

Duration of Self-employment in Developing Countries: Evidence from Small Enterprises in Zimbabwe

Mudziviri Nziramasanga
Minsoo Lee

ABSTRACT. The duration of self-employment is an important policy consideration in developing countries. We use data from a sample of the self-employed in Zimbabwe to compute hazard rates by location and economic sector of the activity. We partition the data by date of entry to assess the impact of economic liberalization measures. Our results show that cost of finance, along with location and sector to be important variables in explaining duration. We then partition our sample in order to control for the effects of location, year of entry and type of activity. Our sub-samples thus consist of individuals facing the same history of macroeconomic trends in similar locations and activities. The results show that personal characteristics are significant in explaining differences between individuals in the duration of self-employment.

1. Introduction

Successful self-employment is important, particularly in developing countries where alleviation of unemployment is a major policy goal. This paper uses a unique data set to examine factors underlying the duration of self-employment in Zimbabwe during the period 1988 to 1996.

Empirical studies in developed countries have concentrated on the decision to enter self-employment.¹ This limitation has been imposed by the

availability of data. One of the most important determinants of entry is an initial bequest, either in the form of a going concern or cash. This role of a bequest in overcoming liquidity constraints would seem to point to the importance of the costs of borrowing in determining duration of self-employment. A bequest, after all, is a non-interest bearing, non-repayable loan. This should be even more important in developing countries where capital markets are not perfect. In addition, if net revenue maximization is a goal for the self employed then it is also necessary to include, as explanatory variables, demand for their output. Demand and costs of production are in turn a function of macroeconomic conditions and policies. The duration of self-employment therefore is a direct function of factors affecting economic growth.

Lack of data has also limited the inclusion of industry/sector characteristics in duration models. One exception is Bates (1990, 1999). Logit regression results in the 1990 paper showed that the date of entry, age and educational level of the manager had a significant impact on the duration of self-employment. In the second study he included factor intensity and type of clientele, along with human capital as independent variables in explaining the duration of self-employment among Asian immigrants into the United States. He observed a difference in skill levels and profitability of firm groups by time of establishment and type of industry. Evans and Leighton (1989) found personal characteristics such as work experience, education and marital status to be insignificant in explaining the duration of the firm. McPherson (1995) used cross-country data to explain the growth rate of small-scale firms. The most significant explanatory factors were the

Final version accepted on May 4, 2001

Mudziviri Nziramasanga
Department of Economics
Washington State University
Pullman, Washington 99164-4741
U.S.A.
E-Mail: nziramasanga@wsu.edu

Minsoo Lee
Department of Economics
Commerce Division
Lincoln University
New Zealand
E-Mail: leem2@lincoln.ac.nz



Small Business Economics 17: 239–253, 2001.
© 2001 Kluwer Academic Publishers. Printed in the Netherlands.

country dummy variables that, the author suggests, could be proxies for differences in economic conditions.

The results seem to suggest that both personal characteristics and macroeconomic conditions have a role in determining the duration of self-employment. Changes over time in the macroeconomic conditions determine the rate of exit from self-employment. Differences in personal characteristics and endowments, on the other hand, determine those individuals most likely to exit self-employment from a group facing the same macroeconomic environment. The most efficient way of determining the impact of each variable would be to include all of them in a single model. This requires a measure of duration (the dependent variable) for each firm that also varies over time. An example might be monthly net revenues. We do not have such a measure and have to resort to a dual approach. We therefore use hazard rates to establish a relationship over time between changes in macro economic conditions on the probability of failure for a given cohort of small firms. We then use regression analysis to estimate the impact on duration of differences in personal characteristics among the self-employed in the same cohort and facing the same macroeconomic environment over time. In the first model the dependent variable is the hazard rate which we compute by date of entry into self-employment, location (urban or rural) and by industry (commercial or non-commercial). We relate changes in the different hazard rates over time to known changes in macroeconomic conditions such as economic reform and a decline in national incomes caused by the 1991/92 drought. In the second model we use the actual duration of self-employment as the dependent variable. Since the firms in such a sub-sample were charged the same lending rate and faced the same macro environment the results should tell us the role of individual-specific variables on duration under given macro conditions. We use data for a sample of individuals who were tracked as they entered self-employment between 1988 and 1993, left it, or were still in it by the end of 1996.

In Section 2 we describe the sample. In Section 3 we briefly summarize the policy and macroeconomic environment of the period. Then in Section 4 we estimate the Kaplan-Meier hazard

rates. In Section 5 we obtain regression estimates of the duration rate as a function of personal and sector characteristics. Section 6 contains the summary and conclusions.

2. The data

We have a unique data set drawn from Zimbabwe. It consists of small enterprises registered with a state agency, the Small Enterprise Development Corporation (SEDCO), between 1984 and 1996. Few employed wage labor. SEDCO was created to promote the establishment and growth of small-scale enterprises in both rural and urban areas by providing technical and financial assistance for a fee. The sample included individuals who obtained start-up loans or business skills, or both, on condition the activities were owner-operated. The size of the loan was registered, but not the type or extent of business services. SEDCO registered the date of entry and exit of each individual by area and economic sector, as well as the usual personal information - age, marital status, number of dependents and the initial investment of own funds and loans.

The sample size obviously varied by year, but averaged 2,500 firms from 1989 to 1996. The largest number of entries was during 1988 and the largest number of exits in 1991-92. Figure 1 shows the time profile of entries by location of the activity. Initially, the predominant entries were in the rural areas, a reflection of the importance of agriculture in both the population distribution and economic activity. By 1991, however, the two areas had the same attraction for the self-employed. This reflects the impact of urbanization and the structural transformation of the economy. Figure 2 shows most of the activities of the new entrants to be commercial. However, this share declined monotonically. This is in line with a commercial sector that supplied basic goods. Most of the rural self-employed were in the retail and passenger transportation sectors. Figure 3 shows the distribution, by type of activity, of all the exits from self-employment from 1984 to 1996. Until 1987 the majority were from commercial activities but thereafter the distribution was fairly even.

Table I summarizes the mean values of the personal characteristics of our sample. Associated with the decline in the share of rural entrants is a

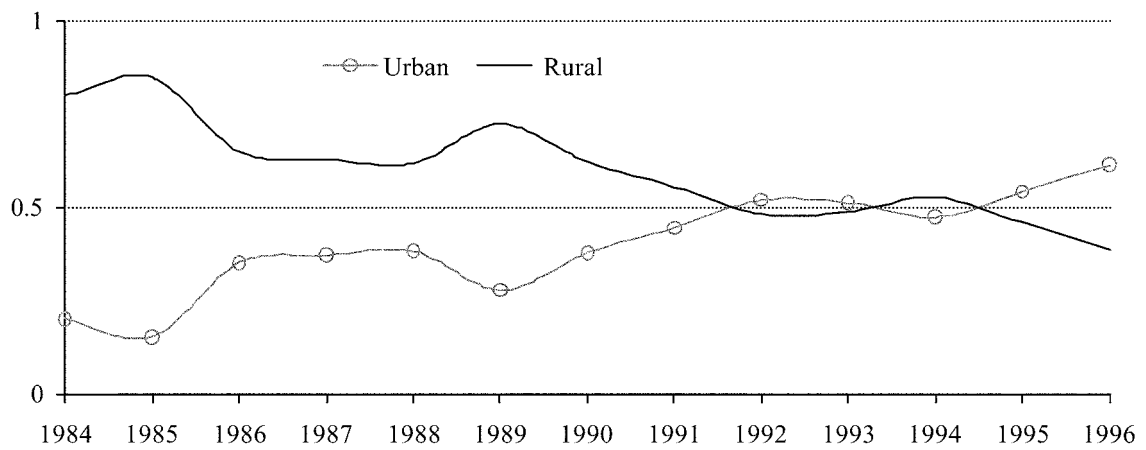


Figure 1. New entrants by location, 1984-90 (percent of all entrants).

