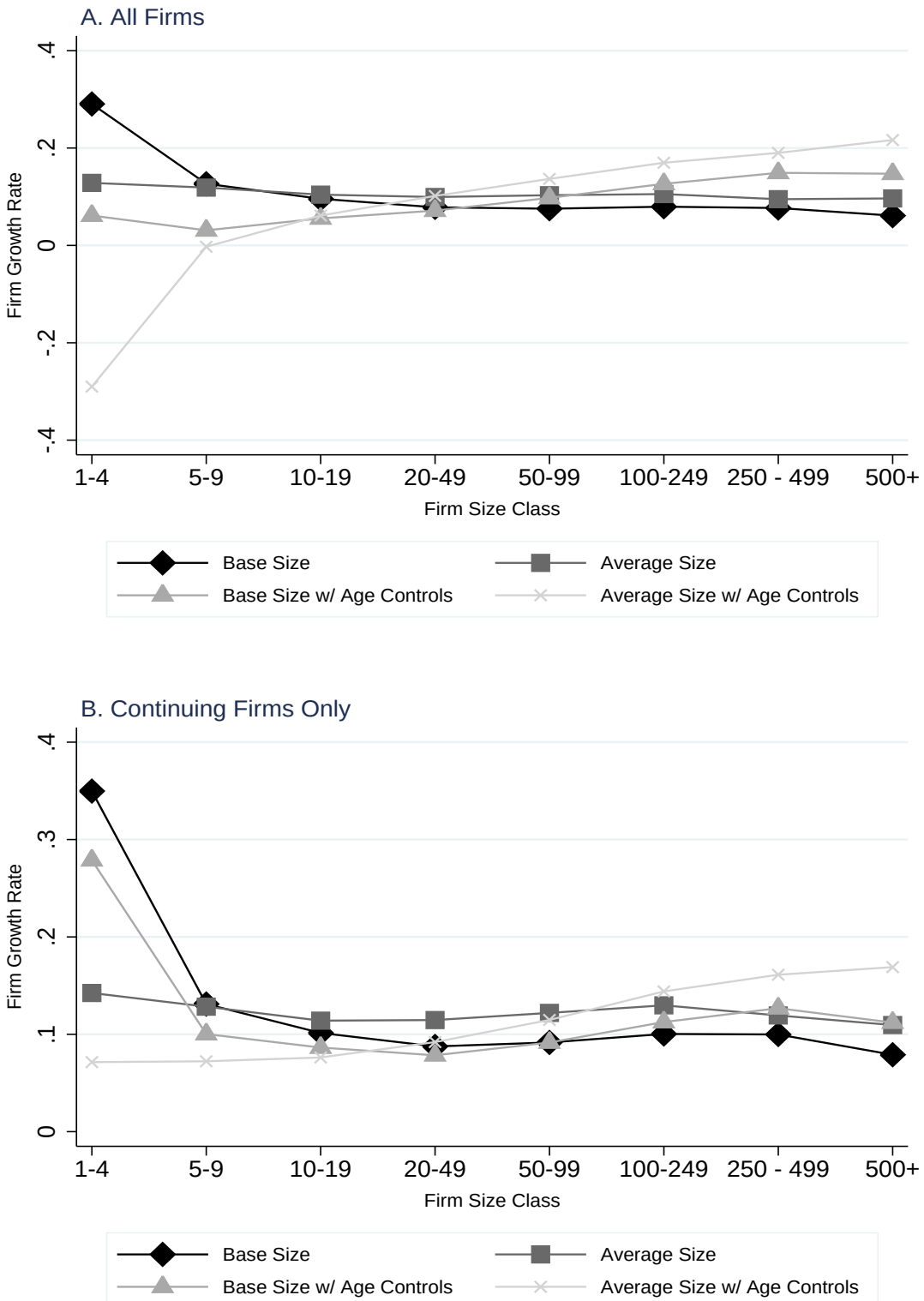


Figure 3: Firm Exit by Firm Size

