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Entry, Exit and the Hazards of Firms under Trade Liberalization: Evidence from Eswatini (formerly Swaziland)

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Entry, Exit and the Hazards of Firms under Trade Liberalization: Evidence from Eswatini (formerly Swaziland)

By Samuel V. Mhlanga

Abstract

The goal of this paper was to estimate an empirical hazard function of firms by determining the impact of selected firm characteristics and unobserved heterogeneity on a firm's survival time prior to exit during a period of *de factor* trade liberalization. Its findings are that: (i) there was significant heterogeneity in entry, exit and survival rates across industries and over time while patterns of co-movement within industries remained. However, exit rates increased rapidly towards the end of the sample period due to high input adjustment frictions and the settlement of market uncertainty, (ii) the probability of survival for incumbent, productive, and lean establishments as well as firms with a larger share of sales was high, *ceteris paribus*, (iii) in general, the probability of observing firm exit was *increasing* since the time of last observed exit, after controlling for unobserved heterogeneity; and (iv) the marginal effects of both productivity and firm size on the firm's decision to enter a market were significant. Overall, a policy intervention targeting a 10 percent increase in the survival time of firms through innovative retention schemes would significantly increase the rate of market entry, other things equal. This policy would accommodate the potential re-entry of quitting plants and also enhance the probability of one-time large firm entry. A few producer-level choices may include; *inter alia*, improvements in managerial quality, relaxation of financial constraints, and effective adoption of new production technologies as well as information and communication technology.

JEL Classification: C41, L25, L6, M13.

Keywords: Entry/Exit, Firm-Level, Hazard Function, Survival Function, Unobserved Heterogeneity, Eswatini/Swaziland.

1. Introduction

A longstanding issue in industrial organization is the Schumpeterian process of creative destruction of firms in capitalist economies where the selection mechanism involves simultaneous and persistent entry and exit of plants. High productivity plants grow and survive while poor performers contract and perish.[1] Pakes and Ericson (1998) refer to this endogenous process of firms breaking into a market and creating a stable output market-share while others fail as a version of the Darwinian theory of "survival of the fittest". Furthermore, some dynamics characterizing plants are that high entry industries are also high exit, suggesting that plant birth and death are a function of firm- and industry-specific factors. Frazer (2005), Söderbom *et al*. (2006) and Gebreeyesus (2008) find that the observed churning in manufacturing is largely a response to underlying productivity differentials among producers and is also driven by input and output market-share reallocations among incumbents. A sector-wide assessment shows dominance of the producer population by small and young plants relative to incumbent competitors within the same industry, and the size gap diminishes only slowly as the producer ages. As such, Frazer (2005) finds that failing firms are small and young, and more importantly that the hazard rate falls with firm size and age.

A robust theoretical foundation for these micro patterns began four decades ago with Jovanovic (1982) who developed a formal learning model of "noisy" selection that clarifies the link between productivity differentials and plant turnover as well as firm growth. In his model, firms update their prior distribution of production costs after entry. As a consequence of progressive revelation of their cost outlay, they become aware of their true type in terms of the efficiency/inefficiency conundrum. In particular, low cost firms survive and/or expand while high cost ones shrink and/or exit. The model further predicts a positive relationship between firm survival and both firm size and age although these characteristics are also an outcome of previous market selection mechanisms.

This churning regularity was subsequently reinforced by Hopenhayn (1992) who developed a dynamic stochastic model of entry, exit and producer dynamics with particular emphasis on resource reallocation through firm and job turnover. The model maintains an equilibrium threshold of productivity; i.e., $\text{Cost} = I(x < x^{*}),$ at which firms either enter or exit depending on efficiency score x, where I is an indicator variable. Firms with higher cost scores than the equilibrium point contract and exit while good firms enter and survive. Thus, there is selection for low cost producers and their spell of survival is much longer. At the same time, high market entry costs constitute an entry barrier as this increases the level of discounted profits necessary to make entry profitable. The distortionary effect of market entry costs is to discourage good new firms while the survival of bad

[1] This paper uses firm, plant, and establishment interchangeably because there is no distinction among these in the panel dataset from Eswatini.

ones is perpetuated. This has the undesirable effect of placing a limiting constraint on plant productivity and therefore economic growth.

The purpose of this paper is to estimate an empirical hazard function of firms by determining the impact of selected firm characteristics and unobserved heterogeneity on a firm's survival prior to exit. This is complemented with a presentation of robustness checks to control for false discovery. It also determines the impact of the same characteristics on a firm's discrete choice to enter or exit a market. To achieve these, the study relies on a unique and unbalanced firm-level panel dataset that has never been used before covering the period 1994-2003. Thus, the data do not suffer the unavoidable weaknesses of previous studies that rely on short Regional Program on Enterprise Development (RPED) surveys of the World Bank, Van Biesenberg (2005), Frazer (2005), Söderbom *et al*. (2006). This period of the panel data coincides with the *de facto* trade liberalization in the Southern African Customs Union (hereinafter referred to as SACU).

The paper shares a common thread with theoretical contributions of Jovanovic (1982) and Hopenhayn (1992). An empirical benchmark for the quantitative handling of firm entry/exit dynamics and survival patterns in the Customs Union (CU) is McPherson (1995). McPherson uses the continuous-time Cox proportional hazard (PH) model to determine hazard rates, basing his analysis on survey data for micro and small enterprises (MSE) covering 1991 and 1992. To our knowledge, the technique adopted here has not been used before to analyse single-spells of firm survival, except for its nonparametric maximum likelihood version applied to microeconomic investment spike hazards by Cooper and Haltiwanger (1999). In contrast to McPherson (1995), this paper compares rates of change between any two points of conditional failure rates over a 10-year period. This helps uncover any relationship between time-to-exit and firm age and size after controlling for productivity and market shares. It also differs from McPherson's work in that the productivity measure is more direct than using firm size as a proxy for productivity. The analysis is then extended to examine the marginal effects of firm characteristics on firms' decisions to enter or exit. In particular, it answers questions whether or not productivity, firm size, and labour and sales market shares influence plants' choices concerning their decisions to enter or quit a market.

This paper contributes to the literature on discrete-time hazard function analyses with unobserved heterogeneity. It also extends understanding of entry and exit dynamics as well as the behaviour of empirical hazard functions during trade reforms. Most importantly, the results generated thereof can help inform policy choices in the framework of regional and continental economic integration. Such users may include the African Union and African States in the context of trade liberalization and free cross-border movement of productive resources through the African Continental Free Trade Area (AfCFTA) Agreement.

The organization of the paper is as follows. The next section discusses the background information, data preparation and variable definitions. Section 3 lays out the econometric framework for data analysis in the sections that follow. In Section 4, the paper presents results on patterns of aggregate rates of entry, exit and survival of firms in Eswatini. It also looks at survival patterns after controlling for firm age and size as well as estimate the hazard model together with its within-sample predictions. The determination of factors that influence a firm's decision to enter or exit the marketplace is also performed. Finally, the conclusion and future research are presented in Section 5.

2. Background and Data

2.1. Background

Eswatini is a small, open but landlocked lower-middle income country and has been a member of the SACU since 1910 and also a member of the Common Monetary Area (CMA) since 1974.[2] All SACU member states charge a Common External Tariff (CET) on extra-regional imports and the South African Rand circulates freely at unity with currencies of other CMA group of countries, Guma (1985). Since the major trading partner of Eswatini is South Africa for historical and geopolitical reasons, the former imports about 90 percent from, and exports over 65 percent of its manufactured goods to the latter. Moreover, the existing asymmetry between these economies is induced by; *inter alia*, differential economic size and level of development that have placed South Africa at the centre of regional decision making and the peripheral member states being involved only at the margin.