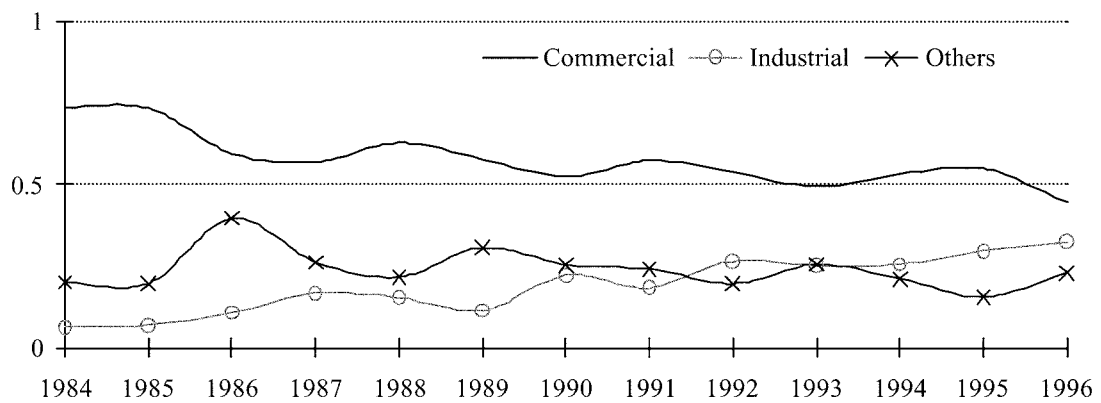


Figure 2. New entrants by sector, 1984-96 (percent of all entrants).

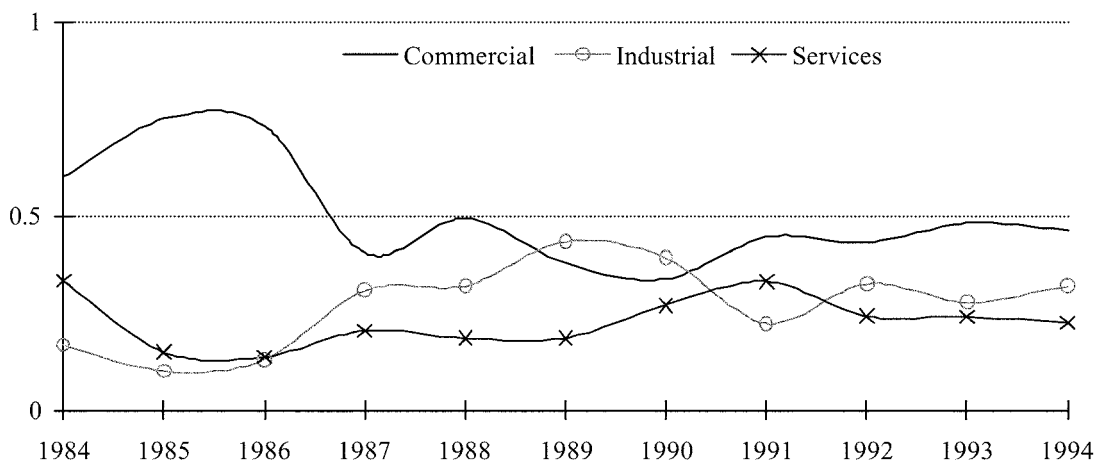


Figure 3. Exits by sector, 1984-96 (percent of all total).

TABLE I
Personal characteristics of the self-employed

Variable	1984–89	1990–96
Age	44.667 (7.69)	38.343 (8.29)
Education	10.22 (3.64)	12.03 (3.25)
Wage employment (years)	10.049 (8.76)	11.741 (7.88)
Equity	32,652 (32,783)	32,998 (35,679)
Cash	1,244.50 (2,481)	1,721.7 (4,990)
Dependents	4.4524 (3.90)	3.189 (2.54)

The figures in parenthesis are the standard errors.
Equity and cash are denoted in current Zimbabwe dollars.

change in the profile of the self-employed. After 1989 the new entrants are relatively younger with a mean age of 38.3 years compared to 44.7. They have more years of secondary schooling and a longer history of wage employment prior to being self-employed. They invested about the same amount of their own real savings (\$32,998 compared to \$32,652 at 1990 prices). The average weighted loan size increased after 1989, so that the ratio of own equity to total initial capital outlay increased from 51 percent in 1989 to 64 percent in 1992. Finally, the new entrants had fewer dependents.

When the sample is divided by location and sector the urban self-employed have on average more years of education (12.5 years) compared to their rural counterparts (9.7). They are younger (38.52 years compared to 42.0) and have fewer dependents (2.77, compared to 3.86). There is a greater variance in the initial investment by location. Investments in commercial activities in the rural areas required the least amount of capital (Z\$23,124), followed by their urban counterparts (Z\$43,657) and urban non-commercial investments (Z\$50,938).

3. Policy and macroeconomic background

During the sample period Zimbabwe initiated a trade liberalization program which was to be

implemented over five years (1990–95).² A major result was a 35 percent decline in the exchange rate in the third quarter of 1991 and by 47 percent over the whole year.³ The U.S. dollar value of imports fell by 6.7 percent while prices increased 37.0 percent. The lack of adequate fiscal prudence caused severe inflationary pressures that were still evident at the end of the sample period.

Interest rates were deregulated in January 1993. Until then the real lending rate had been negative. In addition, those self-employed in rural areas were charged a rate lower than their urban counterparts. The impact of the deregulation was a 16.6 percent increase in urban nominal borrowing rates. The urban/rural differential was also eliminated, resulting in a 25 percent increase for rural firms. The real rate, however, remained negative.

Figure 5 gives annual changes in the consumer price index and real GDP from 1980 to 1996. The real GDP scarcely changed during the sample period (1988–96). There was no significant downturn in response to the introduction of trade liberalization in 1991. The overvalued exchange rate and the ensuing excess demand for imports prior to 1991 had been accompanied by rationing of imports of intermediate inputs and quotas on finished goods. There was excess capacity, particularly in the industrial sector. Data from the 1994 *Census of Industrial Production* shows that importers anticipated the reform program and built up stocks of raw materials throughout 1990, thereby raising the U.S. dollar value of imports by 13.4 percent above the 1989 level. Bilateral commodity aid programs, intended to ease the balance of payments effects of liberalization, financed most of these imports. When the reform program started in 1991 the U.S. dollar value of imports fell 4.2 percent but there was also a decline in raw material inventories equivalent to 8.9 percent of annual imports. Capacity utilization increased. Data from the *International Financial Statistics* of the IMF show a 9.0 percent decline in real GDP in 1992. This was a result of the 1991/92 drought that was the severest on record. It reduced the value of agricultural sales from the communal agricultural areas by 58.5 percent. Most of the rural based self-employed in the sample are located in those areas. Output from the export-oriented large-scale commercial agriculture declined by 17.4 percent. Total domestic con-

sumption fell 22 percent, but the impact was heaviest in rural areas. The key macroeconomic variables for our analysis therefore are the trade liberalization in 1991, interest rate deregulation in January 1993, and the 1991/92 drought that reduced aggregate demand from July 1992 to June 1993.