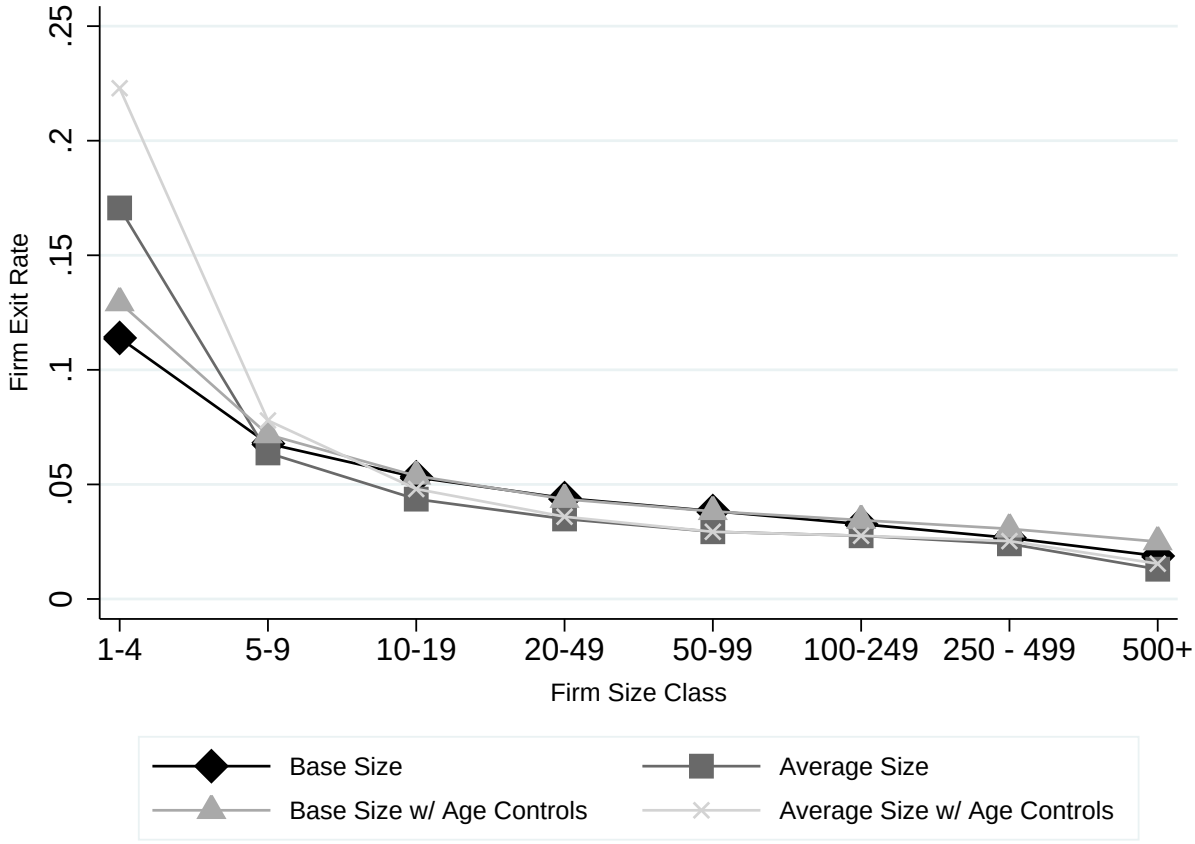
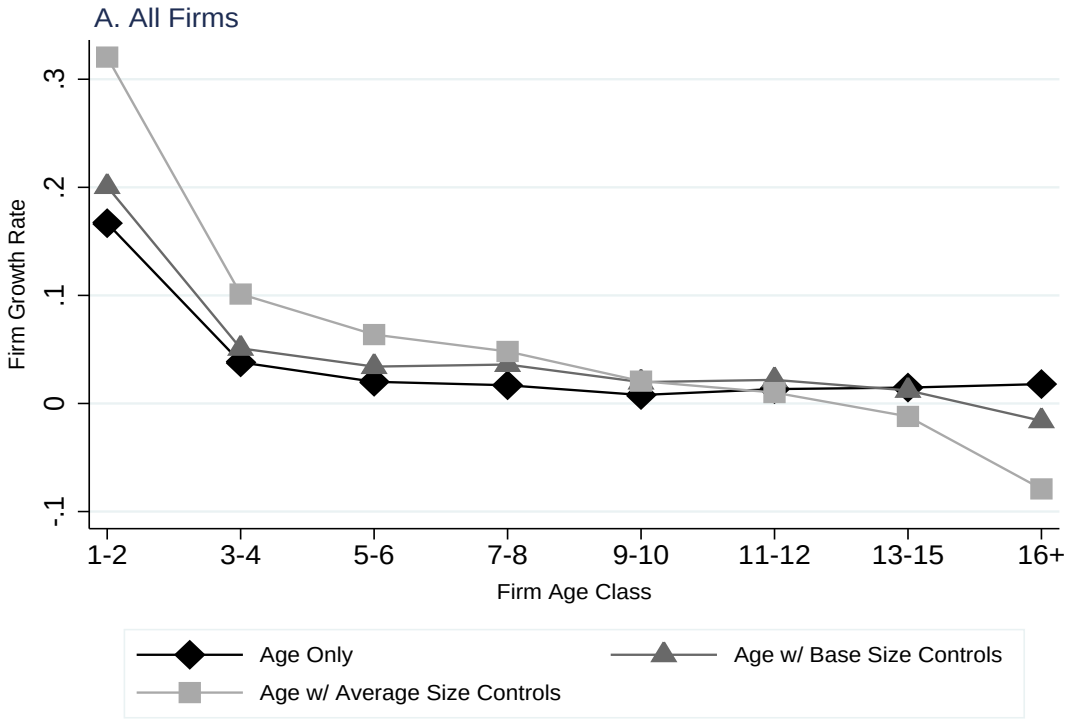