Furthermore, the subtlety of the South African unilateral trade reforms since 1994 showed up in a form of a regional trade liberalization episode for the rest of the sub-region as a result of the CET. The peripheral nations would have preferred to negotiate for time-bound protection of some of their agricultural and manufacturing products through the World Trade Organization (WTO) on grounds of 'sensitivity and/or infant industry' status. The availability of such opportunity was limited by South Africa's dominant role in the group as it sought to vigorously safeguard its own economic policies. At the same time, the domestic output of certain products in Eswatini nonetheless still enjoyed nonreciprocal foreign market access. For example, there is preferential market access for sugar in the EU and U.S., for textile and wearing apparel through the African Growth and Opportunity Act (AGOA) in the U.S. market, and for beef in the Norwegian market. Changes in global commodity prices, particularly in countries where Eswatini products were granted non-reciprocal export market access, also influenced the amount of aggregate revenue received by that industry.

In spite of the advantageous extra-SACU market access, the marked dependence of Eswatini on customs receipts for fiscal revenue exposed the economy to further severe external shocks. For

[2] The SACU membership includes Botswana, Eswatini, Lesotho, Namibia, and South Africa while the CMA has the same SACU members but Botswana.

instance, the impact of renegotiation and settlement of the SACU revenue sharing formula in 2002 was evident in several areas of the economy. Chief among these was the decline in income from this source, inability to ensure timely payment for goods and services supplied by the private sector for long spells of time, and the State-instituted moratorium on procurement by its enterprises which further exacerbated delays in payment for goods and services. There were also intermittent draught episodes, decline in foreign direct investment coupled with firm closures and brain drain due to higher returns to marginal products of capital and labour in the reforming larger market, and deterioration in the domestic ease-of-doing business indicators. All of these translated into a secular decline in economic performance and weakening in the manufacturing sector's aggregate labour productivity (hereinafter referred to as ALP) as shown by the falling real output growth and employment in Figure 1.

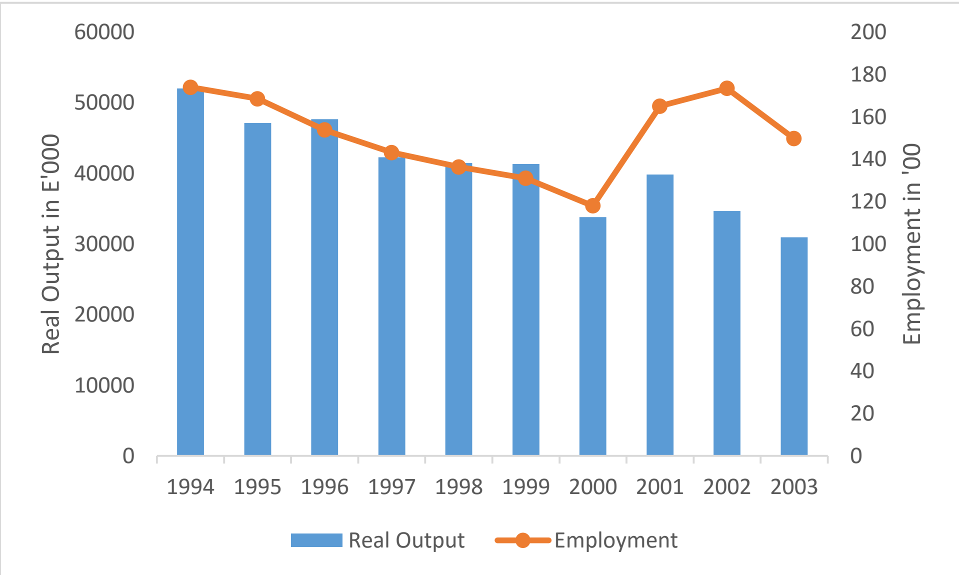

Figure 1: Manufacturing Real Output and Employment for 1994-2003 (Based on Firms in Over 59 Four-Digit ISIC Categories)

Source: Author

The persisting adverse movement in manufacturing real output and employment; *albeit*, with a positive shock in 2001, led to a general ALP deterioration. A heightened pace of job churning was largely induced by firm turnover and attractiveness of returns to marginal products of inputs in cross-border geographical locations. The bilateral nature of the relationship between the two countries enabled ease of human capital migration to South Africa. In Eswatini, high adjustment frictions in primary input markets showed up when remaining firms attempted to downsize to increase productivity. However, strict regulations and labour legislation would not flexibly permit nor the capital irreversibility constraints ease up since the Industrial Act, 2000 came into force. As a result of the deteriorated state of the firm, the incidence of what then became known as fly-by-night firms was intensified to avoid long and drawn out litigations in later years. Moreover, anecdotal evidence abound that as constraints on capital specificity eased and uncertainty about investing in the larger and more sophisticated market settled, the rate of local business shutdowns gained increasing momentum.

2.2. Data Preparation and Definition of Variables

The source of production data for this study was the Central Statistical Office (CSO) of Eswatini, capturing plants that contributed more than a predetermined output threshold within their industry. Plant entry is therefore defined as a firm appearing for the first time in the database at time t, either because it is just starting up or it has crossed the output threshold. Exiting plants drop out of the database because their output contracted below the predetermined threshold level or they closed down operations. Table 1 presents notation and variable definitions used in this study.

Table 1: Notation and Definition of variables

Variables/Notation	Definition
Exit	Firm is present at $t-1$ but missing at t
Entry	Firm is missing at $t-1$ but present at t
Aggregate Labour Productivity $_{it}$ or ALP_{it}	$\ln(Q_{it}/L_{it})$,where Q_{it} is real output and L_{it} is the labour input
firm i's Output Share in industry j at t	$\ln\left(Q_{ij} \Big/ \sum_{j=1}^{k} Q_{ijt} \right)$
Firm i's Employment Share in industry j at t	$\ln\left(L_{ij} \Big/ \sum_{j=1}^{k} L_{ijt} \right)$
Firm Size	Large Firms=1 if Workers $\geq$ 50 and Large Firms=0 if Workers < 50 (i.e., Small and Medium Enterprises or SMEs)
p	The number of covariates
n	The number of instances in years
X	$\Re^{nxp}$ vector of independent variables
X_i	$\Re^{1xp}$ covariate vector of instance i
T	$\Re^{nx1}$ vector of event times
C	$\Re^{nx1}$ vector of last follow up times
y	$\Re^{nx1}$ vector of observed time which is defined as $\min(T, C)$
δ	nx1 binary vector for event status
β	$\Re^{px1}$ coefficient vector
$f(t)$	Firm-level density function of event of interest
$F(t)$	Cumulative event probability function
$S(t)$	Survival probability function
$h(t)$	(Conditional) hazard function
$h_0(t)$	Baseline hazard function

Source: Author

Thus, this study relies on a plant-level unbalanced panel dataset spanning the period 1994-2003 which has information on; *inter alia*, domestic and foreign sales revenue as well as employment in terms of working proprietors and paid workers. It is evident from the definitions that only output and labour market shares and productivity are time-varying covariates while firm size is by choice dichotomous. Thus, a firm that is missing in year $t-1$ but present in year t is an entrant and a firm that is present in year t but missing in year $t-1$ represents a case of exit. The dataset is characterized by a high rate of exit from 2001. This is attributable to at least two reasons: i) the high capital adjustment costs due to capital-irreversibility that slowly diminished over time; *albeit*, at an increasing rate towards the end of the sample period. There were also high firing and hiring costs of workers after the Industrial Act of 2000, ii) the settlement of business uncertainty over time hastened the process of relocation of multinational subsidiaries back to South Africa to exploit scale economies in a larger and reforming market. As a result, the dataset for the period 1994-2003 which can be divided into two *de factor* episodes of trade liberalization in Swaziland is used. The period 1994-1998 covers the South African unilateral reforms and the multilateral trade liberalization activated through specific trade offers to the World Trade Organization (WTO) while 1999-2003 covers only the multilateral trade liberalization period.