Theoretically, the expected impact of the drought on the hazard rate is straightforward. We would expect a decline in consumption, but the impact on small firms would depend on the income elasticity of demand for their products. Those who entered self-employment in 1988 are likely to fare better than later entrants because they probably had more cash reserves and smaller loan repayment costs. The impact of trade liberalization on the self-employed on the other hand could have been a double-edged sword. The economic rents that had previously accrued to licensed importers would disappear. At the same time deregulation could be expected to allow for a more competitive environment in the domestic market, a situation that could support entry into self-employment but reduce duration. The deregulation of interest rates would theoretically mean the end of credit rationing which is usually biased against the small, self-employed entrepreneur. However, the easier access to credit finance would be accompanied by an increase in the costs of borrowing. This would erode profitability, to the disadvantage of a late entrant with a relatively large outstanding loan. The total effect of these changes can only be determined empirically. We

use restricted hazard rates for the 1988, 1990, and 1991/92 and 1993 entrants to isolate the impact of the trade reforms, interest rate deregulation and the drought.

4. Hazard rates

Self-employment is usually characterized by high turnover. We first computed the duration of those leaving self-employment for any reason and regardless of location or the year of exit. The number of failures increased and reached their maximum by the second year (Figure 4). Thereafter, exits declined monotonically. This would suggest an increased probability of survival after the second year.

With this general trend in mind, we computed the non-parametric 12-month moving average hazard rates using the Kaplan-Meier (1958) product-limit estimation technique. We did not use parametric models because they could distort the estimated hazard rates by imposing too restrictive a structure on the data. The Kaplan-Meier technique is an empirical approach and gives the conditional probability of failure at each month assuming the self-employed survived the previous period.

Let f_i be the number of enterprises that failed between t_i and t_{i+1} for $i = 1, \dots, T$. If σ_i and η_i are the number of those still in business by the end of 1996 (i.e. the right censored observations) and new entries between t_i and t_{i+1} , respectively, then the total number of enterprises in the risk set at

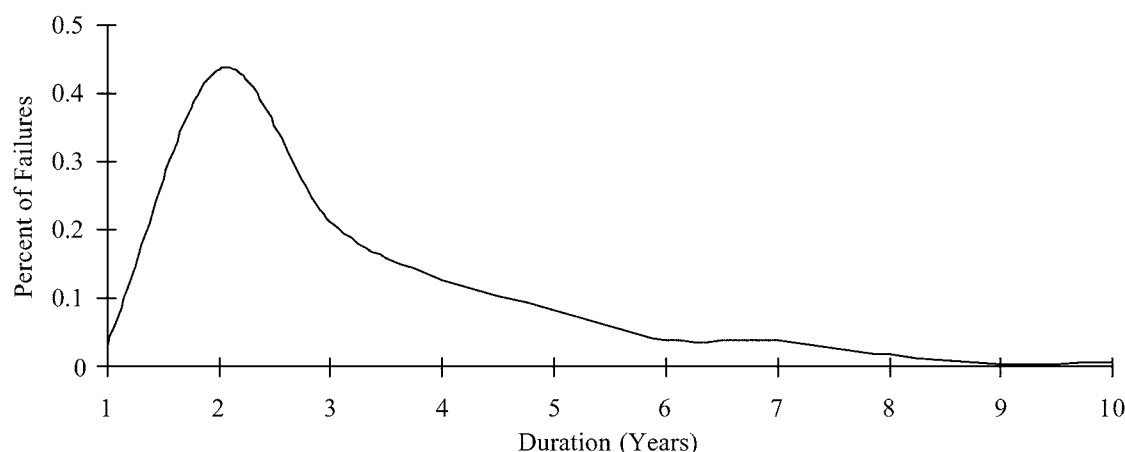


Figure 4. Exits from self-employment, by duration.

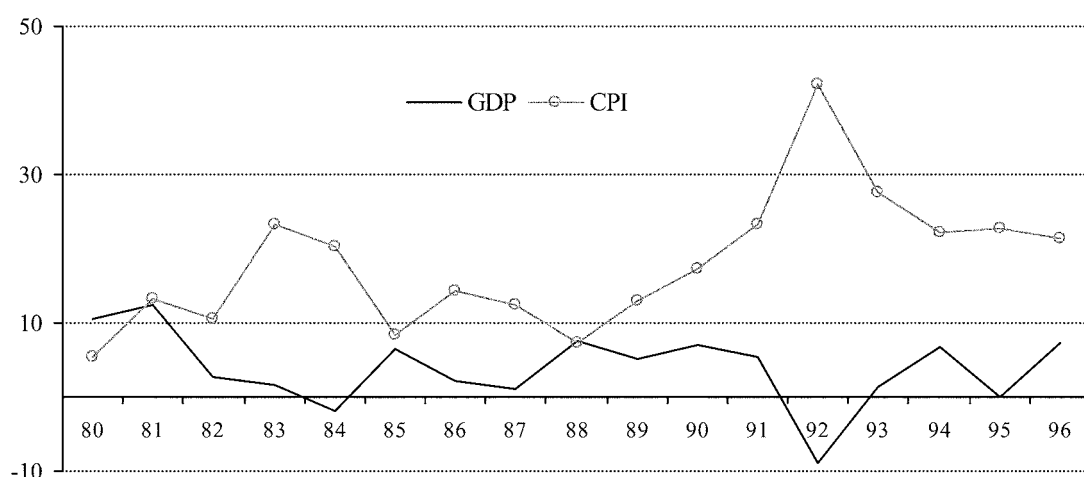


Figure 5. GP growth rate and changes in consumer prices, 1980–96.

duration t_i is $m_i = \sigma_i + \eta_i + f_i$. A generalized hazard rate at duration t_i is then defined as

$$H(t_i) = \frac{f_i}{m_i}. \quad (1)$$

The corresponding Kaplan-Meier product limit survival function is

$$S(t_i) = \prod_{j=1}^i \left(\frac{m_j - f_j}{m_j} \right). \quad (2)$$

We compute two types of hazard rates. The generalized hazard rate allows for entry into the initial risk set, whereas the restricted hazard rate tracks a given cohort of entrants over time and does not allow for new entrants. Comparing the two hazard rates should provide an insight into the impact of changing macro conditions on those already self-employed and new entrants.

4.1. The impact of trade liberalization

The results (Figures 6 through 13) indicate that trade liberalization and increasing costs of finance adversely affect all the self-employed, but the effect is more severe for newer entrants. Figure 6 gives the hazard rate for the sample restricted to 1988 entrants and that which allows for entrants after 1988. Both rates have a similar reaction to trade liberalization in 1991. The two hazard rates were almost identical until January 1993. Thereafter, the unrestricted rate is almost 40

percent higher, implying that entrants after 1993 exited at a higher rate than those already in self-employment.