Figure 4: Employment Growth Rate and Firm Age



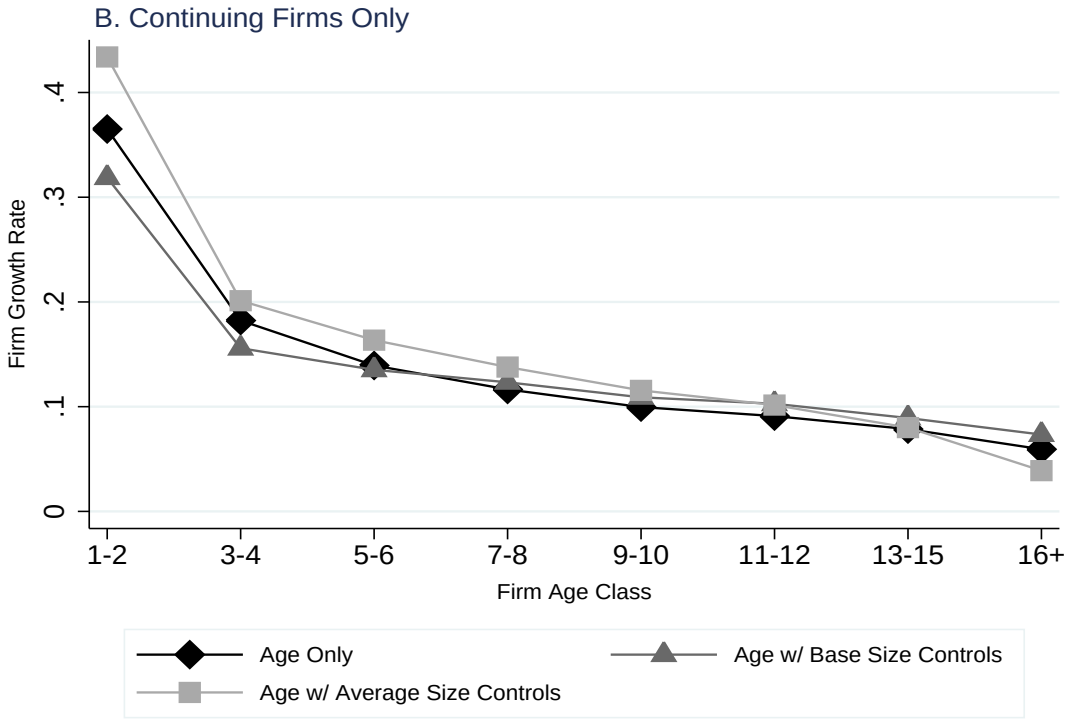


Figure 5: Firm Exit by Firm Age

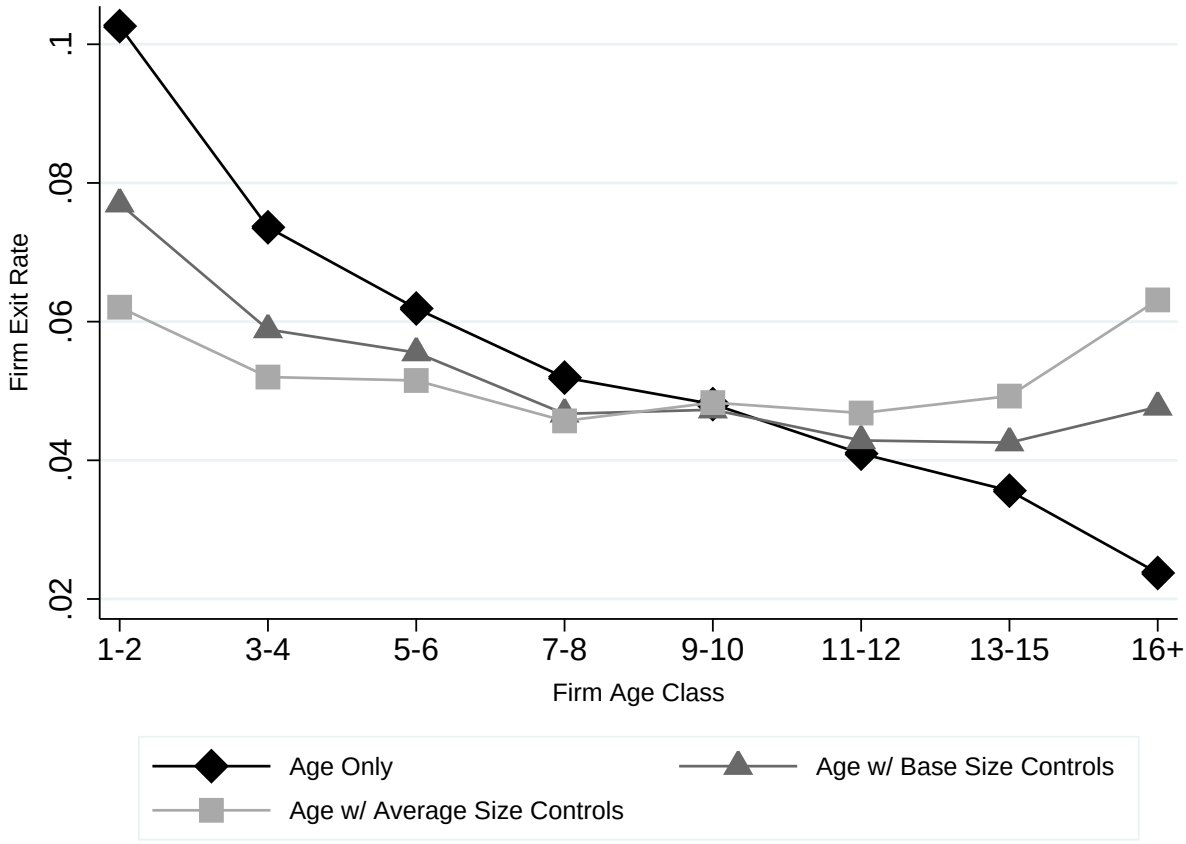
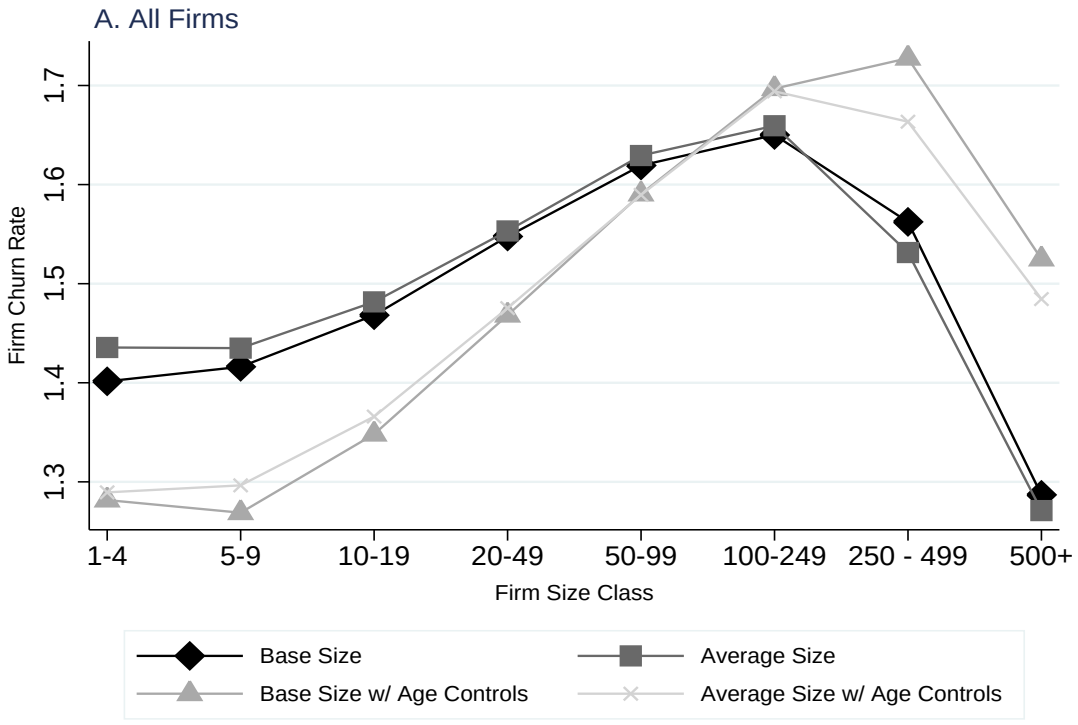