The number of covariates p in table 1 is allowed to exceed the sample size n. It is possible though in high dimensional situations as in firm-level data sets to systematically identify a subset of covariates $s \in p$ such that only $s \ll n$ elements of the parameter vector are nonzero; i.e., the regression sparsity condition is assumed. In the analysis presented in the sections that follow, reliance is only on a few of the covariates suggested by economic theory to have an impact on the duration analysis of firms. However, appropriate controls are introduced to ensure reliability of results.

3. Econometric Framework

The analysis relies on the workhorse semiparametric model developed by Meyer (1990) that estimates hazard functions using the distribution of single-spells to firm exit. Such an approach is fit-for-purpose for several reasons. It provides a representation of the hazard estimated from distributions of survival defined over finite durations of discrete intervals. Given the annual character of the data with limited episodes of discrete points of entry and exit, this framework has a competitive edge over other methods.

The PH model provides for the analysis of failure time of firm exit. Supposing **T**, **C** and **X** represent survival time, the censoring time and related covariates, respectively; then $y = \min\{T, C\}$ denotes the observed time and $\delta = I(T \leq C)$ is the censoring indicator. This can also be expressed as

$$y_i = \begin{cases} T_i & if\ \delta_i = 1 \\ C_i & if\ \delta_i = 0 \end{cases} \tag{1}$$

Notice that in Wang *et al*. (2017) under a machine learning environment, T_i is a latent value for censored instances since these do not experience any event of failure in the observation period. That is; when firm exit is the event of interest, all firms that are in operation at the end of the sample period constitute censored observations, Liedholm (2002; footnote 10). Fan *et al*. (2010) and Meyer (1990) simplify the analysis by assuming conditional independence between **T** and **C** given **X** and that the censoring mechanism is uninformative about **T**. The observed dataset becomes the triplet $\{(X_i, y_i, \delta_i): X_i \in \Re^+, \delta_i\{0,1\}, i = 1,2,\ldots,n\}$ which is deemed an independently and identically distributed sample from the population (X, Y, δ).[3]

Note that T_i denotes the spell length of firm i in an industry. Then the hazard rate for the firm at time t is defined as

$$h_i(t) = \lim_{\Delta t \to 0} \frac{prob[t + \Delta t > T_i \geq t | T_i \geq t; X_{it}]}{\Delta t} \tag{2}$$

where t is the natural measure of time, Δt a very narrow or an infinitesimal interval of time, and X_{it} a vector of regressors or covariates for firm i at time t. This measures the probability of death at time $t + \Delta t$, given survival up to time t. The primary random variable of interest is the discrete-time duration T_i, which represents the time at which the end of a spell for firm i occurs.

The hazard can therefore be parameterized according to the Prentice-Gloekler-Meyer (PGM) proportional hazard (PH) model of the following form:

$$h_i(t) = \lambda_0(t) \exp\{z_i(t)' \beta\} \tag{3}$$

where $\lambda_0(t)$ is an unknown baseline hazard at time t, z_i is an unknown vector of time-dependent and time-invariant covariates, and β is a vector of unknown coefficients. The survival function or the probability that a spell lasts until $t + 1$, given that it has lasted until t, can be expressed as

$$S_t = prob[T_i \geq t + 1 | T_i \geq t] = \exp[-\exp\{z_i(t)' \beta + \gamma(t)\}]$$

The corresponding hazard function can take the complementary log-log form

[3] In high dimensional methods (HDMs) where the sample size n is large and the number of covariates is p≫n, econometric techniques exist to pick up only s of the p covariates that capture significant effects on the estimated regression to ensure model sparsity, Belloni *et al*. (2014) and Ahrens *et al*. (2019).

$$h_i(t) = 1 - \exp\left[-\exp\left(z_i(t)'\beta + \gamma(t) + u_i\right)\right] \quad (4)$$

where the random variable $u_i = \log(\varepsilon_i)$ $u_i = log(\varepsilon_i)$ ~ Gamma $\left(1, \sigma_\nu^2\right)$ is unobserved heterogeneity with unit mean and σ_ν^2 variance. In the context of the Gamma distribution, Jenkins (1995) expresses the associated log likelihood function as

$$LL_1 = \sum_{i=1}^{N} \log\left\{(1 - C_i).A_i + C_i B_i\right\} \quad (5)$$

where

$$A_i = \left[1 + \nu \sum_{t=1}^{k_i} \exp[z_i(t)'\beta + \gamma(t)]\right]^{-(1/\nu)} \textit{ and } B_i = \left[1 + \nu \sum_{t=1}^{k_i - 1} \exp[z_i(t)'\beta + \gamma(t)]\right]^{-(1/\nu)} - A_i$$

and C_i is a censoring indicator equal to unity for a completed spell and zero otherwise. The second term (B_i) holds true on condition $k_i > 1$, otherwise $B_i = 1 - A_i$ if $k_i = 1$.

The u_i captures unobserved firm-specific differences in such covariates as management practices and technology transfer. This feature of unobservables creates a population of firms with a mixture distribution of all firm types. Each firm type is then scaled for by the probability of observing it in the data set that is estimated together with the vector of parameters.

However, ignoring unobserved heterogeneity leads to the following likelihood function for the sample of plants

$$LL_2 = \sum_{i=1}^{N} \sum_{t=1}^{k_i} \left\{y_{it} \log h_t(z_{it}) + (1 - y_{it}) \log\left[1 - h_t(z_{it})\right]\right\} \quad (6)$$

The literature on single-spell survival analysis models controls for unobservables by using random effects estimators. As it turns out, the structural parameter estimates obtained thereof are sensitive to the choice of the mixing distribution of unobserved heterogeneity (Heckman and Singer 1994). Abbring and van den Berg (2007) examined a large class of hazard models and found that the distribution of unobserved heterogeneity among survivors rapidly converges to a Gamma distribution. Following Meyer (1990), Han and Hausman (1990) and Dolton and von der Klaauw (1995), the data analysis relies on the assumption of gamma distribution of unobservables mean normalization at unity and variance σ^2. As robustness checks, unobservable differences can be assumed normally distributed and also estimated using semiparametric methods. Alternatively, the analysis can rely on the proposition by Heckman and Singer (1994) and Dolton and von der Klaauw (1995) to approximate the unknown distribution of unobservables using a discrete multinomial distribution with mass points of support and associated probabilities. These are estimated jointly with the parameter vector and the hazard function by nonparametric maximum likelihood estimation (NPMLE) methods. That is, the model is estimated by increasing the values of the points of support until the likelihood function fails to increase.

4. Empirical Results

4.1. Patterns of Entry, Exit and Survival of Firms

The discussion of firm dynamics in this section starts with the average measurement of turnover components and firm survival for the 59 four-digit International Standard Industrial Classification (ISIC) industries. Preceding work including Roberts and Tybout (1996) studying African manufacturing sectors has found significant heterogeneity in the variation of entry and exit as well as in firm survival across industries and time. Table 2 reports the cross-sectional average rates of firm entry, exit and survival separately for each sector. In column 1, rates of average firm entry per industry are calculated as a ratio of entrants to the population of firms at year t. On average, the manufacturing sector experienced 9.8 percent rate of firm birth during the sample period, and this variable ranged between 9.1 percent in Other Non-Metallic Mineral products and 12.3 percent in Basic Metals. Similar patterns of results were also obtained for the rate of firm death and these exit rates averaged 12.3 percent as shown in column 2. These entry/exit patterns mimic those observed for Chile, Colombia and Morocco (Roberts and Tybout, 1996). There are two robust features of turnover components in Eswatini. First, entry/exit rates are individually as high as those reported in studies for the rest of the developing world. Second, high entry industries are also high exit like in both industrial and developing countries as in Disney *et al*. (2003) for the UK and Dunne *et al*. (1988) for the US.

