SMALL FIRM DEATH IN DEVELOPING COUNTRIES

David McKenzie and Anna Luisa Paffhausen*

Abstract—We collate sixteen panel surveys from twelve developing countries to develop stylized facts from over 14,000 firms on how much firm death there is, which types of these firms are most likely to die, and why they die. Small firms die at an average rate of 8.2% per year. Death rates are higher in richer countries, for younger firms and less profitable firms, and for firms run by youth. We also find that firm death need not mean permanent exit from self-employment for the firm owner.

I. Introduction

TWENTY-SEVEN percent of the nonagricultural labor force in developing countries consists of self-employed business owners with no employees (Gindling & Newhouse, 2014), and 99% of the firms in many poor countries have ten workers or fewer (McKenzie, 2017). These firms are an important source of income for the poor, and many policy interventions are designed to help people start and grow such firms. Yet much less attention has been devoted to the death of such firms, with no systematic evidence available as to the rate of small firm death, which firms are more likely to die, and why they die. Almost two-thirds of published randomized experiments testing policy interventions for small firms in developing countries ignore firm death completely, neither reporting the death rate nor examining it as an outcome. 1

Understanding the prevalence, characteristics, and causes of firm death is important for poverty, productivity, and policy. Since self-employment is an important source of income for the poor, firms shutting down could mean a large loss in income for firm owners. A growing body of literature (e.g., Hsieh & Klenow, 2009) has noted large misallocations of resources in developing countries. Firm death can improve aggregate productivity if less productive firms die and reallocate resources and customers to more efficient competitors. The optimal policy response to firm death then depends on whether it involves large income losses for the poor and whether it is efficiently selecting out the least productive firms.

This paper provides systematic evidence on firm death in small firms in developing countries by collating data on more than 14,000 small firms from sixteen firm panel surveys in twelve countries, enabling estimation of the rate of firm death over horizons as short as three months, and as long as seventeen years. This overcomes many of the limitations of the existing literature on firm death in developing countries, which have had to rely on a small number of time periods, usually in just a single country, often with small samples of microfirms and high rates of attrition. Moreover, we included detailed questions in nine of these surveys to measure cause of death, and most of our surveys also continue to track the firm owner after their firm has died to provide data on what they do once their firm dies.

We begin by estimating the prevalence of firm death. Existing estimates of the rate at which small firms die in developing countries range from as low as 3% per year (Frazer, 2005; Davies & Kerr, 2018) to over 30% annually (Fajnzylber, Maloney, & Rojas, 2006; Nagler & Naudé, 2017). We find the rate of firm death is approximately linear over time horizons up to five years, averaging 8.2% per year, but then it declines over longer time horizons, so that firm death rates average less than 5% per year when looking over intervals of ten years or longer. The result is that half the stock of firms operating at a given point in time will die within the next six years.

We then examine which firms are more likely to die through examining the extent to which firm and owner characteristics predict firm death. Younger firms are much more likely to die: 17% of firms die in their first year, compared to only 4% of five- to six-year-old firms dying in their next year. Less profitable firms are more likely to die. Death rates are higher for younger and older entrepreneurs than for middle-aged owners, and higher for female owners than males, although this gender difference is no longer statistically significant after controlling for other firm and owner characteristics. Firm death rates are found to be higher in richer developing countries than poorer countries.

Finally, we turn to why firms die and what happens after death. Firms are more likely to close because they are experiencing a loss or because the owner suffers household shocks than because of positive shocks to the outside opportunities facing the owner. As a result, firm death is associated with a large fall in the labor earnings of the owner. We find firm death need not be forever, with approximately 40% of owners whose firms have closed opening a new firm again within three years.

II. Measurement of Firm Death in the Existing Literature

At least four approaches have been used to measure firm death in the literature, each with particular strengths and drawbacks. A first approach is seen in some of the earliest empirical work on the topic, undertaken in the early 1990s in
several sub-Saharan African countries (Liedholm & Mead, 1995; Mead & Liedholm, 1998). They carried out cross-sectional “closed firm” surveys by asking a random sample of households about enterprises they previously ran but no longer operate, in addition to those they currently run. Based on these data, they report an average closure rate of 12.9% per year; although using the same data, McPherson (1995) reports annual hazard rates of firm death of 3% to 4%. This approach has the advantage of allowing for large samples and for representativeness of the areas in which sampling occurs. However, as the authors themselves acknowledge, it is likely to be much less accurate than panel surveys, which track businesses over time, since people may forget or not want to talk about businesses that failed, and there is likely to be substantial recall error as to exactly when the business closed. Moreover, it will not capture people who close their businesses and then migrate out of the area.

A second approach has been to use manufacturing censuses or company registers. Examples include Roberts and Tybout (1996), who provide annual firm exit rates of 10.8% in Chile, 11.1% in Colombia, and 6.0% in Morocco; Bertselsman, Haitiwanga, and Scarpetta (2009), who graphically show annual exit rates of approximately 4% to 5% in ten Latin American and eastern European economies; Klapper and Richmond (2011), who use a firm census of formal firms in Côte d’Ivoire and find annual exit rates of around 10%; and Shiferaw (2009), who reports annual exit rates of 16% for privately owned Ethiopian manufacturing firms. These censuses offer the advantage of providing population rather than sample data on the dynamics of larger firms. However, they are unsuited for examining the death of small firms for several reasons. First, many of the censuses are restricted to firms with ten or more workers or those that are formally registered, and they are extremely unlikely to capture nonvisible businesses operating within households. Second, it is not possible to distinguish firms that have closed from those that have switched sector out of manufacturing or have fallen below the cutoff point for inclusion. Third, they do not include firms in the retail and service sectors, which comprise the majority of small businesses.