We next control our samples for the impact of location (Figures 7 and 8). Those self-employed since 1988 in the urban areas were more negatively affected by the import liberalization measures. The hazard rate for the urban 1988 cohort more than doubled during 1991, while that of the 1990 urban entrants increased 33 percent. The rural hazard rates were relatively unaffected. The suggestion is that imports, or goods with a high import content, had a quality advantage over the output of the self-employed in urban areas. The impact on the rural cohort was subdued because they sell largely basic products with relatively little import content.

The results indicate that import liberalization increases production costs particularly for the self-employed in the manufacturing sector in urban markets. The impact on duration is negative. The self-employed in commercial activities are less vulnerable because they can import the finished product and compete on the basis of price. We were unable to observe the impact on exporters because there were none in our sample.

4.2. Drought and interest rate deregulation

After January 1993 the unrestricted hazard rate was almost 40 percent higher than that of the sample restricted to 1988 entrants (Figure 6).

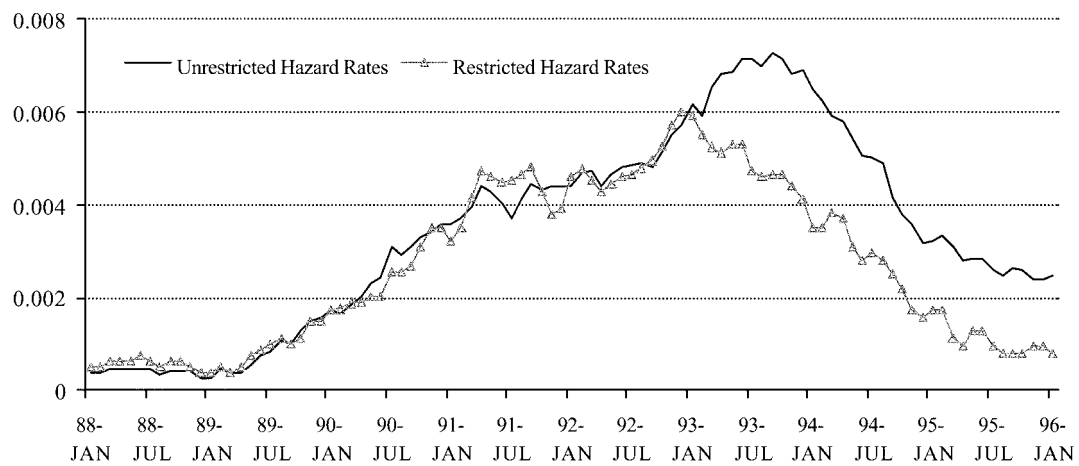


Figure 6. 12-month moving average hazard rates.

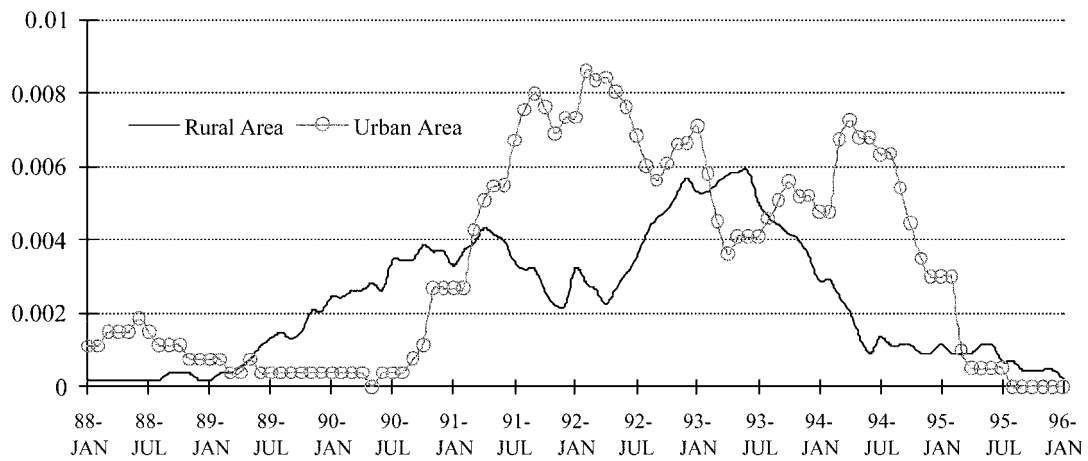


Figure 7. Restricted hazard rates for 1988 entrants.

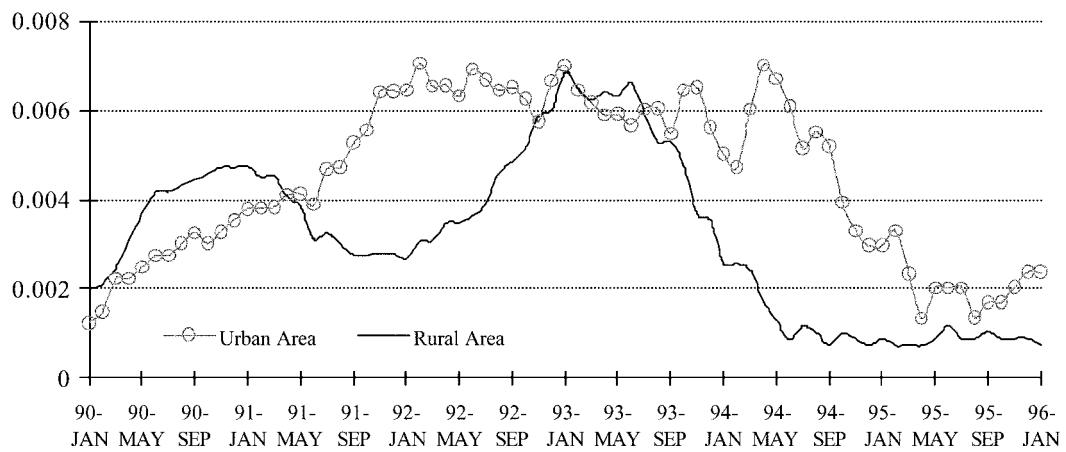


Figure 8. Hazard rates for 1990 entrants, by location.

Those who entered self-employment after 1989 were more affected by the interest rate deregulation, most probably because they still had larger outstanding loan balances. The impact also seems to be long-term. When we control for location it is clear the urban self-employed were more severely affected, although the differential impact largely disappeared by 1995 (Figures 7 and 8).

A comparison of the 1989, 1990 and 1993 cohorts show no significant difference in the magnitude of the change in the urban hazard rates. These estimates are not included but are available on request from the authors. The 1993 rural hazard rates however, were higher than those of any other group at any point in their respective histories (Figure 9). The 1993 rural hazard rate was more

than twice as high in 1994 as those of the 1990 cohort were in 1991. We attribute this to the availability of credit that increased the reliance on loans for this group as a whole. The 1993 rural cohort also had to compete on the basis of price with the 1988 and 1990 cohorts that had lower loan repayment costs and had until then enjoyed higher interest rate subsidies.

