Decline of Small and Medium Size Enterprises in Venezuelan Manufacturing

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Abstract

There exist few studies of long-term small and medium size enterprise (SME) share in developing countries. This paper presents and examines evidence that SME share in Venezuelan manufacturing has experienced serious decline from 1961 to present times. Evidence is given of this decline in terms of key performance measures: numbers of firms, employment numbers and manufacturing value added. An absolute decline of this stratum has also occurred from 1979 onwards. Economic modelling suggests that efficiency and innovation variables are significantly correlated with this decline while a structural variable explains movement around this trend. This broadly concurs with studies in other select economies where these groups of variables have also been found to be significant. However, unlike Venezuela, these variables often explain a recent revival in these economies' SME share. In particular, we find evidence that the decline in Venezuelan SMEs' relative efficiency and innovation performance along with the prejudicial business environment cause this decline in SME share.

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[1] The authors are responsible for any errors.

1. Introduction

Venezuela has experienced a serious decline in SME[i] manufacturing share from at least 1961 when statistics first started being collected in this country. This experience runs counter to some industrial countries where a revival of such share has been acclaimed, for example: the U.S. (Birch, 1981, Acs and Audretsch, 1990), the UK (Storey, 1994, Doi and Cowling 1998), and key European countries (Segenberger et al., 1990), including Italy (Trau, 1997), Greece (Thomadakis and Droucopoulos, 1996), and Norway (Spilling, 1996). Further evidence from the Far East comes from Korea (Nugent, 1994) and Taiwan (Ming-Wen Hu, 1999). The evidence suggests that some industrial economies have experienced a revival[ii] of smaller firm[iii] share in manufacturing and the total economy. Long-term evidence from developing countries has been more difficult to obtain.[iv] The purpose of this paper is to present and explore the evidence for the long-term decline of SMEs in Venezuela. We find that this decline is explained by the failure of SMEs to improve efficiency and innovation relative to large firms. This contrasts with studies of some developed countries, which find that such factors have helped to explain a recent revival in SME share. In addition we show that SME share is negatively correlated with the level of GDP, indicating, we feel, a business environment hostile to SMEs. This may help explain an unusual phenomenon of the Venezuelan SME experience – their absolute decline (as well as relative) since 1979.

The rest of the paper is organised as follows. Section 2 discusses Venezuela's economic background. A modern history of SMEs in manufacturing is provided in section 3. Section 4 outlines the modelling of SME share with empirical results presented in section 5. Conclusions are drawn in section 6.

2. Economic Background

The top left-hand quadrant of figure 1 shows Venezuelan real per-capita GDP[v] (PCGDP) from 1960-1992. We can divide the period in two showing a positive growth rate up to 1978 (1.7% p.a.) followed by a serious decline (–1.9% p.a.) from 1979-1992.

The 1960s and 1970s were periods of significant economic growth. The country was starting from a low base and benefited from immensely rich natural resources. However this growth disguised economic policies that were to lead to a severe crisis. There is a growing literature on the history of Venezuelan policy failure (Baptista, 1984, Bitar and Mejias, 1984, Naim, 1984 and 1993, Enright et al., 1996, Hellinger, 1996, and Buxton, 2001,). In addition there is a select literature, applicable to Venezuela, that examines the failure of economic growth in resource abundant countries (Lane and Tornell, 1994, Sachs and Warner, 1995, Sachs and Rodrigues, 1999, and Manzano, 2000). For the purposes of this paper suffice it to say briefly that these policies included the adoption of import substitution industrialisation strategies, state control over large areas of the economy, an excessive reliance on oil revenues and a commitment to large scale projects with scant regard to their efficiency. Policies were generally inward looking, highly statist and focused on a highly discretionary allocation of resources by government staff. SMEs were not a focus of government policy. High oil prices, while providing a short-term consumption-led boom, did not guarantee prosperity. A demand-led temporary boom during the 1973-1974 rise in oil prices was followed by negative per capita growth for two years. Likewise the 1979 oil price rise was followed in each year from 1979 to 1985 by negative per capita growth. By 1985 real per capita GDP was 19% below the level of 1972. Expansionary policies were followed from 1986 to 1988. These led to a temporary rise in growth but proved unsustainable. Inflation rose despite price controls, external reserves were depleted and widespread shortages developed. As the situation deteriorated, the government responded by further tightening controls on prices, foreign exchange and credit allocations making it impossible for the non-oil economy to be competitive. As a consequence, oil exports continued to account for over 80% of exports and more than half of government revenues. The policies followed up to 1988 led to a highly inefficient economic structure with low or negative productivity growth and an economy that continued to be highly dependent on oil and vulnerable to the vagaries of international oil prices. State-led industrialisation was accompanied by a serious productivity decline (Enright, 1996 and Paredes, 1993). SMEs in manufacturing fared very badly. As we shall observe shortly their share of manufacturing value added and employment suffered overall serious decline in the period of our investigation.