A third approach is to use multipurpose household living standards panel surveys such as the World Bank’s Living Standards Measurement Study (LSMS). This approach was used in Vietnam by Vijverberg and Haughton (2004), who report 61% of firms dying over a five-year period, and McCaig and Pavcnik (2016), who find 30% to 35% death rates over two-year periods. Kraft (2016) uses the Egypt Labor Market Panel Survey to find 51% of firms died over an eight-year period and 61% over a subsequent six-year period. The advantages of these data sets are that the samples can be large and representative and they capture micro- and small businesses operating within households. However, these authors note several challenges to the use of these household surveys to track enterprises. Since the surveys do not identify specific enterprises by either name or code, authors need to match firms over time based on characteristics such as the age of the firm, the identity of which household member runs the firm, and its sector. This can result in measurement errors if firms switch their sector of business or have trouble recalling the age of the firm. Further downsides are that the surveys are often conducted at irregular intervals, limiting the periods over which death rates can be measured, and often they contain relatively little information on firm characteristics to enable exploration of which firms die and why.

The final approach is then to use dedicated firm panel surveys to track a sample of firms over time. The main challenge for this approach has been the dearth of firm panel surveys in developing countries, small sample sizes, and the difficulty of tracking firms with relatively low attrition. This approach was first tried by Mead and Liedholm (1998), who report an annual closure rate for micro- and small enterprises in the Dominican Republic of 29% in 1992 and 22% in 1993, based on a sample of unspecified size with an unspecified attrition rate. They note that they also tried the approach in Zimbabwe but were unable to relocate 42% of firms. Panel surveys of manufacturing firms in several sub-Saharan African countries were collected as part of the Regional Program on Enterprise Development (RPED) and have been used in several papers on firm dynamics (Frazer, 2005; Söderbom, Teal, & Harding, 2006; Sandefur, 2010). These surveys typically include 100 to 200 manufacturing firms per country and do not include household enterprises. They report firm death rates of 6.3% over two years (Frazer, 2005) and 19% to 44% over five years (Söderbom et al., 2006), although they do not report attrition. Davies and Kerr (2018) conducted a ten-year follow-up of a random sample of 1,000 firms surveyed in the 2003 Ghanaian manufacturing census. They could not find what had happened to 29% of the firms with under ten workers in their sample, while 25% had died.

This review of the literature shows that there has been relatively little evidence on the rates of firm death in the most prevalent types of enterprises found in developing countries: micro and small household enterprises that include retail and service firms in addition to manufacturing. Few of these studies measure attrition rates, and none provide bounds on what the rate of firm death will be when this is taken into account. A number of the studies provide descriptive information on what types of firms are more likely to die, and we will compare our findings on these correlates in section V. However, the fact that firm death is only a fraction of the sample and that single-country samples have often been relatively small has meant that studies typically have relatively few deaths with which to examine the characteristics of who dies. For example, Frazer (2005) pools four rounds of firm surveys from Ghana and still has only 30 deaths versus 479 survival episodes to compare, while Davies and Kerr (2018) have 95 deaths of firms with 0 to 9 workers.

III. Our Approach to Measurement and Our Sample

Our conceptual unit of analysis is the firm, rather than the entrepreneur, and our focus is on nonfarm micro and small
A. General household surveys

- Townsend Thai Survey (TTHAI) 1997–2014 (Annual)

B. Specialized firm impact evaluation surveys

- Cotonou Informal Enterprise Survey (BIJINORMALITY) 2014–2016
- Egypt Microinsurance for Microenterprises Survey (EGMACROINSURANCE)
- Ghana Microenterprises Survey (GHMS) 2008–2010
- Kenya GET Ahead Business Training Program Impact Evaluation Survey (KEGETAHEAD)
- Sri Lanka Impact Evaluation Survey of Business Training for Women (SLFEMBUSTRAINING)
- Sri Lanka Informal Enterprises Survey (SLINFORMALITY) 2008–2011
- Lomé Informal Enterprise Survey (TGINORMALITY) 2013/2014–2015
- Uganda Women’s Income Generating Support Impact Evaluation Survey (UGWINGS) 2009–2011

Only the control group is used from surveys that are part of randomized experiments. Sources: Benhassine et al. (2018); Blattman et al. (2016); Campos et al. (2015); Campos et al. (2017); De Mel, McKenzie, and Woodruff (2008, 2009, 2010, 2012, 2013, 2014, 2019); Fakhfakh et al. (2014); Groh and McKenzie (2016); McCaig and Pavcnik (2016); McKenzie (2017); McKenzie and Puerto (2017); National Bureau of Statistics of the Federal Republic of Nigeria (2014); Rubalcava and Tenen (2013); Strauss, Witosel, and Sikoki (2016); Townse (2016).