Figure 6: Firm Churn Rate by Firm Size



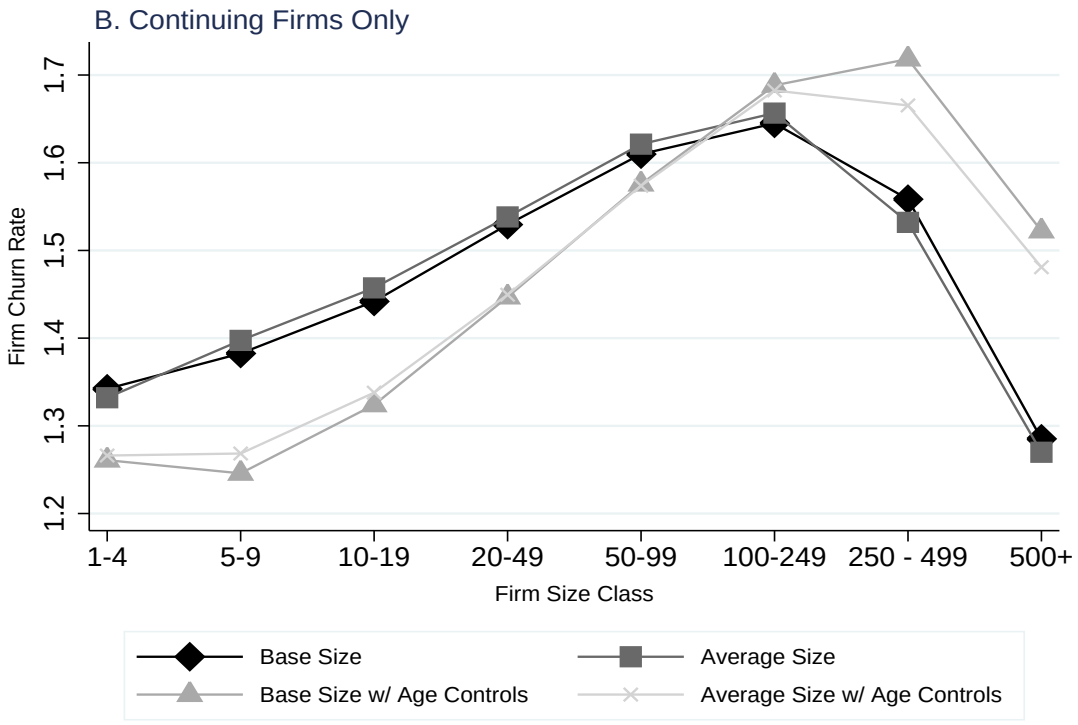
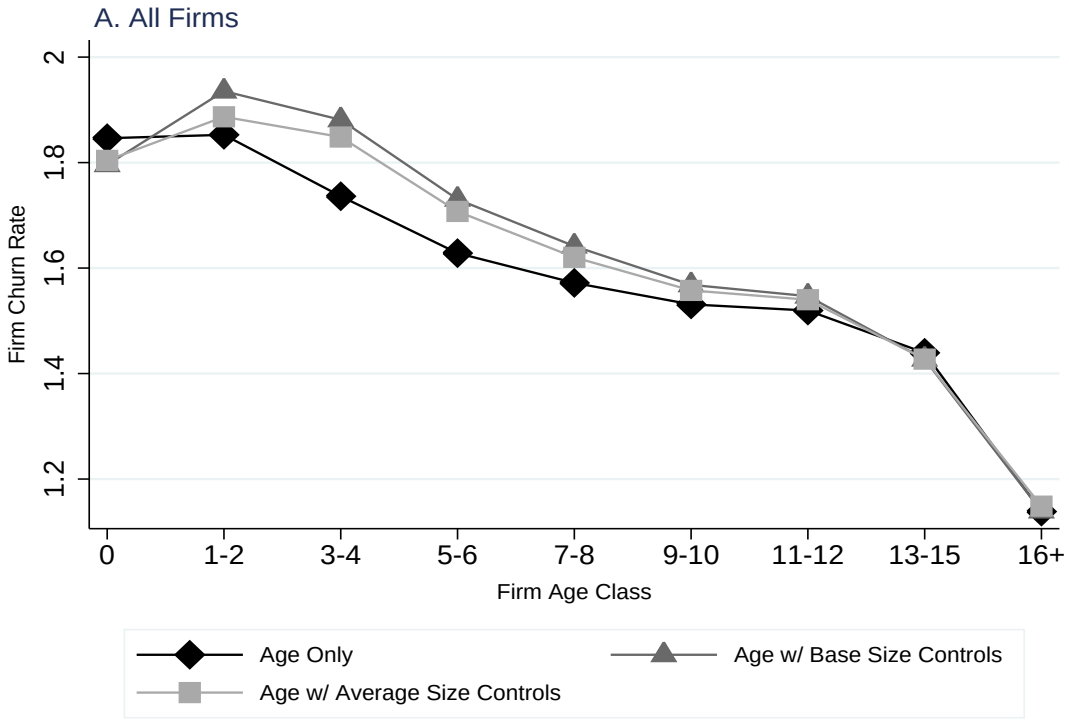