The government of 1989, in contrast with earlier policy and also with its own election promises, introduced radical free market reforms. It began to dismantle the administrative apparatus for discretionary allocation of the resources of the economy and moved to reliance on markets. Liberalisation of exchange rates and tariffs, deregulated investment, cutting of subsidies and restructuring of external debt were part of the package. Immediate economic results were impressive: GDP, after a fall of 8.6% in 1989, rose on average by 7.4% a year from 1990-1992. Although investment fell substantially in 1989 and 1990, it then surged in 1991 and 1992. Private exports were, on average, almost three times higher during the 1989-1992 period than in 1988. However the structural reforms provoked serious political opposition to the government and this paralysed the reform process. The economic situation subsequently deteriorated with GDP growth becoming negative again in 1993. However the period 1989-1993 was characterised by experiments in free market reforms and this was accompanied by an increase in SME share in manufacturing. This was almost certainly due to the emergence of a less restricted business environment allowing a greater facility for small firm set up and growth. 1993 also saw a change in government and a return to the more state-oriented policies that had characterised previous governments.

The deteriorating economic situation provoked an escalating banking crisis, as well as serious inflation and capital flight. Venezuela's economic and political system, however, has always been propped up by oil revenue, which is relatively immune to domestic difficulties. Oil GDP in 1994 rose by 4.6% and by 6% in 1995.

The late 1970s are the turning point in all the performance measures of the Venezuelan economy. For example, the percentage change in three main indicators, GDP per-capita, gross fixed capital formation and real oil revenue are given in Table I.

Table I shows a reversal from positive and very favourable growth in the chosen first period to exactly the contrary in the second. The oil revenues in particular are a leading indicator since they underlie the political and economic system. Their serious decline clearly has major *immediate* explanatory weight for the crisis of the 1980s. Gross fixed capital formation rose substantially in the 1970s reaching 42% of GDP in 1978. By 1990, at 12%, they were one of the lowest in Latin America. The GDP rise from 1961-1979 and the fall from 1979-1990 have already been noted and, of course, reflect the above two measures.

It is clear that Venezuela has been in deep economic crisis for many decades and that its oil wealth has allowed it to continue postponing the severe reforms that it inevitably faces. SMEs throughout the 1961-1995 period in general fared badly. Let us examine this in more detail.

3. History of SMEs in Modern Manufacture

The history of Venezuelan manufacturing from 1961-1995 divides into two periods that closely parallel the experience of the economy as a whole. Firstly, 1961-1978 was a period of growth in manufacturing as well as the total economy. Secondly, 1979-1995 was a period of volatile decline. SME share on all major measures (establishment numbers, employment numbers and manufacturing value added - MVA) declined throughout. The first period saw unremitting and severe decline. The second saw a less serious decline of share and more volatility, i.e. a reversal of the declining trend was experienced in some years reflecting volatility in GDP growth. The date of the change from one period to another slightly alters according to the measure used. For establishment numbers it is 1975, for employment share it is 1978 while for MVA share it is 1976.