Table 1.—Overview of Included Surveys

<table>
<thead>
<tr>
<th>Survey</th>
<th>Rounds</th>
<th>Number of Rounds</th>
<th>Sample Size</th>
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<tbody>
<tr>
<td>A. General household surveys</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Nigeria General Household Survey (NGGHS)</td>
<td>2010/2011–2012/2013 (post-planting and post-harvest each)</td>
<td>4</td>
<td>1,804</td>
</tr>
<tr>
<td>Townsend Thai Survey (TTHAI)</td>
<td>1997–2014 (Annual)</td>
<td>18</td>
<td>1,122</td>
</tr>
<tr>
<td>B. Specialized firm impact evaluation surveys</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>Cotonou Informal Enterprise Survey (BIJINORMALITY)</td>
<td>2014–2016</td>
<td>3</td>
<td>1,197</td>
</tr>
<tr>
<td>Egypt Microinsurance for Microenterprises Survey (EGMACROINSURANCE)</td>
<td>March 2003–March 2011</td>
<td>2</td>
<td>1,441</td>
</tr>
<tr>
<td>Ghana Microenterprises Survey (GHMS)</td>
<td>2008–2010</td>
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<td>397</td>
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<tr>
<td>Sri Lanka Microenterprise Survey (SLMS)</td>
<td>2000–2016</td>
<td>15</td>
<td>269</td>
</tr>
<tr>
<td>Sri Lanka Informal Enterprises Survey (SLINFORMALITY)</td>
<td>2008–2011</td>
<td>4</td>
<td>105</td>
</tr>
<tr>
<td>Sri Lankan Longitudinal Survey of Enterprises (SLLSE)</td>
<td>2008–2014</td>
<td>11</td>
<td>284</td>
</tr>
<tr>
<td>Lomé Informal Enterprise Survey (TGINORMALITY)</td>
<td>2013/2014–2015</td>
<td>5</td>
<td>499</td>
</tr>
<tr>
<td>Uganda Women’s Income Generating Support Impact Evaluation Survey (UGWINGS)</td>
<td>2009–2011</td>
<td>2</td>
<td>461</td>
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</tbody>
</table>

**Small Firm Death in Developing Countries**

Enterprises in developing countries. The vast majority of such firms have fewer than ten workers, with the modal firm in many developing countries consisting of just the owner, with no paid workers (McKenzie, 2017). We define firm death as having occurred if a firm is open at one point in time and then is reported as having shut down by the owner in a subsequent survey round. By “shut down,” we mean that the owner of the firm has decided to stop operating the firm and no one else is operating it. It is not intended to include temporary closures of a few days or weeks that may occur when the owner is ill or away.

Seasonal firms, which regularly open for only part of the year, close for part of the year, and then reopen again, will be rare in our data for a combination of sectoral choice and sampling reasons. First, our focus is on firms outside the agricultural and fishing sectors, and so excludes seasonality that arises in those sectors. Second, the majority of our sample comes from firm panels that rely on firms operating full time for inclusion. Nevertheless, we discuss this issue in more detail with regard to the different surveys below.

**A. Putting Together a Large Panel of Micro and Small Firms**

We draw on information on firms from both multipurpose household and firm panel surveys in order to construct a large panel for examining death rates. Our resulting data set combines data from sixteen surveys in twelve developing countries and comprises 14,426\(^2\) firms at baseline, with a longitudinal dimension that is able to cover the dynamics of these firms in the short, medium and long term. Table 1 lists the surveys underlying the data set, and online appendix A.1 discusses more details of each survey.

Our inclusion criteria for using multipurpose household panel surveys were to include nationally representative surveys with a detailed nonfarm business module, low rates of attrition, and a relatively large sample size and enabled us to measure firm survival and death rates over at least three or more waves. This yielded four surveys. The first two are the Mexican Family Life Survey (MxFLS) and the Indonesian Family Life Survey (IFLS), both of which provide large samples of households. These surveys occur at low frequency, enabling us to measure firm death over horizons of three, four and a half, and eight years in Mexico and seven, eight, and fifteen years in Indonesia. We examined the set of LSMS surveys to determine the ease at which they could be used to construct household firm panels. This led to the inclusion of the Nigeria General Household Survey (NGGHS), which allows measurement of firm death over 0.5-, 1.5-, 2-, and 2.5-year horizons. Finally, we also include data from the Townsend Thai Project. This is a smaller sample, but it resamples households annually over an extended period of time, enabling firm death to be measured over periods from one to seventeen years.

These household panel surveys were not designed to track businesses over time and do not link the businesses reported from one survey wave to the next. We therefore consider households that operate only one enterprise and follow Vijverberg and Haughton (2004), McCaig and Pavcnik (2016), and Kraft (2016) in using information on firm age, business...
We then pool surveys that have been collected as part of randomized controlled trials to assess different interventions designed to help micro and small firms in different countries. In each case, we use only the control group data in order to be able to assess firm death in the absence of any intervention. We searched publicly available data sets for impact evaluations targeted at microenterprises, but found that most data made available only provided sufficient detail for replicating particular papers and were not suitable for assessing survival dynamics. We use eleven panel surveys carried out in randomized trials conducted by one of the authors. These include microenterprise surveys of informal firms used for formalization experiments in Benin, Malawi, and Sri Lanka; surveys of microenterprises used in business training interventions in Kenya, Sri Lanka, and Togo; microenterprises that were part of cash grant interventions in Ghana and Sri Lanka; microfinance clients that were part of an insurance intervention in Egypt; business plan competition applicants in Nigeria; and microenterprises that were part of an intervention that gave wage subsidies, savings help, and business training in Sri Lanka. The one additional publicly available data set that we were able to include contained data from a program for female small businesses in Uganda from Blattman et al. (2016). Many of these specialized firm surveys are representative of urban microenterprises of particular size cutoffs or informality status, having been found through door-to-door listing surveys. Some of the samples also screen on the gender of the owner. Most samples do screen on the owners working full time in the business and tend to screen out firms that operate only seasonally or for very limited hours. Several surveys are further restricted to firm owners who applied for some program, such as the business plan competition applicants in Nigeria, the microfinance clients in Egypt, and the Uganda study targeted at women in marginalized villages in northern Uganda.

These specialized firm surveys collect data at relatively high frequencies, with a number collecting data at quarterly or semiannual frequencies. However, few of them follow firms for more than three and a half years. The exceptions are three surveys from Sri Lanka, which tracked firms at five to six years and at ten to eleven years in the case of the Sri Lanka Microenterprise Survey (SLMS). Table A.4 provides an overview of the follow-up periods provided by each survey.