The last column presents survival rates of incumbents calculated on the basis of a backward looking definition. A firm is defined as an incumbent if it existed at time $t-1$ and also at time t. These are therefore firms that survived at least two consecutive periods. The average rate of firm survival was 91 percent. However, it remains curious whether the propensity of firm survival is related to size and age. This question is the subject for sub-section 4.2.

Table 2: Firm Entry, Exit and Survival Rates in 59 Four-Digit ISIC Industries (1994-2003)

Two-Digit ISIC Sectors	Entry Rates	Exit Rates	Survivor Rates
Food and Food Products (15)	0.094	0.133	0.894
Textiles (17)	0.100	0.144	0.851
Wearing Apparel (18)	0.096	0.153	0.813
Wood and Wood Products (20)	0.108	0.126	0.854
Pulp, Paper and Paper Products (21)	0.108	0.131	0.875
Publishing and Printing (22)	0.101	0.115	0.937
Chemicals (24)	0.105	0.098	0.982
Rubber and Plastic Products (25)	0.097	0.090	1.000
Other non-Metallic Mineral Products (26)	0.091	0.127	0.947
Basic Metals (27)	0.123	0.118	0.867
Fabricated Metal Products (28)	0.097	0.105	0.917
Machinery and Equipment (n.e.c.) (29)	0.100	0.089	0.952

Furniture and Other Manufacturing (n.e.c.) (36)	0.100	0.111	0.976
Average	0.098	0.123	0.910

Source: Author's Own Calculations.

The missing time dimension in Table 2 masks the effects of the harsh market conditions brought about by the South African trade reforms into the customs union (CU). In particular, the two trade regimes that ran in parallel at each sub-period are not accounted for. That is; first, the 1994-1998 schedule of unilateral trade reforms reduced tariffs from 16 percent in 1994 to 10 percent in 1998 and at the same time the region experienced a complete elimination of quantitative restrictions. Second, a tariff offer phased over some years running from 1995 to 2002 was instituted, Jonsson and Subramanian (2001). That the removal of tariff protection exposed incumbents to tougher competition means high-cost plants could not survive but closed down operations while low-cost firms expanded market shares through the reallocation mechanism and survived. Potential entrants with sub-optimal efficiency levels remained non-market participants. Under these market conditions, it is therefore of interest to determine the churning patterns of plants in the 1994-1998 and 1999-2003 periods.

Table 3: Historical Average Entry, Exit and Survival Rates of Firms

Sector	1994-1998	1999-2003	$\frac{(1999-2003)}{(1994-1998)}$
	Entry Rates		
Food and Food Products (15)	0.272	0.106	0.390
Textiles (17)	0.250	0.149	0.596
Wearing Apparel (18)	0.278	0.188	0.676
Wood and Wood Products (20)	0.209	0.146	0.699
Pulp, Paper and Paper Products (21)	0.278	0.125	0.450
Publishing and Printing (22)	0.227	0.063	0.278
Chemicals (24)	0.277	0.018	0.065
Rubber and Plastic Products (25)	0.300	0.001	0.003
Other non-Metallic Mineral Products (26)	0.319	0.053	0.166
Basic Metals (27)	0.286	0.133	0.465
Fabricated Metal Products (28)	0.286	0.083	0.290
Machinery and Equipment (n.e.c.) (29)	0.286	0.048	0.168
Furniture and Other Manufacturing (n.e.c.) (36)	0.231	0.024	0.104
	Exit Rates		
Food and Food Products (15)	0.041	0.249	6.073
Textiles (17)	0.021	0.297	14.143
Wearing Apparel (18)	0.056	0.313	5.589
Wood and Wood Products (20)	0.023	0.341	14.826
Pulp, Paper and Paper Products (21)	0.056	0.292	5.214
Publishing and Printing (22)	0.015	0.241	16.067
Chemicals (24)	0.043	0.218	5.070
Rubber and Plastic Products (25)	0.000	0.222	-
Other non-Metallic Mineral Products (26)	0.021	0.237	11.286
Basic Metals (27)	0.071	0.267	3.761
Fabricated Metal Products (28)	0.036	0.262	7.278
Machinery and Equipment (n.e.c.) (29)	0.048	0.286	5.958
Furniture and Other Manufacturing (n.e.c.) (36)	0.026	0.214	8.231
	Survivor Rates		
Food and Food Products (15)	0.728	0.894	1.228
Textiles (17)	0.750	0.851	1.135

Wearing Apparel (18)	0.722	0.813	1.126
Wood and Wood Products (20)	0.791	0.854	1.080
Pulp, Paper and Paper Products (21)	0.722	0.875	1.212
Publishing and Printing (22)	0.773	0.937	1.212
Chemicals (24)	0.723	0.982	1.358
Rubber and Plastic Products (25)	0.700	1.000	1.429
Other non-Metallic Mineral Products (26)	0.681	0.947	1.391
Basic Metals (27)	0.714	0.867	1.214
Fabricated Metal Products (28)	0.714	0.917	1.284
Machinery and Equipment (n.e.c.) (29)	0.714	0.952	1.333
Furniture and Other Manufacturing (n.e.c.) (36)	0.769	0.976	1.269

Source: Author's Own Calculations

Table 3 reports average rates of firm entry, exit and survival by industry and trade regime period. The first two columns document the three firm types for the period when both the unilateral and multilateral trade liberalization episodes were running in unison and for the period when only the latter episode was running. The last column presents the ratio of the entry, exit and survival rates of the latter period to the former. Note the much higher orders of magnitude of entry rates for the earlier period and their substantial decline in the latter period. This is consistent with a market environment experiencing aggressive removal of protection that reduces tariffs from over 13 000 in the early 1990s to 7 900 lines in 1998, resulting in higher competition and a decline in market entry. The last column shows ratios for firm entry that are less than unity, confirming that firm entry rates were relatively lower in the period 1999-2003.

On the other hand, the magnitude of exit rates of firms initially stabilized around some constant mean over time and intensified towards the end of the sample period. This was in line with the rapid strengthening of competition among producers in each industry as the process of dismantling tariff barriers continued and quantitative restrictions removed. As a result, the ratio of death rates in the third column is a multiple times larger than unity. For example, the Publishing and Printing industry experienced more than 16 times the rate of firm exit in the 1999-2003 period relative to what obtained in the 1994-1998 period. Two features about quitting firms can be identified. First, quitting firms had aggregate labour productivities occasionally higher than those of continuing plants and some quitters were of course less productive. Second, a significant proportion of the quitting firms were of foreign origin with relatively low production costs. These tended to relocate back to South Africa in order raise scale economies and also gain direct access to larger markets in metropolitan regions. One explanation for the cross-border time lag of 'footloose' multinationals may be that this was an outcome of high capital and labour adjustment costs induced by capital specificity as well as costs of employment and worker separations, respectively. Another explanation may be that the time-to-exit for firms got shorter in the latter part of trade forms due to toughness of competition in the region. At the same time, there were also inefficient plants that had productivity lower than the threshold for market entry and therefore shrank and closed down businesses.