The total stock[vi] of firms in manufacturing in Venezuela failed to grow significantly from 1960-1995. In 1961 there were 7531 firms, while 34 years later there were only 8864 - a growth of 15%. The only period of significant growth was in the 1970s. The overall picture of the manufacturing sector is of stagnation.[vii] However the very small number of large firms (196 in 1961) did increase by over 4 times. The real stagnation was in the SME sector whose total numbers were, and still are, very small by international standards.[viii] The top right-hand quadrant of figure 1 shows large firm numbers (NL) while the bottom left-hand quadrant of this figure shows SME numbers (NS).

SME share of the stock of establishment numbers (NSS), shown in the bottom right-hand quadrant of figure 1, declined throughout from 97.4% in 1961 to 90.4% in 1995. However its most notable relative decline was in the period of fast growth in the 1960s and the early 1970s. Subsequent decline of share in the second period 1979-1995 was less pronounced though still evident.

Total manufacturing employment numbers (LT) dramatically increased from 160,000 in 1961 to 484,000 in 1979 but dropped to 442,000 in 1995. Total manufacturing employment stagnated from 1979-1995. Absolute SME employment figures (LS) almost doubled in the first period from 102,000 in 1961 to 199,000 by 1979. Subsequently they declined to 185,000 by 1995. Large firm employment numbers (LL) also fell in this second period from 285,000 to 267,000. Again the picture is of stagnation in the second period. These are plotted in the top left-hand quadrant of figure 2.

Similarly SME employment share (LSS) fell in both periods, especially the first: the period of fast economic growth – see the top right-hand quadrant of figure 2. It dramatically dropped throughout the whole period, from 63% in 1961 to 41% in 1979 and 39% in 1995. By international standards the employment numbers in the SME manufacturing sector are very small by the end of the period. In 1995 only 420,000 employees were in Venezuelan manufacturing - 70,000 less than in 1979.

Overall Manufacturing Value Added (MVA) resembled GDP with growth in the first period and stagnation with volatility in the second. The bottom left-hand quadrant of figure 2 shows the growth in the first period up to 1979 and the subsequent stagnation.

The bottom right-hand quadrant of figure 2 shows the trend of the dramatic fall in SME MVA share (QSS), falling from a share of 40% in 1961 to 20% in 1979 to 14% in 1995. In general SME share was inversely correlated with manufacturing output and GDP. When there was significant recession SME share tended to increase.

In summary a number of significant features of this whole period stand out. Firstly SME decline is evident on all three measures: stock of establishment numbers, employment and MVA. Secondly decline is both relative and absolute. SME relative decline was most severe in the early period of fast growth 1961-1979. However relative decline was still experienced in the second period, 1979-1995, though to a lesser extent. Absolute decline on all three measures was experienced in the second period – though not in the first. Thirdly SME share is negatively correlated with both MVA growth and GDP. The exception to this is the 1990-1993 period where structural market reforms allowed SMEs to increase their share at a time of GDP growth.

We now explore the reasons for this serious decline of SMEs' share.

4. Modelling SME Share

Acs and Audretsch (1989) - hereafter AA - developed a model examining small firm share suggesting that it is significantly related to three groups of variables: structural, efficiency and innovation variables. The model's results were that SME share …
"is negatively related to the existence of structural barriers, positively related to the extent to which small firms rely on a strategy of innovation, and negatively related to the efficiency differential between small and large enterprises." (AA p.399). These three groups of variables can be broadly explained as follows.

Firstly, *structural variables* (sometimes known as market variables) in the manufacturing sector include capital intensity and market size. These may be envisaged as barriers to entry for small firms since their presence, when significant, favour large firms which benefit from increasing levels of capital intensity or economies of scale. The level of advertising and import penetration in a sector are also occasionally employed as structural variables since they may also constitute barriers to small firm entry and limit national competition.

Secondly, smaller firms may increase their share vis-à-vis large firms if they become comparatively more efficient, i.e. improve *their relative efficiency variables*. For example, increasing comparative productivity of SMEs relative to large firms may be measured in labour and capital productivity figures.