### B. Dealing with Attrition

A key threat to our ability to measure firm death rates comes from survey attrition, in which owners of businesses could not be found or refused to be reinterviewed in the follow-up survey. The studies we draw on mitigate this threat in two main ways. The first has been to conduct multiple follow-up attempts and track individuals who move, thereby reducing overall levels of attrition. Second, the specialized firm surveys usually record whether the business is still in operation, even if the owner refuses to be reinterviewed or is away from the business when survey attempts are made. Table A.5 summarizes the attrition rates in our combined data set by period of measurement. Attrition rates are relatively low for this combined sample: 4.8% for one year, 10% for two years, 9.5% over three years, and around 20% in many periods beyond five years, with some exceptions of lower attrition rates.

We then form bounds for death rates to account for attrition. A lower bound for firm death is obtained by assuming that all firms that have missing values for firm death status at follow-up are still operating. An upper bound for firm death is obtained by assuming that all of these firms died.

### C. Summary Statistics on Firm Characteristics

Table 2 provides baseline summary statistics of our sample of firms in order to provide a description of the types of firms for which we are able to examine firm death rates. The sample consists of small enterprises run by individuals with relatively low levels of education (only 6% have any tertiary schooling) and who have an average age of 43 years. Fifty-six percent of the owners are women. The firms have been in business for a mean of nine and median of six years, with just over half (52%) in retail, 31% in services, and 14% in manufacturing. Only 29% of firms have any paid workers, with a mean of 0.75 worker per firm. Conditional on having paid workers, the median firm has only one worker and only 10% have five or fewer.

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1 The majority of households that operate a business operate only one business. In the 2000 round of the IFLS, these are 80%; in the 2002 round of the MxFLS, 93%; in the 2010 round of the NGGHS, 58%, and in the 1997 round of the Townsend Thai Project, 83%.

2 However, these surveys are not well designed for studying firm entry rates, since we miss firms that open and then close again between survey rounds. Appendix A.2 discusses firm entry in more detail.

3 This relies on the assumption that the control group death rates were not affected by the treatments. The different experiments try to minimize the possibility of this interference through methods such as not sampling firms that are too close to one another. McKenzie and Puerto (2017) formally test this assumption, finding no impact of their treatment on the survival rates of other firms operating in the same markets.

4 The Uganda study targeted women, rather than firms, as the unit of observation. We take the sample of control group participants who started a firm and use this subsample to track firm dynamics.
more workers. Mean (median) monthly profits are 129 ($63). The median firm is thus earning approximately $2.65 per day it operates.

IV. How Much Firm Death Is There?

The first question that we wish to use these data to answer is just what the rate of firm death is for small firms in the economy. That is, starting with a sample of existing firms today, how many of them will have closed a year from now or five years from now? The answer to this question is useful for understanding the rate of churn in these small firms, as well as for policymakers and researchers planning interventions to help these firms.

A. The Fitted Relationship between Death Rates and Time

The surveys vary in their frequency, so we cannot measure firm death for the same interval (e.g., one year) for all the surveys. We therefore begin by calculating firm death rates for each of the 79 survey-time interval combinations in our data and report these rates in appendix table A.2. along with data from the Bureau of Labor Statistics and U.S. Census Bureau for firms with at least one paid employee. Among firms with 1 to 4 paid workers, the one-year death rate over 1995 to 2016 averaged 19.7%. It was highest for younger firms, averaging 28.4% for firms aged one to four years, 20.8% for firms aged five to nine years, and 16.6% for firms aged ten or more years. Death rates were lower for firms with more workers, averaging 4.6% for firms with five to nine workers and 4.0% for firms with ten to nineteen workers. U.S. data also show high exit rates from self-employment, with 28% of the incorporated self-employed exiting over a year (Schweitzer & Shane, 2016). This evidence suggests that firm death rates for small firms are higher in the United States than the averages seen in our sample.

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Using these fitted relationships, we can then estimate the half-life of firms that are observed to be in existence at a given point in time. From the quadratic fit, 50% of firms are predicted to die within 6.2 years, while from the linear fit, 50% are predicted to die within 5.8 years.

In appendix table A.3, we collate together estimates of firm death in developing countries from other literature. Figure A.1 then plots these alongside our data and the fitted quadratic. The firm death rates from other studies are all relatively close to the fitted quadratic, showing that results are generally consistent across a number of contexts. It may also be of interest to some readers to benchmark these death rates against those in the United States. The main source of firm dynamics data in the United States comes from data from the Bureau of Labor Statistics and U.S. Census Bureau for firms with at least one paid employee. Among firms with 1 to 4 paid workers, the one-year death rate over 1995 to 2016 averaged 19.7%. It was highest for younger firms, averaging 28.4% for firms aged one to four years, 20.8% for firms aged five to nine years, and 16.6% for firms aged ten or more years. Death rates were lower for firms with more workers, averaging 4.6% for firms with five to nine workers and 4.0% for firms with ten to nineteen workers. U.S. data also show high exit rates from self-employment, with 28% of the incorporated self-employed exiting over a year (Schweitzer & Shane, 2016). This evidence suggests that firm death rates for small firms are higher in the United States than the averages seen in our sample.

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Each data point is the firm death rate measured over a survey–time horizon combination. Worst-case bounds that assume all attriting firms are either open or closed are indicated by vertical lines. (Left) Full sample with a fitted quadratic. (Right) Zooms in on death over the first five years of tracking, with a fitted line. Letters indicate the surveys, described in detail in the appendix.