Finally, the lower bloc of table 3 shows patterns of firm survival in the two periods that may initially appear somewhat puzzling. The rate of firm survival in Wood and Wood Products (ISIC: 20) and Rubber and Plastic Products (ISIC: 25) ranges between 8 and 43 percent higher than the previous period, respectively. This is in contrast to the finding of substantially higher exit rates than the previous period. A plausible explanation; also confirmed rigorously in section 4.2, is that there was a relatively high incidence of exit by one-year old firms in the 1999-2003 period. Since there was also a marginal increase in firm entry compared to the previous period, some new born plants that survived for at least two years had the effect of raising the survival rates of firms in the latter period.

Thus, firm churning in the manufacturing sector during trade liberalization in the CU produced a few stylized facts. First, the variability of entry and exit rates of firms over time and across industry remained significantly high although the two series appeared to co-move over time. Second, the failure rate of new born plants heightened excessively towards the end of the reform period. That is, the spell length of time-to-exit for firms became predominantly shorter. This occurred at the backdrop of two-year olds or more survivors experiencing increases in survival rates during the latter period.

The analysis thus far has shown how firm turnover and survival rates vary within and across industries as well as over time. However, firm survival tends to vary with different firm characteristics such as size, age (or one-year old entrants), productivity, and market shares of output and workers. The next section takes this investigation to the different roles of these characteristics in shaping patterns of plant survival or hazards in the manufacturing sector.

4.2. Firm Survival and Hazard Model Estimates

4.2.1. Survival Patterns After Controlling for Age and Size

This sub-section looks deeper into firm survival by taking into account that there are one-year old firms as well as those that are at least two-years old, and also distinguishes between SMEs and large producers. Defining the cumulative distribution function $F(t)$ as

$$F(t) = \Pr(T \leq t)$$

then the survivor function for the discrete-time case is

$$S^d = \Pr(T \geq t) = 1 - F(t)$$

and the product limit estimate of the survivor function, aka the Kaplan-Meier (KM), is

$$\hat{F}(t) = \prod_{j|t_j<t} \frac{n_j - d_j}{n_j}$$

As noted in Kalbefleisch and Prentice (2002), the nonparametric product limit estimate, $\hat{F}(t)$, makes the conditional probability of plant exit concur precisely at each period t_j with the observed share d_j/n_j of the n_j individual plants that fail at time t_j. This measure of firm survival patterns permits a comparative analysis entrants and continuing plants, and SMEs and larger firms.

A. One-Year Old Entrants Versus Incumbent Firms

Table 4 presents a life table of plant survival patterns based on $\hat{F}(t)$ for the period 1994-2003, where survival is viewed as continued investment in fixed production costs for at least two consecutive periods. The dataset was divided into entrants versus incumbent and SMEs versus large firms to analyse relative survival rates in each group. Looking at differences in survival rates between each pair of the groups, the gaps between survival rates of entrants and incumbents as well as between SMEs and large firms were significant according to Log-Rank and Peto-Peto-Prentice tests. As the survival column of the entrant-incumbent Panel A shows, 83.96 percent of entrants survived for at least two years compared to 92.34 percent for incumbents. Put differently, the probability of survival for new plants was considerably lower in a statistical sense compared to older plants to the extent that no entrants survived for nine or more years. This happened in the backdrop of all firms censored at the end of the 10th year.

Table 4: Life Table of Firm Survival by Age and Size in Eswatini (1994-2003)

				Firm Entry and Exit Dynamics				
Interval		**Beg.Total**	**Exit**	**Lost**	**Survival**	**Std Error**	**[95% Conf. Int.]**	
Panel A:				**Entrants**				
1	2	1066	171	0	0.8396	0.0112	0.8162	0.8603
2	3	895	159	0	0.6904	0.0142	0.6617	0.7172
3	4	736	150	0	0.5497	0.0152	0.5193	0.5790
4	5	586	141	0	0.4174	0.0151	0.3877	0.4469
5	6	445	127	0	0.2983	0.0140	0.2711	0.3260
6	7	318	115	0	0.1904	0.0120	0.1675	0.2146
7	8	203	103	0	0.0938	0.0089	0.0773	0.1122
8	9	100	100	0	0.0000	.	.	.
				Incumbents				
1	2	222	17	0	0.9234	0.0178	0.8797	0.9517
2	3	205	18	0	0.8423	0.0245	0.7874	0.8841
3	4	187	14	0	0.7793	0.0278	0.7188	0.8283
4	5	173	12	0	0.7252	0.0300	0.6614	0.7790
5	6	161	23	0	0.6216	0.0325	0.5543	0.6817
6	7	138	15	0	0.5541	0.0334	0.4862	0.6166
7	8	123	14	0	0.4910	0.0336	0.4237	0.5547
8	9	109	9	0	0.4505	0.0334	0.3841	0.5144
9	10	100	100	0	0.0000	.	.	.
Interval		**Beg.Total**	**Exit**	**Lost**	**Survival**	**Std Error**	**[95% Conf. Int.]**	
Panel B:				**Small and Medium Enterprises (SMEs)**				
1	2	852	127	0	0.8509	0.0122	0.8252	0.8732
2	3	725	122	0	0.7077	0.0156	0.6760	0.7370
3	4	603	117	0	0.5704	0.0170	0.5365	0.6029

4	5	486	107	0	0.4448	0.0170	0.4112	0.4779
5	6	379	102	0	0.3251	0.0160	0.2939	0.3567
6	7	277	84	0	0.2265	0.0143	0.1990	0.2552
7	8	193	73	0	0.1408	0.0119	0.1185	0.1651
8	9	120	62	0	0.0681	0.0086	0.0525	0.0863
9	10	58	58	0	0.0000	.	.	.
Large Firms								
1	2	436	61	0	0.8601	0.0166	0.8239	0.8894
2	3	375	55	0	0.7339	0.0212	0.6898	0.7729
3	4	320	47	0	0.6261	0.0232	0.5789	0.6697
4	5	273	46	0	0.5206	0.0239	0.4727	0.5663
5	6	227	48	0	0.4106	0.0236	0.3642	0.4563
6	7	179	46	0	0.3050	0.0221	0.2624	0.3486
7	8	133	44	0	0.2041	0.0193	0.1677	0.2432
8	9	89	47	0	0.0963	0.0141	0.0709	0.1263
9	10	42	42	0	0.0000	.	.	

Source: Author's Own Calculations

B. Firms with Less Than 50 Workers (SMEs) Versus Large Firms

The same analysis is conducted for SMEs and large firms in Panel B. Again, the hypothesis of SME-large firm equality of survivor functions is rejected with high confidence. Thus large firms have a higher propensity to survive relative to their smaller counterparts in Eswatini. For example, 85.09 percent of SMEs survived for at least two years compared to 86.01 percent for large firms whereas 70.77 percent of SMEs survived at least three years relative to the 73.39 percent for larger plants.

Both panels A and B in table 4 produce the standard narrative found in the literature that continuing and large plants survive for much longer than entrants and smaller businesses, see Frazer (2005) and Van Biesenbroeck (2005). Just how vulnerable new born plants and SMEs are in the market relative to their continuing and larger counterparts cannot readily be gleaned from the distribution of the product limit estimator $\hat{F}(t)$. A deeper analytical framework capable of producing summary measures of risk exposure to firm exit is employed in the next section.

4.2.2.Hazard Model Estimates

This section turns to the estimation of the PH model with unobserved heterogeneity by exploiting the features of the hazard function. To correctly interpret the results from both 'heterogeneity' and 'no heterogeneity' versions of the error term of the model, it is important to note some facts about coefficients in a survival analysis setting. In such a framework, a negative (positive) parameter means that the covariate reduces (increases) the hazard or raises (lowers) the probability of firm survival. Since each parameter is a partial derivative of the hazard function with respect to the related covariate, the coefficient interpretation first requires its exponentiation. An exponentiated coefficient of a continuous variable implies that for a unit increase in the covariate, the hazard is multiplied by that exponentiated coefficient in calculating the hazard ratios, *aka* the relative risk.