It is not possible to separate the effects of deregulation and the drought in the absence of time series regression estimates. The two events overlapped in time. The estimates for the 1992 entrants into self-employment (Figure 10) show that the hazard rate for rural firms rose faster than that of their urban counterparts in the aftermath of the drought and deregulation. The 1989, 1990, and

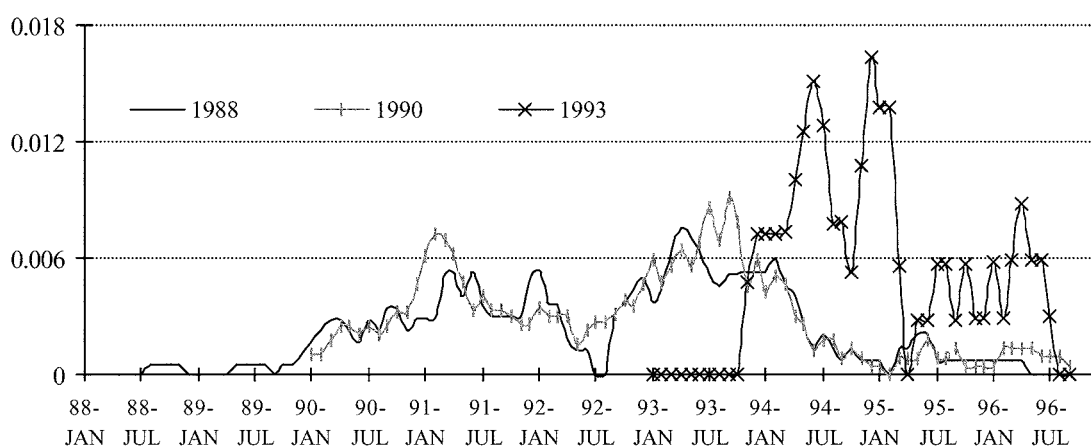


Figure 9. Hazard rates for entrants in 1988, 1990 and 1993, rural areas.

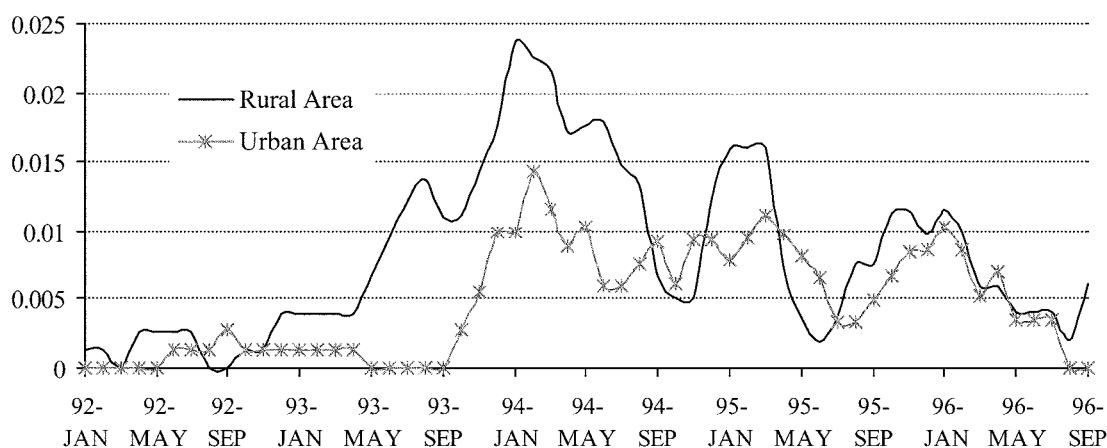


Figure 10. Hazard rates for new entrants in 1992, by location.

1991 cohorts reveal no such pattern. The disparity in hazard rates for the 1992–93 period partly reflects the greater impact of the drought on rural enterprises. The results also reflect a greater reliance on loan finance by the 1992 rural cohort. Loans constituted 64 percent of project finance for these entrants, compared to 51 percent in 1988 and 59 percent for those who entered in 1993. The 1992 rural entrants therefore faced a greater liquidity constrain as a result of the combined effects of the drought and higher lending rates.

4.3. Hazard rates by type of activity

We divided our sample by type of activity. Those in the commercial sector generally owned retail outlets or provided customized services. Non-commercial activities mainly involved the manufacture of basic household goods for the domestic market.

We first control for the date of entry and compute the hazard rates by type of activity for the 1990 cohort. The probability of failure in non-commercial activities increased in response to trade liberalization in 1991 (Figure 11). There was no visible impact on commercial firms. This is to be expected since liberalization raised the costs of imported inputs and thus production costs in manufactured goods. High tariffs limited imports of consumer goods and thus left the commercial sector relatively unaffected. The hazard rate for the non-commercial sector also showed a greater

response to interest rate changes in 1993 because of its relatively greater loan capital requirements.

We then controlled for the location (Figures 12 and 13). Trade liberalization had a greater impact on the non-commercial sector hazard rate in urban locations, but left rural operations unaffected. The 1992 drought and higher interest rates in January 1993 had the greatest impact on non-commercial activities in rural areas where the hazard rate more than quadrupled (Figure 13) as well as urban commercial firms (Figure 12).

The hazard rates show that economic conditions, choice of sector and location have a significant impact on the probability of failure. The self employed in urban areas on the whole face a greater probability of failure than their rural counterparts. Both groups are negatively affected by higher costs of borrowing. This lends support to earlier findings in the United States that stressed the importance of an initial endowment.

5. The role of personal characteristics

What remains is to assess the role of personal characteristics in determining the duration of self-employment. To minimize the impact of changes in macroeconomic variables we partitioned our data by year of entry into self-employment, so that each sub-sample faced the same conditions over its lifetime. We estimate results by location and type of business activity.

An accelerated failure time model (Kalbfleisch

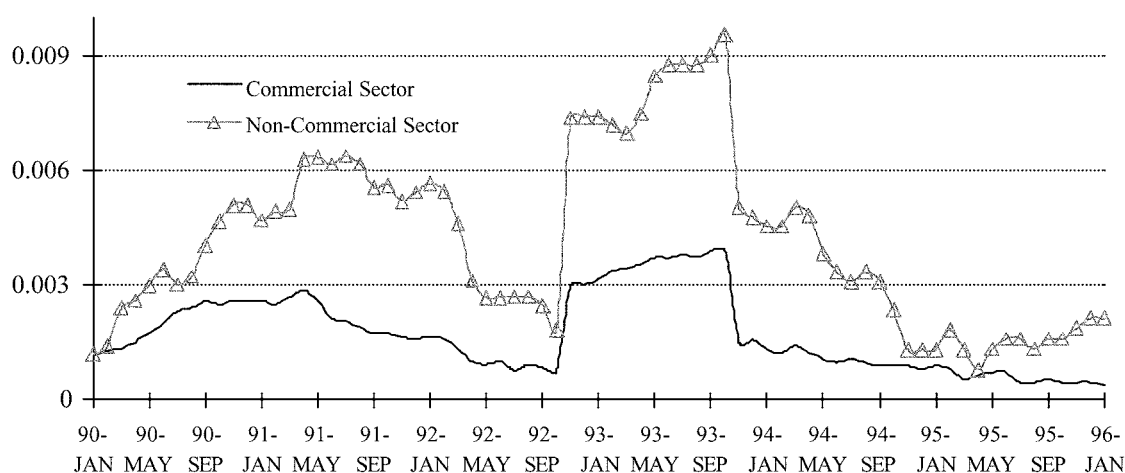


Figure 11. Hazard rates for entrants in 1990 by type of industry.