Figure 7: Firm Churn Rate by Firm Age



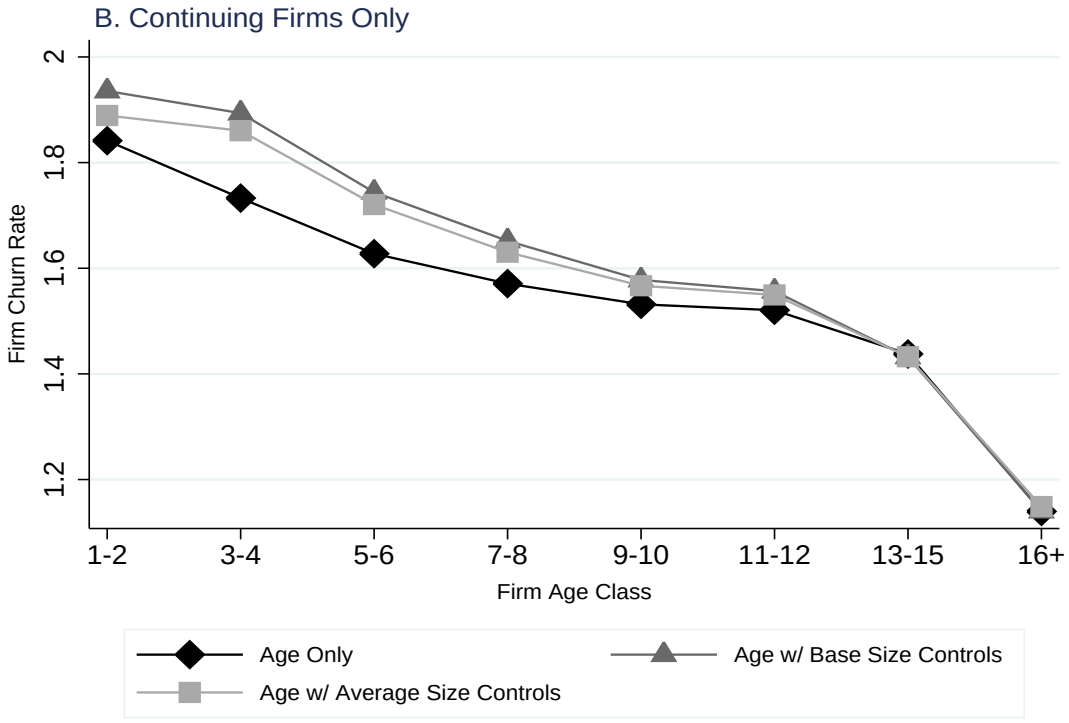


Figure 8: Stable Employment Growth by Firm Size (Tenure)