In essence, the structural model estimation of firm survival generates a β-vector of coefficients and $100(exp^{\beta} - 1)$ represents the percentage change in the hazard given a unit change in the covariate, all else equal. This means a unit increase or decrease in the covariate increases or decreases the hazard by $(\exp^{\beta} - 1)$. In the case of dummies, $\exp^{\beta}(= 1 - \exp^{-\beta})$ provides the hazard for the 'at risk' group in relation to the 'excluded' group of firms. Alternatively, $\exp^{-\beta}$ indicates that the hazard for the 'excluded' group was $(1 - \exp^{-\beta})$ percent different from that of the 'at risk' group of firms.[4]

Table 5 reports estimation results of the heterogeneity/no heterogeneity models by relying only on a few theoretically driven covariates. Plants that experienced an exit episode were traced from their point of appearance in the 1994-2003 dataset until their disappearance, and their time-to-exit spells were measured. Transition spells that lasted beyond 2003 were censored and this produced a total number of 5 767 spells which served as the basis for the estimation procedure. The results for the manufacturing sector are presented for the probability of shutdowns in the two columns. The first column shows the application of the complementary–log−log estimator without unobserved heterogeneity; i.e., $E(u_i) = 0$ in Eq.4. The second column extends the first one by assuming Gamma distributed unobserved heterogeneity that implements the PGM hazard model with $E(u_i) \neq 0$ and constitutes the main results. As expected, both columns report identical results for the 'no frailty' component of the model.

Table 5: Hazard Model Estimates of Firm Turnover (1994-2003)

Variable	No Heterogeneity	Gamma Heterogeneity	Normal Heterogeneity	NPMLE *Single Mass Point*
No Frailty Model		**Event of Interest: FIRM EXIT**		
Log(time)	-1.202***	-1.202***	-1.310***	-.855***
Entry Dummy	-1.356***	-1.356***	-2.657***	-1.261***
Productivity	-.159**	-.159**	-.460***	-.077***
Output Share	8.307***	8.307***	7.748***	2.689**
Labour Share	-5.679***	-5.679***	-4.353	-.631
Size Dummy	.107	.107	.430	
Constant	.001	.001	3.515**	
Frailty Model				
Log(time)		1.864		
Entry Dummy		-12.481		
Productivity		-3.033		
Output Share		44.295		
Labour Share		-27.452		
Size Dummy		-.777		
Constant		50.181		
Statistics				
ln_varg _ Constant		4.754***	.752***	
Observations	5 926	5 926	5 926	5 926
Gamma_var		116.102		
Se_Gamma		64.139		
LR-Test		854.613		

[4] Allison (1984) provides the details.

LR-Test (*p*-value)	3.61e-188		
Rho	.559	.563	.561
Sigma_u	1.445	1.456	1.448
Z2_1_1			-.329***
P2_1			1.496***

Legend: *p<0.05; **p<0.01; ***p<0.001. The total number of spells under analysis is 5 767.

Source: Author's Own Calculations

To conduct robustness checks on PGM results, Eq. 4 was also implemented by assuming the Normal distribution of unobserved heterogeneity in column 3 and also by relying on the NPMLE in column 4.[5] The convergence difficulties in both instances in spite of variations in initial values forced the use of only one mass point to validate or otherwise the version of the model that does not bear the unobservable component.

Entrants versus Incumbents: The significantly negative coefficient on log (time) suggests that an additional year of firm survival in Eswatini reduced the firm's propensity of exit by 30.02 percent during the 10-year period of trade liberalization. There was also an *a priori* expectation that the growth and survival of new firms, which were usually small in size, was governed by their market value and the distribution of their efficiency shocks. Thus, the parameter on entrants indicates that the probability of failure for an entrant at the end of the first year of existence, given its survival up to the end of the first year, was $\left\{\exp^{-(-1.356)} = 3.88\right\}$ times higher than for incumbent firms. Another way to interpret this result is that the age-specific failure rate for incumbent firms was $\left\{\frac{1}{3.88} - 1 = 74.23\right\}$ percent lower than that of entrants. This means that older establishments lived much longer than new ones, conditional on surviving at least the first two years. In this sense, an incumbent firm is one that makes a discrete choice at the beginning of each period whether or not to invest and, if it does, it then invests in fixed costs of production to escape an exit episode as implicitly suggested by Hopenhayn (1992) and more recently by Weintraub *et al*. (2008) and Weintraub *et al*. (2011).

SMEs versus Large Firms: Firm size and the probability of failure at any point in time, given that the firm has survived till that time, are inversely related is a prediction of the 'learning' theory advanced by Jovanovic (1982), which received support from Van Beveren (2007). It is however surprising that firm size in the present study shows no influence on the variation of hazard rates. Similar results are obtained even when the binary definition of firm size is replaced with employment as a continuous variable. This outcome confirms McPherson's (1995) findings about the probability

[5] The NPMLE method assumes a discrete multinomial distribution estimated with either hshaz or gllamm in Stata. The nonparametric estimation relies on the Gâteaux derivative to find an NPMLE solution that optimizes the log-likelihood, on condition convergence is feasible. Cooper *et al*. (1999) use a similar procedure to study machine replacement and business cycles in the US.

of exit in Swaziland using a very broad definition of industry over a two period span of the data. McPherson (1995) attributes his results to the large plants in these SACU member states having experienced a trade-off between access to reliable input sources, consumer awareness of the producer and its products, scale economies and restrictive regulatory policies. The latter has the potential effect of raising adjustment costs of inputs, thereby introducing distortions to the functioning of the relevant markets.

Another perspective to these producer-level patterns noted by Schoar (2009) is the distinction between subsistence and transformational entrepreneurship where only a negligible proportion is able to transition from the former type to the latter. In a study of SMEs by a consulting firm in 2003 in Eswatini, subsistence entrepreneurs with limited business skills and soundness of economic objectives dominated the market. Since SMEs tended to be young and lacked the requisite entrepreneurial thrift for growth, this group of plants experienced relatively more death.

Aggregate Labour Productivity: Theories of international trade with heterogeneous firms such as Melitz (2003) predict that a potential entrant picks up a productivity draw from an unknown distribution prior to paying a sunk entry cost in the market. On condition the firm meets the minimum productivity threshold for successful entry; it pays a fixed cost to operate its business. Similarly; prior to each incumbent firm making an investment in the current period, it has to make an exit choice based on its sell-off value and its efficiency index proxied by ALP. If it continues, it can compete with high-quality but cheaper import products. An unproductive incumbent shrinks such that once it hits the minimum productivity level it exits the market. At the point of exit; however, investment irreversibility due to high adjustment costs may cause exit delays. Thus, a 10 percent increase in productivity reduces the hazard rate of firms by 14.7 percent, all else constant.

Real Output and Labour Market Shares: The market share of real output/sales significantly promotes the conditional hazards of establishments. That is, the higher the sales market share of the typical firm the higher the probability of that firm to exit the market. One logical explanation is that foreign multinationals initially set up subsidiary plants in Eswatini to take advantage of the country's access to foreign markets and cheaper inputs were now relocating to the reforming economy to raise scale economies at headquarters. The high market share quitting firms were occasionally more productive than the continuing ones and therefore market shares were shifted from efficient to lower-productivity plants leading to the observed mediocre economic growth during the sample period.