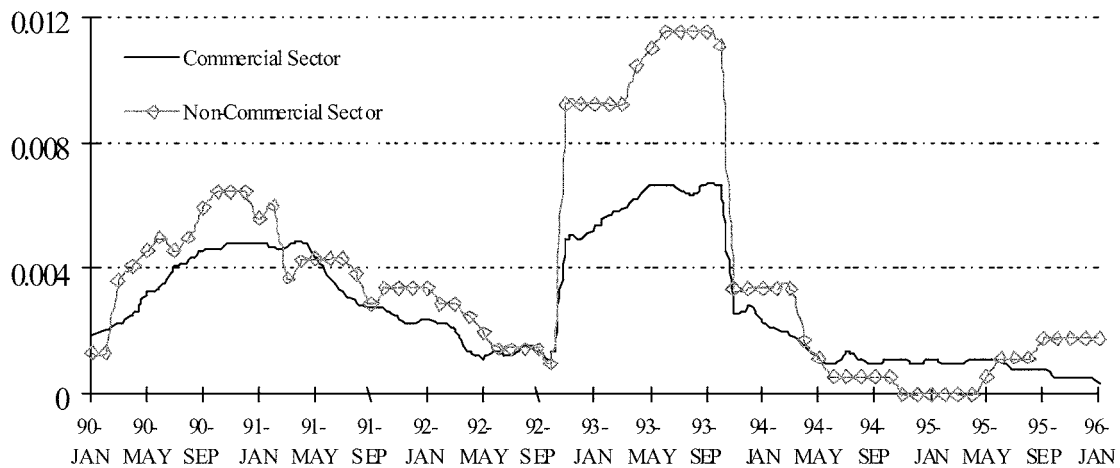


Figure 12. Hazard rates for entrants in 1990 by type of industry, urban areas.

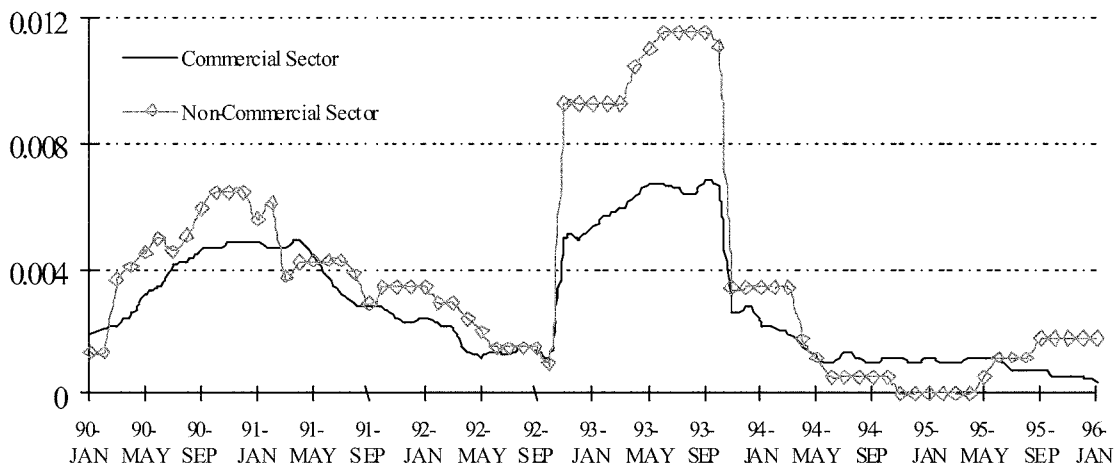


Figure 13. Hazard rates for entrants in 1990 by type of industry, rural areas.

and Prentice, 1980; Lancaster, 1979; Lynch, 1985; Nickell, 1979) is used to assess factors influencing the duration of a respondent's self-employment. This model captures the multiplicative effects of independent variables on an event's time distribution. The response variable is the duration of self-employment. This time period (T) is uncensored for those who exited self-employment during the sample period, but is "right-censored" for those who were still in self-employment after the end of sample period, in this case December 1996. We postulate that the duration will be

$$T = \exp(x'\beta)E, \quad (3)$$

where E is the duration sampled from the baseline distribution corresponding to the covariates. This nonlinear model can be transformed into log-linear form

$$y = X\beta + \alpha\epsilon, \quad (4)$$

where $y = \ln(T)$, $\epsilon = \ln(E)$, and α is a scale parameter to be estimated. The parameter ϵ is a vector of errors with survival distribution function $\Psi(t) = \text{PROB}(\epsilon_j > t)$, cumulative distribution function $F(t) = \text{PROB}(\epsilon_j \leq t)$, and the density function $f(t) = d\Psi(t)/dt$, where ϵ_j is an element of ϵ .

The log-likelihood, L is written as

$$L = \sum_i \log \left(\frac{f(\xi_i)}{\alpha} \right) + \sum_i \log(\Psi(\xi_i)), \quad (5)$$

where $\xi_i = (y_i - x_i'\beta)/\alpha$. The first term of the log-likelihood is the sum over the uncensored observations and the second term the sum over the right censored observations. The coefficient estimates obtained after the log-linear transformation in Equation (5) can be interpreted as elasticities with respect to the individual variable.

Several sources (Cox and Oakes, 1985; Kalbfleisch and Prentice, 1980; and Lancaster, 1990) explain possible choices of distributions for duration models. These are normal, inverse Gaussian, log-normal, gamma, and Weibull. Which distribution is the best for any specific application, however, cannot be determined *a priori*. We tried all five but found that there were no major differences in the results. We settled on the Weibull distribution as yielding the best results overall. The regression results with other distributions can be provided upon request.

The dependent variable is duration of self-employment, measured as the log of the actual number of days. The explanatory variables (also in their log form in Equation (5)) included the size of the initial capital loan, the owner's equity contribution. The personal characteristics are the age of the proprietor, his level of education in years of schooling (and their squared values to account for the presence of diminishing importance), their sex and number of dependents.

We can expect some correlation among the explanatory variables such as the size of the loan granted and the owner's equity contribution. Table II presents the matrix of Pearson correlation coefficients for the independent variables by sector and year of entry into self-employment. We include only those coefficients where the p -values indicated significance at least at the 10 percent level. As would be expected, age and the length of previous wage employment are positively related in all the sub-samples (except for the urban commercial and non-commercial sectors for 1988 and 1993 entrants, respectively). The number of dependents increases with age for all the categories. The number of dependents also is positively correlated with the length of previous wage employment for five of the twelve sub-samples,

but decreases with the level of education. The level of education also had a positive impact on loan size, but this correlation was significant only in half of the sub-samples. Finally, the size of the equity contribution by the owner had a positive effect on the magnitude of loan finance.

There are some mixed relationships. Prior wage employment had a positive effect on loan size for those entering self-employment in the rural non-commercial sector in 1988. The impact was negative otherwise. Years of education were positively correlated with the length of prior wage employment in 1988. The effect was negative in later years. This reflects an increase in years of education among the younger age groups that also have a shorter work history. The strong correlation likely diluted the explanatory power of individual coefficients in some equations. Since the correlation coefficients were significant in only some of the samples, however, we could not exclude variables from the equations.

The regression estimates themselves are shown in Table III. The gender coefficient is the largest. Males are more likely to stay longer in self-employment in the urban commercial sector (1988 cohort) and the whole rural sector (1993 entrants). The elasticities ranged from 0.82 to 2.426. There are negative coefficients, but most are not significantly different from zero. The exception is the urban, non-commercial sector for the 1990 entrants. The gender variable is probably a proxy for such market imperfections as gender preferences in educational opportunities and wage employment. We have no evidence of similar preferences in the provision of loans, but we cannot discount them.