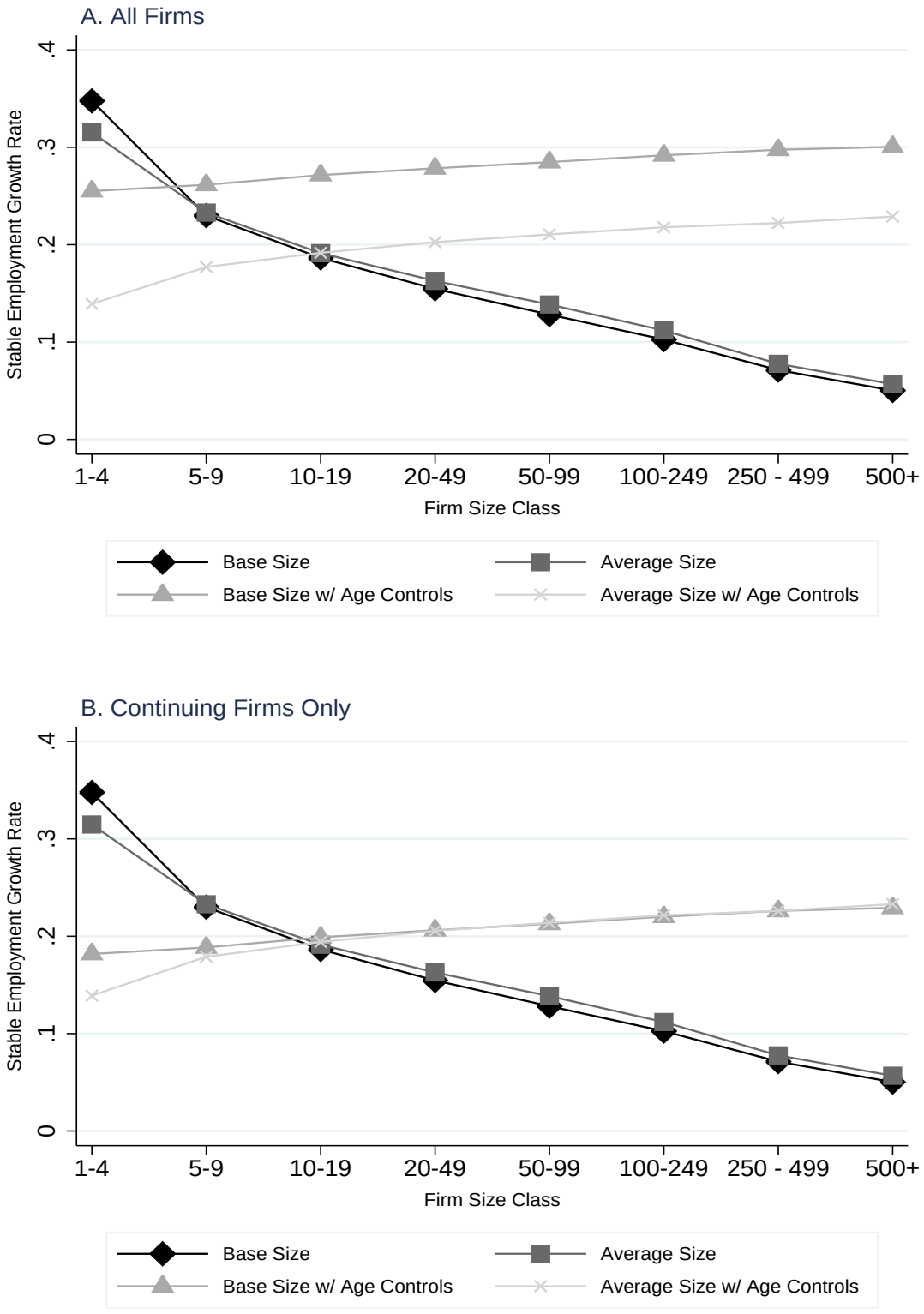
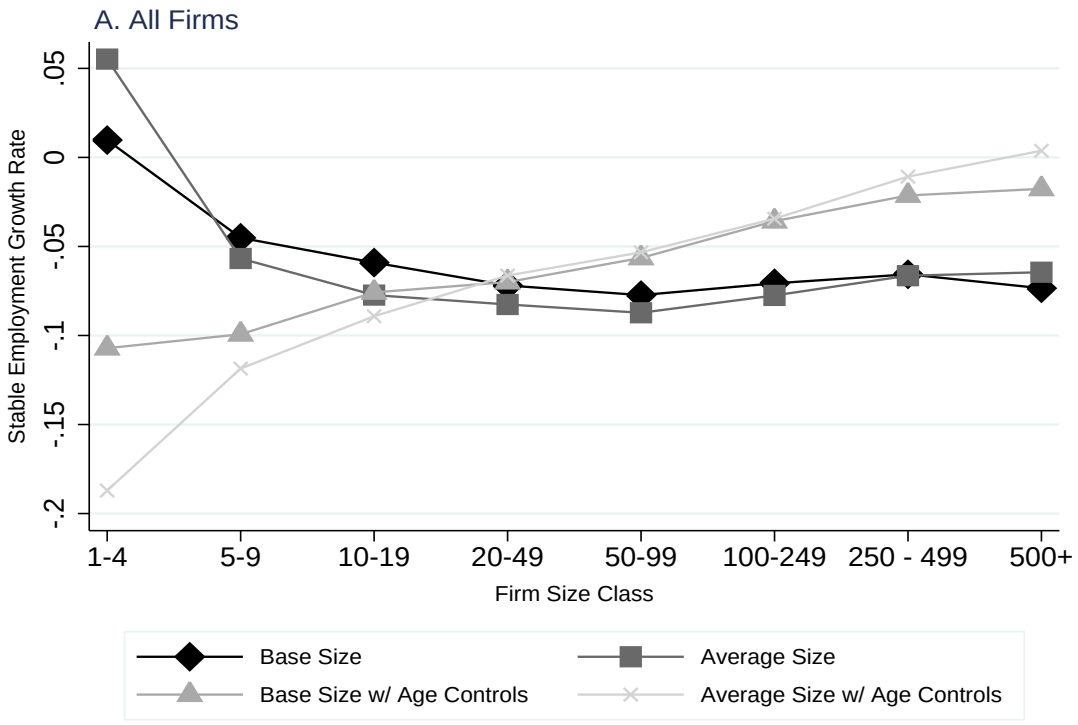


Figure 9: Stable Employment Growth by Firm Size (Retention)