The period under study was characterized by a high incidence of downsizing in various industries in order to operate lean establishments and expose the manufacturing processes to new and better methods of production arising from learning by doing or by watching to foster survival. Levinsohn and Petrin (1999) refer to this as real productivity growth and is consistent with the significantly negative coefficient on the labour market share covariate. The plant-level decision to raise establishments' productivity by scaling down on the size of labour through retrenchments reduced the age-specific probability of plant failure or increased the probability of firm survival.

Unobserved Heterogeneity: An important source of variation in the hazard rates of plants was the individual firm's unobserved heterogeneity, $u_i \neq 0$. As shown in table 5, the value of the log of the gamma variance (or *ln_varg*) is 4.75 and the *p*-value of the likelihood ratio test is significant at circa zero. This means the value of the variance is significantly large and therefore the inclusion of unobserved heterogeneity in the empirical estimation model is vital as a source of variation in plant survival.

Several explanations for this outcome abound. The bourgeoning literature in business economics led by Bloom and others identifies high returns on investment in unobservables such as management practice, adaptability to innovation, and adoption of new production technologies. In a randomized experiment for India, Bloom *et al.* (2013) found that the adoption of appropriate management practices increased productivity by 17 percent in the first year. Giorcelli (2019) used non-experimental data on Italian firms that participated in a US program for training managers that also supplied participating firms with new production machines and other forms of business support. The study found that the program had positive effects that lasted for at least 15 years for participating firms. In Bloom *et al*. (2010), firms employing at least 100 workers in developing countries are badly managed and poor in the delegation of decision making while financial constraints are binding to smaller producers. Similarly, Bruhn *et al*. (2018), Bloom *et al*. (2010), and De Mel *et al*. (2008) found that effective delegation and relaxing financial constraints improve the performance of firms. These factors extend those identified much earlier by Tybout (2000) that militate against productivity improvements in developing countries.

Taking the analysis from structural model estimation to graphical representation of the empirical hazard function with and without unobserved heterogeneity, clarifies the shape of the hazard further. The focus of attention is still the empirical hazard function with unobserved heterogeneity, estimated under the assumption of Gamma distribution of errors.

The "Discrete Gamma Heterogeneity" based on $u_i \neq 0$ provides a narration similar to Cooper and Haltiwanger (1999) in the estimation of microeconomic investment spike hazards. Controlling for frailty in the distribution of the hazard function produces an upward-sloping curve. This is consistent with the anecdotal evidence that during the trade liberalization period in Eswatini, firm exit was positively correlated with exiting multinationals and new plants which were typically small. The shape of the hazard is also consistent with firm failure that was negatively correlated with capital adjustment costs and aggregate demand uncertainty associated with trade reforms. The net effect of both forces was that firm failure was slowly decreasing in the time since the prior exit as the distributional exhaustion intensifies as in Eslava *et al*. (2006).

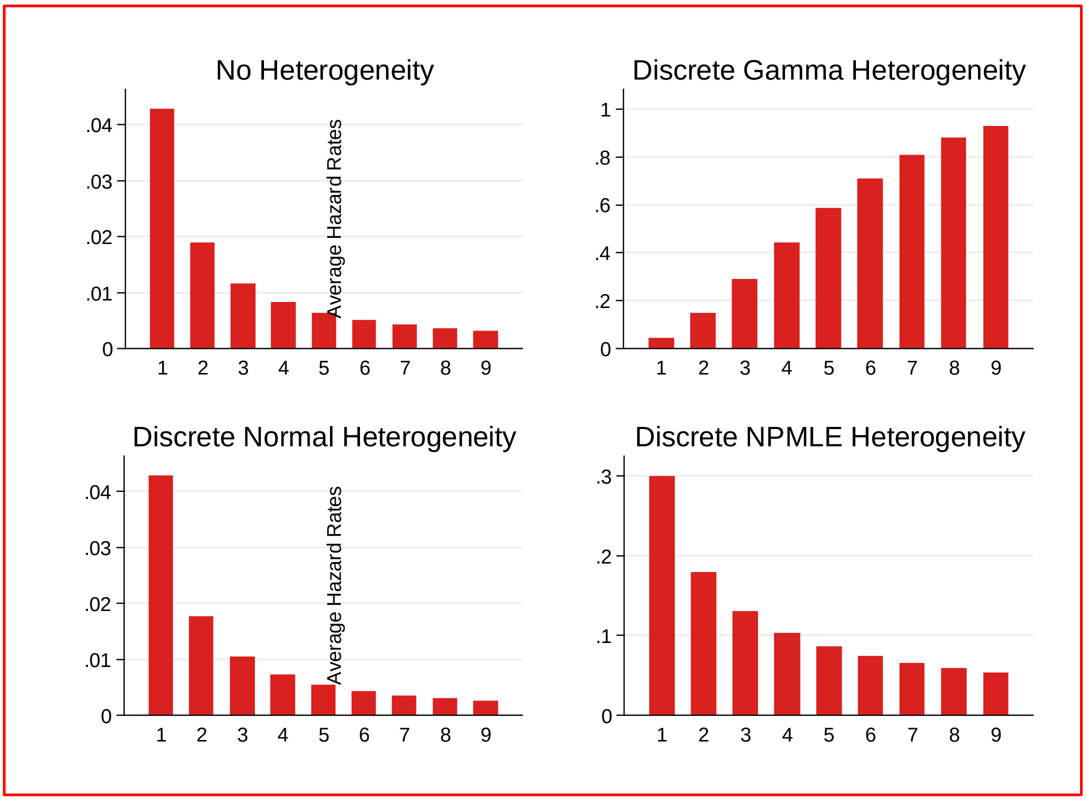

Figure 2: Empirical Hazard Function Estimates

The potency of an empirical model can be assessed through its ability to perform accurate in-sample predictions. For the case of Eswatini, the focus is on the period covering only the trade reform episode in the CU and in-sample prediction seems sensible. In the next section, a model prediction for discrete-time hazards of plant entry/exit is carried out.

4.2.2.1 Within-Sample Model Prediction for Discrete Time Hazards of Plant Turnover

This section begins by contrasting entrants with continuing firms that capture less or more than the median share of sales in their industry. As it turns out, the sales market share exhibits relatively more variability and therefore more suitable for the purpose at hand.

Firms with market share more or less than the median value: The idea begins with predicting the probability of conditional failure h_t from the complementary log−log function without covariates to produce predictions of baseline hazards. That is, a firm will exit at time t, given that it survived until time t. Then the survivor function S_t is estimated as

$$S_t = \exp^{\sum_{i=t}^{T}(\ln(1-h_t))}$$

and a median measure of sales market share is estimated. The dataset is effectively sliced into firms with high and low sales market-shares, depending on whether they score higher or lower than the median value of shares in the industry. In each group of plants, the baseline hazards h_0 for incumbents and h_1 for entrants are estimated. In this process, the estimation of survival functions s_0 for incumbents and s_1 for entrants is performed. The hazard functions h_0 and h_1 on the left in figure 3 reflect low and high sales market-shares; respectively, and are downward-sloping. The predicted hazard rates evidently mimic hazard function with no heterogeneity in figure 2 above.

Figure 3: In-Sample Prediction of Hazard and Survival Rates Based on Sales Market Share

This sub-section as a whole has demonstrated that duration dependence, binary and continuous covariates have a role in the shape of the hazard, particularly when unobservables are accounted for. The vulnerability of new firms in the face of tougher competition from new imports, among other things, is evident in their high probability of exit. The outcome of the process however produced no guidance about any potential effects of firm-specific features on a firm's decision to enter or exit a market.