The level of education has a negative impact on duration, but the magnitude declines with more years of schooling. The sign of the coefficient for the squared log of years of formal education is positive. This suggests a decline in the importance education to duration after 12.3 years for 1988 entrants and 17.5 years for the 1993 group, periods far longer than the respective sample weighted averages. Prior wage employment also has a negative effect on duration although the coefficient is significantly greater than zero only for the urban commercial sector in 1988 and the rural non-commercial sector in all three years. A long history of formal employment, most likely in an

TABLE II
Pearson correlation coefficients matrix, by sector and year

	Loan size	Age	Education	Employment	Equity	Dependents
Loan size	1	0.476 rnc 1993	0.471 unc 1988 0.322 uc 1990 0.215 unc 1990 0.471 rc 1993 0.242 uc 1993 0.197 unc 1993	0.621 rnc 1988 -0.429 unc 1993 -0.134 unc 1990 -0.429 rc 1993 -0.150 rnc 1993	0.458 rc 1988 0.563 rnc 1988 0.287 rc 1990 0.545 rnc 1990 0.461 uc 1990 0.453 unc 1990 0.467 rnc 1993 0.527 uc 1993 0.456 unc 1993	0.142 unc 1990 -0.333 rc 1993
Age		1	-0.256 rc 1990 -0.229 rnc 1990 0.224 uc 1993	0.232 rc 1988 0.627 rnc 1988 0.421 unc 1988 0.450 rc 1990 0.427 rnc 1990 0.542 uc 1990 0.499 unc 1990 0.421 rc 1993 0.771 uc 1993 0.583 unc 1993	0.608 rnc 1988 0.191 uc 1990 0.130 unc 1990	0.402 rc 1988 0.458 rnc 1988 0.447 uc 1988 0.384 unc 1988 0.369 rc 1990 0.470 rnc 1990 0.531 uc 1990 0.383 unc 1990 0.384 rc 1993 0.394 rnc 1993 0.595 uc 1993 0.400 unc 1993
Education			1	0.349 unc 1988 -0.285 unc 1990 -0.349 rc 1993 -0.316unc 1993	0.267 rc 1988 0.241 rc 1990 0.351 uc 1993	-0.353 rc 1988 -0.285 rc 1990 -0.386 rnc 1993 -0.185 unc 1993
Employment				1	0.558 rnc 1988 0.227 uc 1990	0.130 rc 1990 0.351 unc 1990 0.521 rc 1993 0.530 uc 1993 0.264 unc 1993
Equity					1	
Dependents						1

rc: Rural commercial sector; rnc: Rural non-commercial sector; uc: Urban commercial sector;
unc: Urban non-commercial sector.

urban setting, does not necessarily provide suitable training for self-employment in a rural environment. Another interpretation is that the educated and those with experience in formal wage employment have a higher opportunity cost when in self-employment and will always have an eye on the formal job market. The estimated coefficients get larger over time, an indication that this opportunity cost has risen as real wages have risen.

The owner's equity contribution to total project costs has a positive impact on duration of self-employment, but the coefficient was significant only in urban commercial sector for the 1988 and

1990 entrants, and the rural commercial sector for 1993. Again, the results confirm the importance of liquidity and lower loan costs. The sign for the loan variable itself is negative and significant in only two sectors (rural commercial sector in 1988 and urban commercial sector in 1990). The sign is positive and significant for those who entered the urban commercial sector in 1993 but is not significantly different from zero elsewhere. This change of signs for the urban commercial sector over time probably indicates a more efficient utilization of loan finance as the interest rates were deregulated. The magnitudes of the elasticities

TABLE IIIa
The estimates of duration models for entrants in 1988^a

Independent variables	Commercial in rural area	Commercial in urban area	Non-commercial in rural area	Non-commercial in urban area
Constant	6.599** (0.0001)	4.915** (0.028)	9.659** (0.0001)	6.886** (0.0005)
Sex	-0.002 (0.994)	0.822** (0.006)	-0.299 (0.302)	0.138 (0.662)
Loan	-0.012** (0.007)	-0.009** (0.004)	-0.007 (0.198)	-0.004* (0.097)
Age	0.053* (0.065)	0.264** (0.023)	-0.119 (0.315)	0.079 (0.515)
Age ²	-0.001 (0.175)	-0.003* (0.055)	0.002 (0.178)	-0.001 (0.701)
Education	-0.026 (0.716)	-0.293 (0.147)	0.016 (0.847)	-0.115 (0.307)
Education ²	0.002 (0.602)	0.014* (0.079)	0.003 (0.600)	0.007 (0.225)
Employment	-0.017 (0.463)	-0.003** (0.019)	-0.184** (0.018)	-0.004 (0.936)
Employment ²	0.001 (0.380)	0.003** (0.027)	0.010** (0.013)	0.001 (0.583)
Equity	-0.001 (0.164)	0.005** (0.038)	0.005 (0.547)	0.003 (0.360)
Dependents	-0.001 (0.972)	-0.194** (0.008)	0.043 (0.472)	-0.101 (0.122)
Log Likelihood for Weibull	-62.148	-0.972	-3.049	-37.869
Mean of duration rates	3,902.1	3,811.3	3,816.5	3,775.7

^a Age¹, Employment¹ and Education¹ are coefficients for the squared log of the respective variable. The mean duration rates have been derived from the mean log values. The figures in parenthesis are *p*-values.

TABLE IIIb
The estimates of duration models for entrants in 1990

Independent variables	Commercial in rural area	Commercial in urban area	Non-commercial in rural area	Non-commercial in urban area
Constant	6.393** (0.0001)	9.041** (0.006)	5.305** (0.002)	6.534** (0.0006)
Sex	0.107 (0.705)	-0.108 (0.756)	-0.119 (0.723)	-0.419** (0.034)
Loan	-0.004** (0.021)	-0.003* (0.053)	-0.001 (0.445)	-0.001* (0.066)
Age	0.086 (0.114)	0.064 (0.641)	0.153* (0.055)	0.095 (0.398)
Age ²	-0.001 (0.202)	-0.0005 (0.7789)	-0.002** (0.041)	-0.001 (0.543)
Education	-0.134* (0.098)	-0.251 (0.255)	-0.063 (0.565)	-0.044 (0.652)
Education ²	0.009* (0.067)	0.011 (0.225)	0.004 (0.423)	0.002 (0.661)
Employment	0.006 (0.767)	-0.128 (0.108)	-0.093* (0.089)	-0.075 (0.138)
Employment ²	-0.0001 (0.874)	0.003 (0.242)	0.003 (0.142)	0.003 (0.140)
Equity	0.005 (0.154)	0.005* (0.086)	0.004 (0.247)	0.001 (0.494)
Dependents	-0.012 (0.587)	-0.168** (0.048)	-0.020 (0.616)	-0.079* (0.061)
Log Likelihood for Weibull	-185.281	-66.856	-46.031	-172.070
Mean of duration rates	2,192.1	1,583.9	2,062.7	1,586.3

The figures in parenthesis are *p*-values.

with respect to both the loan size and owner equity are relatively small, ranging from 0.001 to 0.012.

The age of the self-employed has a largely positive and significant impact on duration, but the magnitude decreases over time. It is possible this variable is a proxy for experience. Dependents are supposed to be a net drain on resources and the variable had a mostly negative impact across all sectors and over time. However, the coefficient

was significant only in the rural sector in 1988. This is to be expected since the average number of dependents declined over time (Table I).