**B. Do Death Rates Vary with Level of Development?**

On one hand, we might expect businesses in less developed countries to face more constraints, such as less access to credit and so be less likely to survive negative shocks. However, there may be fewer other options for employment in poorer economies, suggesting fewer voluntary exits. Figure 2 plots the observed correlation between annualized firm death rates and per capita GDP. We see a positive relationship (correlation 0.41), with firm death rates higher in richer developing countries. Each log point increase in per capita GDP is associated with a 5.3 percentage point higher annualized firm death rate ($p = 0.056$). This is consistent with the evidence above that small firm death rates are higher in the United States than in our sample.

**V. Which Firms Are More Likely to Die?**

We next examine how firm death varies with several key firm and owner characteristics. The aim in this section is to provide evidence that helps provide data on how death rates vary over the firm life cycle and to answer descriptive questions about which types of firms are more likely to die. Inspired by Haltiwanger et al.'s (2013) analysis of U.S. firm growth and exit by firm size and firm age, we follow their approach in using a saturated dummy variable regression approach to describe patterns in the data and show these results graphically. Our main specifications control for time horizon and time horizon squared, following the pattern in Figure 1, and include dummies for each of the sixteen different surveys. We cluster standard errors at the firm level when generating confidence intervals, given that we have multiple observations per firm.

**A. Are Younger Firms More Likely to Die?**

Perhaps the most common stylized fact about firm death is that younger firms are more likely to die than older firms. Theoretically this can arise from new entrepreneurs learning that they are inefficient and exiting, as in Jovanovic (1982), from starting with a low level of investment and not being
able to keep up with the advances of competitors as in Ericsson and Pakes (1995), or from taking on high levels of risk and failing early, as in Cressy (2006). Empirically, younger firms have been found to be more likely to die in the United States (Bernard & Jensen, 2002; Dunne, Roberts, & Samuelson, 1989; Evans, 1987; Haltiwanger et al., 2013) and in developing countries (Vijverberg & Haughton, 2004; Frazer, 2005; Shiferaw, 2009), although Söderbom et al. (2006) found no significant relationship between firm age and death rates, and Davies and Kerr (2018) find that firms in the middle age category (five to fourteen years old) are less likely to die than younger firms (less than five years old), while older firms (older than fourteen years) do not have higher likelihoods of dying than younger firms.

We regress firm death on a set of dummy variables for firm age, along with the time horizon and survey controls. We plot the fitted firm age coefficients in of figure 3A. As in Haltiwanger et al. (2013), to facilitate interpretation, we scale the data so that firms in the baseline group (here firms of age less than one year) are shown at their unconditional mean, and rescale the other effects by adding the difference in coefficients compared to this baseline group. We see a strong, negative relationship, with older firms considerably less likely to die in the next year than younger firms. A firm in its first year is estimated to have a 17% chance of dying, compared to 14% for firms aged one to two, and only 4% for firms aged five to six.

Of course, this relationship between firm death and firm age is likely to vary with the time horizon considered and should flatten over longer time horizons given the upper bound of 100% death. We therefore interact each firm age dummy with the time horizon and time horizon squared, and in figure 3B, we show how the firm death and firm age relationship varies over different time periods. We see that the negative relationship does not flatten very much over the time horizons of most firm panel surveys. A new firm is then predicted to have a 62% chance of dying within five years and 95% chance of dying within ten years.

**B. Are Smaller Firms More Likely to Die?**

Firm size is closely linked to firm age in many theoretical models, with firms starting small and either growing or dying. Lower death rates for larger firms do appear to be the case in studies that compare medium or large-sized firms to small firms. For example, Davies and Kerr (2018) find that Ghanaian firms with 75 or more workers are 5 percentage points more likely to survive over ten years than firms with 0 to 9 workers. Söderbom et al. (2006) estimate that a firm with 50 workers is 7 percentage points more likely to survive than a firm with 10 workers in their data from Ghana, Kenya, and Tanzania, and Shiferaw (2009) finds that Ethiopian firms with more than 100 employees are more likely to survive than those with 10 to 30 workers. The relationship has been less strong when examining smaller firms and household enterprises. Vijverberg and Haughton (2004) find larger firms less likely to die in Vietnam, whereas McPherson (1995) finds no significant relationship with firm size in Swaziland and Botswana and even finds larger firms being more likely to die in Zimbabwe.

Figure 4 examines the relationship between firm death and firm size, measured in terms of number of employees. Eighty percent of firms in our sample have no paid workers, 9% have one worker, 3.6% have two workers, and only 3.6% have six or more workers. Although the firm death rates are lower for firms with one or two workers than those with no workers, the death rate then rises again with firm size, and the overall relationship is fairly flat. This is accompanied by quite wide confidence intervals, showing that we cannot measure firm death very precisely for firms with more workers. Haltiwanger et al. (2013) find that in the full sample of U.S. firms, the firm death and firm size relationship disappears once one
controls for firm age. In our setting, the correlation of firm age and number of employees is only 0.02. Not surprisingly, then, adjusting for firm age by fully interacting firm size with our firm age dummies and then holding constant the age distribution leads to very little change in the fitted relationship in figure 4.

In contrast, there is a much stronger relationship between firm death and firm profitability, with figure 5 showing that more profitable firms within a country are more likely to survive than less profitable firms: a firm earning less than $1 per day in profits has a 16.7% chance of dying in the next year, compared to a 6% to 8% chance for firms earning $5 or more per day in profits. This is not driven by younger firms earning less profit, as holding the age distribution constant leads to very little change in this fitted relationship.