4.3 The Decision to Enter/Exit a Market

The decision to enter or exit an industry is a function of future profitability of current investment in productive inputs. A potential entrant decides to be a producer if it believes it can acquire the required attributes of a successful firm in a competitive environment. One such characteristic is the productivity of its inputs in terms of being higher than the threshold level in the chosen industry. Successful entry means investing in sunk and fixed entry costs by the new firm. Existence of the firm beyond entry may depend crucially on productivity through good managerial practice and technological advancement as well as on the growth of its market share leading to plant expansion. Failure to attain these producer goals would lead to firm shrinkage and exit.

The identification of the characteristic effects of firms on the decision to enter/exit relies on discrete choice modelling of the binary response to ALP, firm size and market shares. The decision to enter or exit the goods markets is determined by the following modelling setting

$$X_{it}^{Entry/Exit} = \begin{cases} 1 & if \quad X_{it}^{*} > 0 \\ 0 & if \quad Otherwise \end{cases}$$

where $X_{it}^{Entry/Exit}$ is an indicator variable that equals one if a firm enters or exits the market and zero otherwise. X_{it}^{*} is an unobserved latent variable inferred from firm churning through productivity covariates of interest with controls. Industry and year effects are controlled for in all model specifications. The binary choice formulation of the problem can be estimated in a number of ways. The methodological choice normally depends primarily on whether productivity and firm size are recorded as continuous or categorical variables and/or whether the covariates are endogenous. For purposes of this analysis and given the definitions of the covariates; however, all explanatory variables are treated as continuous and are scrutinised using probit methods of investigation as reported in table 6.

Table 6: Average Marginal Effects of Covariates on Market Entry and Exit (1994-2003)

	$X_{it}^{Entry} = X_{it}^{*} > 1$				$X_{it}^{Exit} = X_{it}^{*} > 1$			
	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx	dy/dx
Labour Productivity	.039*** (.009)				.0078 (.009)			
Output Share		.005 (.009)				.019 (.007)		
Labour Share			-.009 (.005)				.003 (.004)	
Firm Size				-.021*** (.006)				-.001 (.005)
Firm-Year Observations	1 241	1 241	1 241	1 241	1 288	1 288	1 288	1 288
Year Effects	√	√	√	√	√	√	√	√
Industry Effects	√	√	√	√	√	√	√	√
Statistics								
$prob\left(y_{it}^{Entry/Exit} = 1 \middle| X_{it}\right)$	.164	.164	.164	.164	.059	.059	.059	.059
Correctly Classified	90.54	90.54	90.53	90.54	94.02	94.02	94.02	94.02
McFadden's Adj R^2	0.305	0.294	0.296	0.304	0.095	0.106	0.095	0.096

Legend: *p<0.05; **p<0.01; *** p<0.001. Standard errors are in parenthesis.

Source: Author's Own Calculations

The partial derivative evaluated at the mean of productivity is statistically significant for the probability of market entry. In particular, a 10 percent increase in the average marginal effect of labour productivity increases the potential producer's decision to enter the goods market in the manufacturing sector by 3.9 percent. In an environment of tough market competition as experienced by firms during the sample period, the requirement for productivity improvements acts as an entry barrier to high cost producers. Thus, only productive establishments could enter and survive while inefficient ones shrunk and closed businesses. Similarly, a 10 percent reduction in employment increased the probability of small firm entry by 2.1 percent. Again, import market competition dictated that firms implement downsizing programmes to continue operations. However, the height of input adjustment costs was such that firm size became downward-rigid and inefficient plants were able to maintain market shares even at sub-optimal productivity levels. In the case of plant exit, all producer-level attributes had no influence on a firm's decision to cease operations. This suggests that factors other than the covariates analysed here were responsible for plant exit.

The Goodness of Fit: The statistics panel of Table 6 provides goodness-of-fit results for the probit models. The models correctly classify at least 90 percent for each covariate while the explanatory power for entrant firms is at least 29 percent and for quitters is at least 9.5 percent. This is an indication that the probit model performs reasonably well.

To further assess the overall fit of the probit model of entry/exit patterns, the Hosmer, Lemeshow and Sturdivant (2013) Chi-Square test of the distance between observed and predicted frequencies for each of the binary variables was implemented. Ideally, an entrant or quitter should be observed only once during the sample period. But a plant may enter or exit the market at time t only to reverse the decision at time $t + k$. Taking into account the 1994-2003 sample period, the overall potential trajectories of firm-level entry/exit are $2^{10} = 1{,}024$ for an individual plant. A substantial number of entry/exit patterns either do not occur or only occur infrequently among the 217 establishments. The comparison of frequencies is simplified by aggregating these behavioural patterns into 10 groups based on whether one observes entry/exit in 1995 and whether there were zero, one, or more transitions between market entry and exit in the remaining eight years. The Hosmer-Lemeshow Chi Square-Test comparing the observed and predicted frequencies was used. In all eight cases, the Test is large and therefore cannot reject the probit model. Thus, the goodness-of-fit results confirm the findings produced by the Chi-Square Test-statistics. That is, the chosen functional form and the error structure are appropriate for the analysis, and the predictions of market entry/exit may indeed be correct.

5 Conclusion and Future Research

The goal of this paper was to estimate the empirical hazard of firm exit and to determine the impact of the selected characteristics on a firm's choice to enter or exit the market. It documented entry, exit and survival rates of firms across 59 four-digit ISIC sub-sectors in Eswatini for the 1994-2003 period. It found that both longitudinal and cross-sectional distributions of entry and exit had substantial variability with positive net entry only until 2001 and negative net entry thereafter. This was consistent with two factors that obtained during the sample period. Firstly, firms had high input adjustment costs due to capital irreversibility and regulatory constraints on worker displacements. Second, the upward shifts in efficiency thresholds for domestic producers and exporters diminished the spell lengths in the face of toughening import competition in the manufacturing sector.

The hazard rate was positively associated with output market shares, indicating that quitters were mostly successful firms but only relocating back to home country. Furthermore, the firm-level reorganization of resources to improve efficiency through worker displacement led to labour market shares that strongly worked to significantly reduce hazard rates of firms. Estimates of the hazard function showed that for each successful market entry, the duration-dependence of exit for that firm declined by 30.02 percent, other things constant. The hazard rate of entrants was 3.88 times higher than that of incumbents while a 10 percent productivity increase reduced the hazard rate by 14.7 percent and raised the likelihood of firm entry by 3.9 percent. Although SMEs dominated the manufacturing sector, firm size had no significant effect on the hazard rate. An evaluation of the partial derivative at the mean produced significant effects of firm size on the firm's decision to enter the market. That is, the smaller the size of the producer the higher was its probability to invest in fixed market entry costs in the first year of entry. Thus, McPherson's (1995) conjecture that larger plants are more likely to access reliable supply of inputs, possess higher market visibility and enjoy scale economies while also facing a dense maze of regulatory difficulties still holds.

Therefore, an industrial policy intervention that targets at least a 10 percent increase in the survival time of firms through innovative retention schemes prior to inception of trade reforms would significantly increase the rate of market entry, other things equal. This policy would accommodate the potential re-entry of quitting plants and also enhance the probability of one-time large firm entry. A few producer-level policy choices could include improvements in management practices, adoption of new technologies, ensuring effective delegation, and innovative ways of relaxing financial constraints.

Future work will take cognizance that the hazard model of firm exit studied in this paper is explained only in terms of a few covariates suggested by economic theory. It is however quite conceivable that a substantial number of theoretically and empirically driven firm- and non-firm specific characteristics do influence the duration of firm survival. That is; the number of covariates may be $p \gg n$, where n is the sample size. Therefore, High Dimensional Sparse (HDS) methods using only covariates that are adequate enough to precisely capture the features of the empirical hazard function can be applied to predict the $s \ll n$ regressors while considering the two trade regimes separately.

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