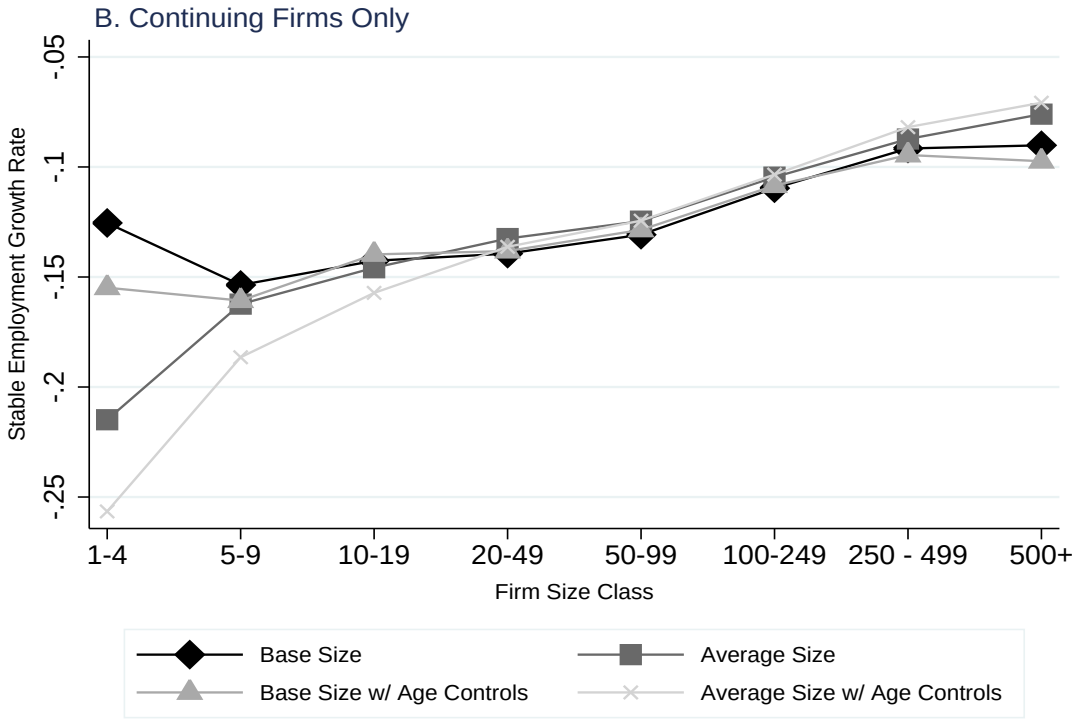
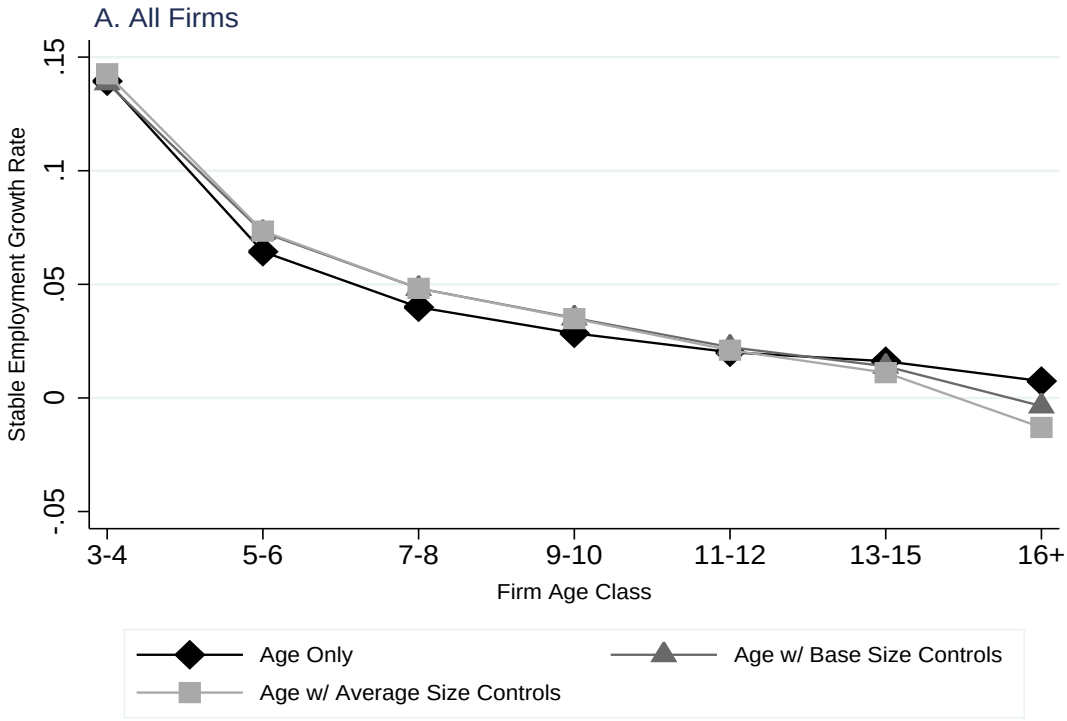


Figure 10: Stable Employment Growth by Firm Age (Tenure)