C. Are Firms in Certain Sectors More Likely to Die?

While many studies have used just data from manufacturing firms, studies that have included other sectors have found death rates to vary with sector. However, they come to different conclusions about which sectors have higher death rates. McPherson (1995) and Mead and Liedholm (1998) find that firms in the retail sector are more likely to close than firms in the services or manufacturing sector, Klapper and Richmond (2011) find that manufacturing firms face a higher risk of closing compared to firms in the services sector, and Vijverberg and Haughton (2004) find that manufacturing and services firms are significantly more likely to close than those in the retail sector. Figure 6 shows that in our data, retail firms have the highest death rates and manufacturing firms the lowest, with services in the middle. However, the confidence intervals all overlap, and we cannot reject that the firm death versus firm age relationship is constant across the three sectors ($p = 0.180$).

D. How Does Firm Death Vary with Characteristics of the Firm Owner?

The association between firm death rates and owner characteristics has been less studied in much of the literature, since many surveys of firms do not provide personal characteristics of the owner. Our surveys allow for examination of these relationships.

Are male or female owners more likely to have their firms die? Female-owned firms are, on average, smaller and less profitable than male-owned firms in developing countries. Both factors would suggest their firms would be more susceptible
to failure. However, the literature has found mixed associations between gender and firm death. McPherson (1995) finds female-owned firms are more likely to close in two of the four countries he studies but finds no significant relationship in the other two. In contrast, Shiferaw (2009) and Vijverberg and Haughton (2004) find female-owned firms to be less likely to die than male-owned firms in Ethiopia and Vietnam, respectively. Figure 7 shows that the firm death versus age relationship looks similar by gender, but with female-owned firms having slightly higher death rates than male-owned firms at each firm age. Female-owned firms are 1.8 percentage points more likely to die at each firm age ($p = 0.094$).

Are firm death rates higher for younger or older entrepreneurs? Younger owners have had less time to accumulate skills and capital and are at an age where job mobility is also higher, even in wage work. But older entrepreneurs may close as they near retirement or see less time to recover from shocks. The result might be that survival probabilities are highest for the middle aged. Fajnzylber, Maloney, and Rojas (2006) find this in the context of the likelihood of staying self-employed (not necessarily in the same business) over a year in Mexico, where the maximum is found for ages 36 to 50. Likewise, Vijverberg and Haughton (2004) find firm death rates to be lower for 26- to 45-year-olds than for older or younger firm owners. Figure 8 confirms this U-shaped pattern. Firm death rates are highest for youth, with an annual death rate of 30.4% for 15- to 19-year-olds and 22.8% for 20- to 24-year-olds. Death rates then fall until age 35, are stable between 35 and 59, and then rise again from age 60. Since younger individuals operate younger firms (the correlation is 0.30), part of this pattern is due to younger firms being more likely to die. But figure 8 shows that the U-shaped pattern continues to apply even when we hold the firm age distribution constant.

Are firms run by more educated owners less likely to die? To the extent that higher education also reflects higher ability, we might expect firms run by more educated owners to be more likely to survive. However, the existing literature has either found no relation between firm death and education (Vijverberg & Haughton, 2004; Krafft, 2016, in one time period), or that firms with more educated owners are actually more likely to die (Fajnzylber et al., 2006, for self-employment; Krafft, 2016, in a second time period). Figure 9 shows that firm death rates are highest for firm owners with no education and then fluctuate with no simple pattern among firm owners with some education.
E. Multivariate Analysis of the Correlates of Firm Death

This analysis provides detailed nonparametric examination of the associations between firm death and different firm and owner characteristics. In table 3, we include all the variables together to examine how they jointly predict firm death. Column 1 provides coefficients from a least-squares regression of firm death. Columns 2 and 3 examine how sensitive these associations are to attrition by assuming that all attriting firms died (column 2) or remained open (column 3). Column 4 examines robustness to an alternative outcome (discussed in section VI) of whether the original entrepreneur is not the owner of any firm, not just the death of the original firm.

Table 3 shows that the associations between firm death and firm and owner characteristics are robust to attrition and to the precise measure of firm death. Firm death rates are statistically significantly lower as the age of the firm increases (compared to the base group of firms age less than one year) as in figure 3, increase with the time horizon at a diminishing rate (as in figure 1), fall as monthly profits increase (as in figure 5), and exhibit a U-shaped pattern with owner age (as in figure 8). Although there is a significant negative association with the number of employees, the magnitude is extremely small (one more employee is associated with a 0.4 percentage point reduction in the death rate), and we do not see significant differences by sector. The association with owner’s education is significant at the 10% level in column 1 but also small in magnitude, and the higher death rate of firms owned by women is not significant once we have controlled for these other firm and owner characteristics.

VI. Why Do Firms Die, and What Happens after Death?

Section V shows that firm death does not simply occur at random but is more likely to occur for certain types of firms and firm owners than others. Firm death may arise for a variety of reasons. A first set of reasons comes from firm-level shocks, such as the entry of new competitors, a reduction in product demand, or increases in input prices that reduce the profitability of the firm and cause it to make a loss. A second set of shocks may come from the household side. With

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**Table 3: Multivariate Correlates of Firm Death**