A comparison of similar sectors (commercial and noncommercial) by location (urban and rural) in the same year and across years yields a decidedly mixed picture. It is clear there are differences in the impact of the explanatory variables on duration and the signs depend not only on the

TABLE IIIc
The estimates of duration models for entrants in 1993

Independent variables	Commercial in rural area	Commercial in urban area	Non-commercial in rural area	Non-commercial in urban area
Constant	9.184** (0.0001)	6.731** (0.036)	20.354** (0.028)	-1.215 (0.621)
Sex	1.151** (0.043)	-0.041 (0.886)	2.426* (0.067)	-0.199 (0.266)
Loan	-0.008 (0.158)	0.003* (0.097)	-0.001 (0.666)	0.0001 (0.990)
Age	-0.053 (0.594)	0.062 (0.595)	-0.227 (0.324)	0.425** (0.001)
Age ²	0.0004 (0.725)	0.0006 (0.642)	0.002 (0.368)	-0.005** (0.0006)
Education	-0.299 (0.300)	0.239 (0.338)	-0.368 (0.373)	0.155 (0.344)
Education ²	0.015 (0.299)	-0.007 (0.455)	0.007 (0.648)	-0.006 (0.354)
Employment	0.145** (0.015)	-0.062 (0.538)	-0.554* (0.080)	-0.072 (0.301)
Employment ²	-0.004** (0.029)	0.002 (0.536)	0.016 (0.083)	0.003 (0.175)
Equity	0.012* (0.059)	0.0006 (0.858)	-0.012 (0.164)	0.0003 (0.799)
Dependents	-0.028 (0.469)	0.006 (0.952)	-0.028 (0.734)	0.071* (0.251)
Log Likelihood for Weibull	-47.255	-31.191	-11.270	-73.177
Mean of duration rates	1,237.0	970.0	1,126.4	985.5

The figures in parenthesis are *p*-values.

sector but vary over time. We could not completely control for the macroeconomic conditions. Aggregating observations over a year makes this impossible. However, the relatively large number of insignificant coefficients would indicate that those personal characteristics do not have much of an impact on duration.

6. Summary and conclusions

We used our unique sample to compute non-parametric hazard rates that show the impact of location, type of economic activity, costs of borrowing and a more competitive environment on the probability of exit from self-employment.

Our results show the importance of location. The probability of failure was higher for urban than for rural-based self-employed. This may be due to lower levels of competition in rural areas and also a smaller debt burden in times of rising interest rates.

Our results are also relatively insensitive to personal characteristics, except for the rural areas. Age is consistently significant and we believe it is a proxy for other sources of non-credit finance, such as transfer payments. This may explain for the significance of all personal characteristics in the case of those in commercial rural activities. They are on average older than all the other groups and could therefore have better access to bequests

from employed children. Unfortunately we could not measure for this effect directly.

Access to loan finance by itself is not an advantage. Our results show that the size of the loan, given high market lending rates, is negatively related to duration of self-employment. This is consistent with earlier work elsewhere. However, the relatively small elasticity suggests that market demand conditions facing each proprietor in their respective location and sector may play a larger role in determining who stays in self-employment. Partial economic reforms that do not reduce the inflation rate will not necessarily benefit the small entrepreneur in a developing country.

When we partitioned our sample to control for year of entry into self-employment loan size still had a negative effect on duration. This suggests the impact of liquidity constraints on entrepreneurs who otherwise faced similar conditions but had different levels of indebtedness. Results from one sub-sample suggested that subsidized rates might encourage this inefficient utilization of loan finance. As real interest rates became positive loan finance also had a positive impact on duration.

A major contribution from our results has been to demonstrate the impact of economic conditions on duration through our analysis of hazard rates. Aggregate demand seems to be the most important factor with regards to the rate of exit from

self-employment over time. Economic reforms and deregulation have been touted as conducive to the growth of small business. Our results show that partial reforms that do not reduce inflation or generate growth are unlikely to promote duration in self-employment in a developing country. We also showed that personal attributes do play a role in determining who exits self-employment from a cohort facing the same macroeconomic environment. Their impact, however, seems relatively limited. Local conditions facing each entrepreneur may probably play a much larger role in this regard. Unfortunately, the level of aggregation of our data by sector and location does not allow us to take these local conditions into effect and this may be a direction for further research.

Notes

¹ See, among others, Harrison and Leamer (1997), Evans and Jovanovich (1989), Blanchflower and Oswald (1998) and Fairlie (1999).

² For the complete program description, see Zimbabwe (1991).

³ The rates, in U.S. currency per Zimbabwe dollar: January 1991 (0.3876), June, 0.3108, September, 0.2011, December, 0.1980.

References

- Bates, Timothy, 1990, 'Entrepreneur Human Capital Inputs and Small Business Longevity', *Review of Economics and Statistics* **72**(4), 551–559.
- Bates, Timothy, 1999, 'Exiting Self-Employment: An analysis of Asian Immigrant-Owned Small Businesses', *Small Business Economics* **13**(3), 171–183.
- Blanchflower, David and Andrew Oswald, 1998, 'What Makes an Entrepreneur?', *Journal of Labor Economics* **16**(1), 26–60.
- Cox, D. and D. Oakes, 1985, *Analysis of Survival Data*, New York: Chapman and Hall.
- Evans, David and Boyan Jovanovic, 1989, 'An Estimated Model of Entrepreneurial Choice Under Liquidity Constraints', *Journal of Political Economy* **97**(4), 808–827.
- Evans, David S. and Linda S. Leighton, 1989, 'Some Empirical Aspects of Entrepreneurship', *American Economic Review* **79**(3), 519–535.
- Fairlie, R. W., 1999, 'The Absence of African-American Owned Business: An Analysis of the Dynamics of Self-Employment', *Journal of Labor Economics* **17**(1), 80–108.
- Harrison, A. and E. Leamer, 1997, 'Labor Markets in Developing Countries: An Agenda for Research', *Journal of Labor Economics* **15**(3) Part 2, S1–S19.
- Kalbfleisch, J. D. and R. L. Prentice, 1980, *The Statistical Analysis of Failure Time Data*, New York: John Wiley & Sons, Inc.
- Kaplan, E. L., and Paul Meier, 1958, 'Nonparametric Estimation from Incomplete Observations', *American Statistical Association Journal*, 457–481.
- Lancaster, T., 1979, 'Econometric Methods for the Duration of Unemployment', *Econometrica* **47**(4), 939–956.
- Lancaster, T., 1990, *The Analysis of Transition Data*, New Cambridge University Press.
- Lynch, L., 1985, 'State Dependency in Youth Unemployment: A Lost Generation?', *Journal of Econometrics* **28**, 71–84.
- Nickell, Stephen, 1979, 'Estimating the Probability of Leaving Unemployment', *Econometrica* **47**(5), 1249–1266.
- Government of Zimbabwe, *Zimbabwe: A Framework for Economic Reform, 1991–95*, Government Printers, January 1991.

Copyright of Small Business Economics is the property of Springer Science & Business Media B.V.. The copyright in an individual article may be maintained by the author in certain cases. Content may not be copied or emailed to multiple sites or posted to a listserv without the copyright holder's express written permission. However, users may print, download, or email articles for individual use.