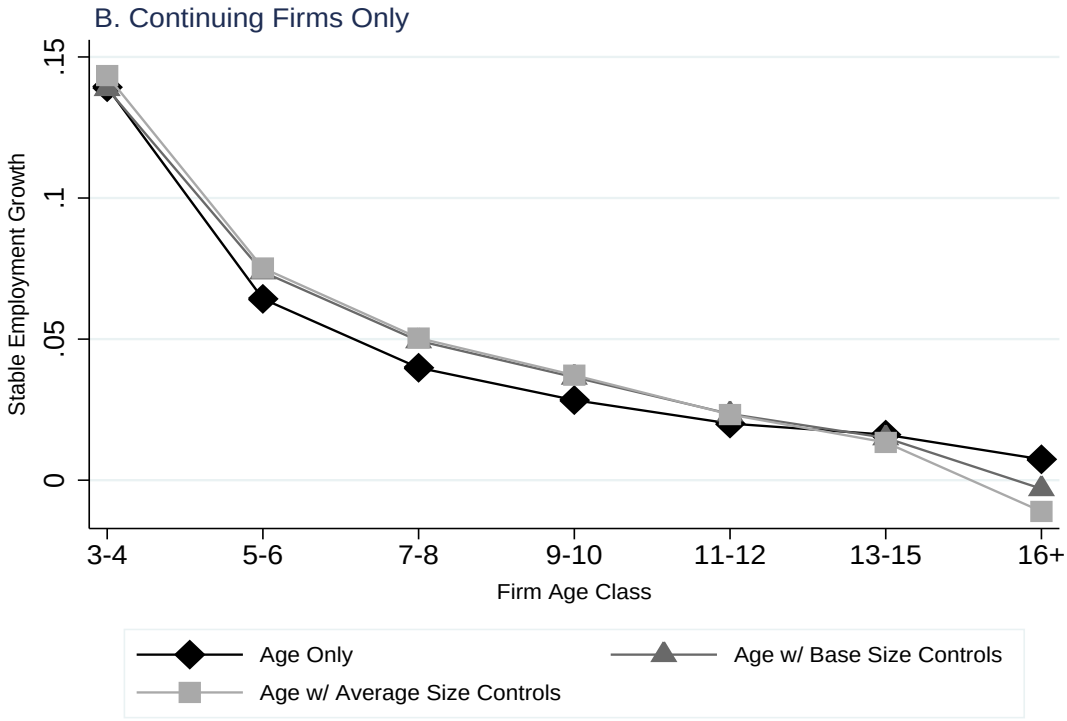
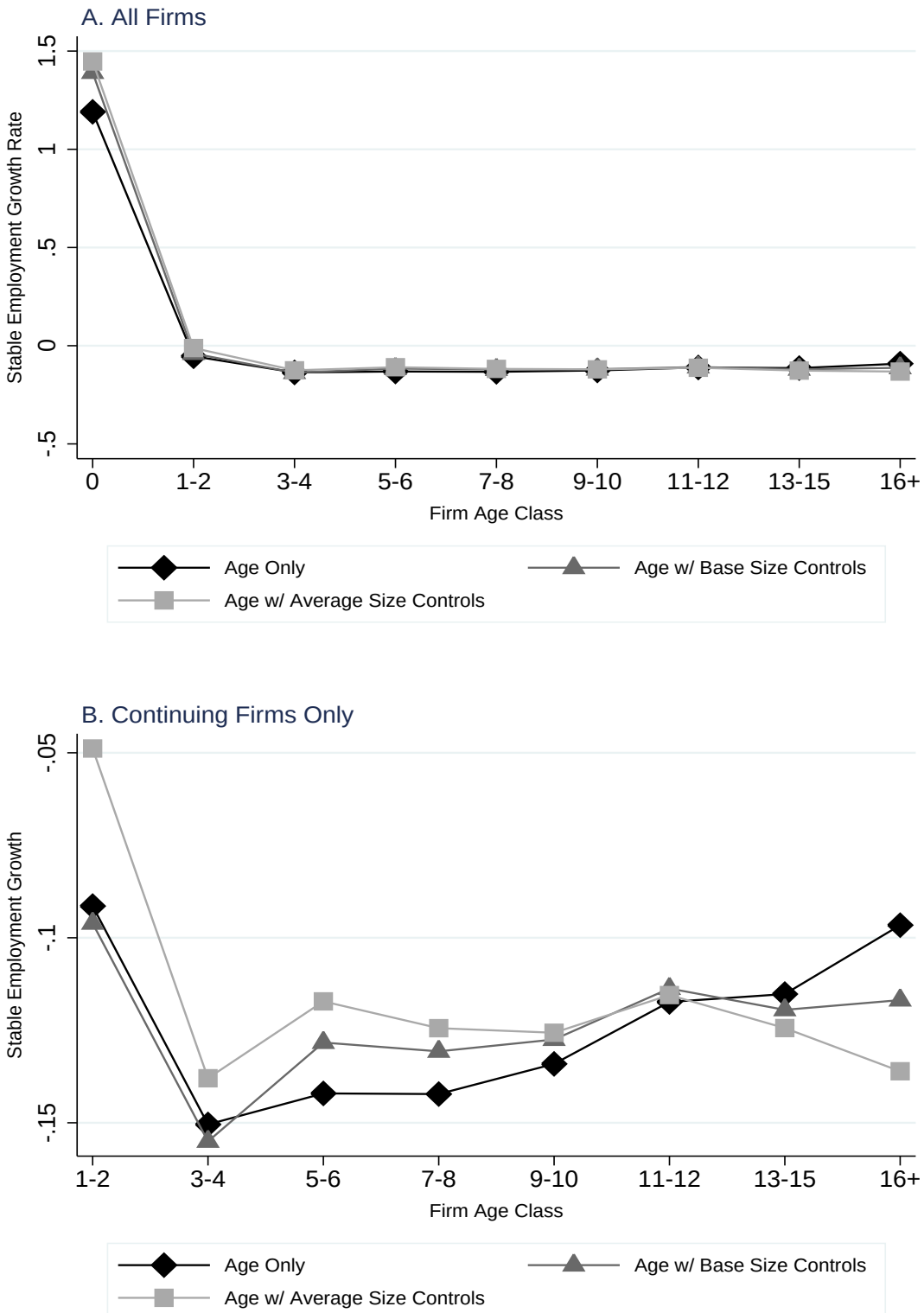


Figure 11: Stable Employment Growth by Firm Age (Retention)



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