<table>
<thead>
<tr>
<th></th>
<th>(1) Original Firm Dies</th>
<th>(2) Assume Attrition = Dead</th>
<th>(3) Assume Attrition = Live</th>
<th>(4) Does Not Operate Any Firm</th>
</tr>
</thead>
<tbody>
<tr>
<td>Firm aged 1 to 2</td>
<td>-0.0218**</td>
<td>0.00577</td>
<td>-0.0293***</td>
<td>-0.0116</td>
</tr>
<tr>
<td>(0.00994)</td>
<td>(0.0102)</td>
<td>(0.0110)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm aged 3 to 4</td>
<td>-0.0739**</td>
<td>-0.0396**</td>
<td>-0.0740**</td>
<td>-0.0550***</td>
</tr>
<tr>
<td>(0.0122)</td>
<td>(0.0121)</td>
<td>(0.0130)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm aged 5 to 6</td>
<td>-0.116**</td>
<td>-0.0756**</td>
<td>-0.115**</td>
<td>-0.0980**</td>
</tr>
<tr>
<td>(0.0127)</td>
<td>(0.0128)</td>
<td>(0.0130)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm aged 7 to 8</td>
<td>-0.107***</td>
<td>-0.0710**</td>
<td>-0.0973**</td>
<td>-0.0818**</td>
</tr>
<tr>
<td>(0.0142)</td>
<td>(0.0143)</td>
<td>(0.0148)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm aged 9 to 10</td>
<td>-0.133***</td>
<td>-0.0975**</td>
<td>-0.120**</td>
<td>-0.112**</td>
</tr>
<tr>
<td>(0.0143)</td>
<td>(0.0140)</td>
<td>(0.0149)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm aged 11 to 12</td>
<td>-0.165***</td>
<td>-0.130**</td>
<td>-0.160**</td>
<td>-0.129**</td>
</tr>
<tr>
<td>(0.0198)</td>
<td>(0.0198)</td>
<td>(0.0206)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm aged 13 to 15</td>
<td>-0.159**</td>
<td>-0.121***</td>
<td>-0.148**</td>
<td>-0.126**</td>
</tr>
<tr>
<td>(0.0184)</td>
<td>(0.0187)</td>
<td>(0.0177)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Firm aged 16+</td>
<td>-0.140***</td>
<td>-0.104***</td>
<td>-0.130**</td>
<td>-0.105**</td>
</tr>
<tr>
<td>(0.0137)</td>
<td>(0.0134)</td>
<td>(0.0140)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Time horizon</td>
<td>0.116***</td>
<td>0.116***</td>
<td>0.103**</td>
<td>0.111**</td>
</tr>
<tr>
<td>(0.00284)</td>
<td>(0.00258)</td>
<td>(0.00309)</td>
<td></td>
<td>(0.00301)</td>
</tr>
<tr>
<td>Time horizon squared</td>
<td>-0.00366***     -0.00399***      -0.00294***               -0.00342***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.000170)</td>
<td>(0.000146)</td>
<td>(0.000178)</td>
<td></td>
<td>(0.000174)</td>
</tr>
<tr>
<td>Number of employees</td>
<td>-0.00453***     -0.00217*         -0.00881***               -0.00521***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.00241)</td>
<td>(0.00215)</td>
<td>(0.00270)</td>
<td></td>
<td>(0.00253)</td>
</tr>
<tr>
<td>Log monthly profits</td>
<td>-0.0272***     -0.0255***       -0.0267***               -0.0255***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.00316)</td>
<td>(0.00310)</td>
<td>(0.00343)</td>
<td></td>
<td>(0.00305)</td>
</tr>
<tr>
<td>Firm is in retail</td>
<td>0.0137</td>
<td>0.0144</td>
<td>0.00188</td>
<td>0.00443</td>
</tr>
<tr>
<td>(0.0111)</td>
<td>(0.0108)</td>
<td>(0.0116)</td>
<td></td>
<td>(0.0107)</td>
</tr>
<tr>
<td>Firm is in manufacturing</td>
<td>-0.0147          -0.0147          1.316-05             -0.0050</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.0130)</td>
<td>(0.0131)</td>
<td>(0.0129)</td>
<td></td>
<td>(0.0130)</td>
</tr>
<tr>
<td>Owner’s age</td>
<td>-0.00757***            -0.00975***              -0.00519***              -0.00754***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.00185)</td>
<td>(0.00179)</td>
<td>(0.00185)</td>
<td></td>
<td>(0.00176)</td>
</tr>
<tr>
<td>Owner’s age squared/1,000</td>
<td>0.0800***       0.0926***          0.0640***               0.0844***</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.0203)</td>
<td>(0.0193)</td>
<td>(0.0204)</td>
<td></td>
<td>(0.0195)</td>
</tr>
<tr>
<td>Owner is female</td>
<td>0.0134</td>
<td>0.00416</td>
<td>0.0182</td>
<td>0.0127</td>
</tr>
<tr>
<td>(0.0110)</td>
<td>(0.0107)</td>
<td>(0.0114)</td>
<td></td>
<td>(0.0107)</td>
</tr>
<tr>
<td>Owner’s years of education</td>
<td>-0.00258*         -0.00226        -0.00176             -0.00213</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>(0.00149)</td>
<td>(0.00140)</td>
<td>(0.00158)</td>
<td></td>
<td>(0.00145)</td>
</tr>
<tr>
<td>Observations</td>
<td>56,182</td>
<td>63,137</td>
<td>63,137</td>
<td>57,892</td>
</tr>
</tbody>
</table>

Estimates from linear regressions. Robust standard errors, clustered at the firm level, in parentheses. Significant at *10%, **5%, and ***1%. Regressions also include survey fixed effects.
imperfect labor markets or other missing markets, illness of the business owner or of household members that the owner has to look after may cause the owner to shut down the business when he or she cannot hire someone else to run the firm. Firm death can also arise from positive shocks to the entrepreneur’s outside options, such as an attractive wage job offer or the entrepreneur coming up with an idea for a different firm. In micro and small firms, the firm is tightly linked to the occupation of the owner, and it is rare for the firm to continue when the owner leaves.9

These different reasons for firm death can be difficult to disentangle in the absence of random variation in these different types of shocks. Nevertheless, in contrast to firm censuses, our surveys provide useful suggestive data on why firms shut down and also enable us to examine what happens afterward to the firm owner.

A. Cause of Death Data to Examine Reasons for Firm Death

Nine out of sixteen surveys directly asked firm owners whose businesses have closed to report the main cause of firm death. The first two columns of table 4 report the results. The most common cause of firm death according to the owners is that the firm is making a loss, which 41% of owners say. Household reasons such as sickness or caring for family are the second most common, accounting for 26% of closures, while only 11% say they are closing for better wages or alternative business opportunities.10 Appendix tables A.6 and A.7 show that the cause of death varies by gender, with women more likely to close their business for sickness or family reasons (34%) compared to men (12%), while male owners are more likely to close because the firm is making a loss or to pursue better opportunities.

9 For instance, in the SLMS, only 1.5% of owners who stopped operating their business from round to round had sold it, while only 2.9% said the firm was being operated by another family member. In the Lome Informal Enterprises Survey, 1.2% of owners who were no longer running their business had sold it, and 1.8% had passed it to a family member. In the Ghana Microenterprises Survey, 7.5% of the businesses that were no longer being operated by the original owner were being run by another family member, while no business had been sold.

10 Twenty-two percent give “other” as cause of death. This includes some firms in Sri Lanka, where the data for what “other” refers to was never entered, as well as reasons like the government shutting down the firm, disasters causing assets to be destroyed, and international migration.
times of death (see panel B). All regressions also include survey-wave fixed effects. Using the change in labor income of owners of surviving firms as a counterfactual income trend for the owners who closed their businesses, we see in column 1 of panel A in table 5 that firm death is associated with a significant reduction in labor earnings. Columns 2 and 3 present results of the same regression specifications on the sample of surviving firm owners and owners who reported experiencing a loss, or illness and family care, or better opportunities as reasons for closure. We see that firms closing because they of a loss or because of illness and family care have even larger drops in labor income, whereas owners who closed to pursue better opportunities experience increases in labor income on average. It is possible that owners who close their businesses experience large income drops in the short run but are able to recover to similar or even higher income levels after some time. In panel B, we consider whether changes in labor income differ depending on the time that has passed since the firm died. For the full sample, we see in column 1 that income drops are the largest if the firm has died in the previous year. These drops are reduced to about 68% one to two years after firm death. Two to three years after firm death, we observe no significant changes in labor income.

C. Firm Death Need Not Mean Permanent Exit from Self-Employment

After closing a firm between survey round \( t \) and \( t + 1 \), we sometimes then observe the business owner operating a firm again in a later round. We can distinguish two types of such firms using survey questions on the name of the firm, whether it is in the same sector, and whether there is a change in the line of business. The first are “zombies,” in which the owner reopens the exact same firm he or she had closed. Such occurrences are relatively rare, with only 6.2% of the firms in our sample ever observed to do this. In contrast, it is more common for a firm to close down, and then for the owner to operate a different firm, which we call a “phoenix” arising from the ashes of the old firm. Of all owners whom we observe closing a firm within a year, 20% operate a new firm again within the same year. Figure A.2 looks at reopening rates for the five surveys for which we have the largest numbers of closed firms. We see reopening rates increasing with time, with approximately 40% of owners of closed firms opening a different firm within three years, although this rate is lower in the Townsend Thai data than in the specialized firm surveys.

Figure A.3 examines how much difference reopening firms makes to our calculations of the association between firm death and firm age (panel A), and the cumulative rate at which firms die over time (panel B). We still see that firm death rates are highest at younger ages, although not quite as high when using exit from self-employment compared to death of the original firm. When it comes to tracking a group of firm owners over time, we see that the death rates are quite similar using either measure over shorter periods and 50% of owners still exit self-employment within seven years (compared to six years using closing the original firm). Along with column 4 of table 3, which shows that the association of firm death with other firm and owner characteristics is similar across the two measures, the tendency of some firm owners to reopen their firm or to open a new firm does not greatly change any of the conclusions in this paper. One key reason for this is that many of these new firms themselves fail quickly.

VII. Conclusion

Firm death is extremely common among small firms, with half of the current stock of small firms in a developing country likely to die within the next six years. Yet because panel surveys of such firms are still relatively rare, often do not track firms for long periods, and often lose firms that die to attrition, systematic data on the rates, correlates, and causes of firm death have not been available. This paper overcomes these issues by pooling together data from sixteen panel surveys in twelve countries, in which special efforts were made to limit attrition and ascertain the status of firms that closed down. Our evidence suggests that the most common reason for firm death is that less profitable and less productive firms end up experiencing losses and closing. However, other small firms, particularly those run by women, close because of illness and family reasons, suggesting nonseparability between the household and firm, while a minority of firms close because better opportunities arise for the owner.

We see several potential uses for this research. The first is as a benchmarking tool. There is currently little evidence for researchers or policymakers tracking the failure rates of firms in their study or intervention to compare to, to know whether the rates they see in their data are high or low. This paper provides guidance as to what death rate can be expected at different time horizons and for firms of different ages. The second potential use is for targeting of programs. Programs that want to work actively with businesses for several years may wish to avoid small firms at greatest risk of closing down, while other programs that are designed to help firms at risk of failure to survive may wish to use the information provided here to decide which firms to offer the program to. Finally, the results may be of interest in deciding whether interventions are needed and what types of intervention. To the extent that firms are exiting because they have low productivity and competition is reallocating production to more efficient firms, policymakers may not want to intervene. Similarly, if firm death arises because of voluntary exit in pursuit of better opportunities, again no intervention may be warranted. In contrast, if firms die because of a lack of separability with household shocks, or because of firm shocks that were not able to be insured, policymakers may want to experiment with policies to insure these types of shocks. Our results suggest that there is a subset of firms, particularly those run by women, for which such policies may be of particular importance.