Thirdly, greater *innovation* efforts by smaller firms compared to large firms should likewise see greater SME share. In expanding markets, where large firms can reap economies of scale, smaller firms may offset these disadvantages arising from structural variables by engaging in efficiency and innovation efforts. For example, smaller firms may take advantage of flexible technologies to compete with larger ones (Carlsson 1984). Of course the converse applies. When small firms fail, for whatever reasons, to engage in such innovation and efficiency measures, declining share is expected. This is also the Venezuelan experience.

This examination of these variables has been applied to U.S. data by AA. They found that high barriers to entry in the industry (i.e. advertising, industry capital, the concentration ratio and industry innovation rates) had a negative influence on SME share in U.S. manufacturing. However medium size firms (100-500 employees in the case of the U.S.) could compensate for these disadvantages if they improved their relative efficiency and innovation performance.

Thomadakis and Droucopoulos (1996) - hereafter TD - have also explored these variables in Greek manufacturing. They analysed the period 1983 – 1990 and looked at slightly different variables. They found that barriers to entry in the form of capital intensity and advertising (product differentiation) had no significant impact on SME share. Market size had a strong negative influence while import penetration was not significant. Three performance variables were examined. Relative capital intensity and relative efficiency were very significant. However relative investment intensity was insignificant. TD found some evidence of structural barriers having negative impact though not to the same extent as the AA study of the U.S. They did find substantial agreement with respect to relative efficiency measures. However their proxy for modernisation (relative investment intensity) did not show any significance in explaining SME shares in Greek manufacturing. There was therefore partial agreement between the two studies taking into account the very different levels of development of the U.S. and Greece.

Mata (1993) investigated Portuguese manufacturing between 1982 and 1986. Like the Greek study the time period is short so long run conclusions are difficult to make. Mata tests for a slightly different set of variables to AA and TD. However he does find evidence that Portuguese SME share in manufacturing was negatively correlated with structural barriers to entry such as economies of scale, capital intensity and advertising. This is in agreement with AA's results for the US. There was also a significant correlation with innovation activity. Mata found evidence that SMEs were less flexible than supposed since their share was adversely affected by instability. He also found a negative correlation between export-oriented industries and SME presence.

Ming-Wen Hu (1999), broadly using the same explanatory factors, found confirmation of the significance of these variables in the case of SMEs in Taiwan in 1991. SMEs relative labour productivity (an efficiency variable), and the industry capital–labour ratio (a structural barrier to entry) were among the variables that proved significant.

It should be noted, however, that not all investigation has agreed with the importance of these variables. In an important study of Korean SMEs Nugent found that "the technological-organisational factors, which are generally stressed in the literature, on balance seem to have contributed little to the observed trends" (Nugent 1996 p.247). Instead a range of financial and international marketing variables proved to be significant for Korea.

Mulhern and Stewart (1999) – hereafter MS – examined SME manufacturing share in Venezuela. They also found structural, efficiency and innovation variables to explain SME share (the dependent variable was MVA rather than employment share).[ix] However, the focus of their study was to determine whether the model employed in the previous literature was appropriately interpreted as a forward looking rational expectations specification or an error-correction model. As a result they did not pursue model reduction which would provide a clearer indication of the determinants of SME share. Nevertheless, they provide some initial support for the AA model.

The present paper wishes to apply the AA model to SME employment share[x] with respect to Venezuelan manufacturing from 1961-1990.[xi] Following MS we consider two additional variables. One is the relative unit wages of the SME stratum and the other is GDP - a Venezuelan specific variable explained below.

We use the specification below, following TD and MS, to analyse SME employment share, ES.

$$\Delta ES_t = \delta + \Sigma\pi_i X_{it-1} + \Sigma\gamma_i \Delta X_{it} + \alpha ES_{t-1} + u_t \qquad (1)$$

Where the i^{th} explanatory variable is entered both as a lagged level, X_{it-1}, and a difference term, ΔX_{it}. This autoregressive distributed lag (ADL) model may be interpreted as a partial adjustment specification, as in TD, or an unrestricted error correction formulation, as in MS. In either case the coefficient on lagged SME share, α, is expected to take values between zero and minus one to ensure correct adjustment.

In addition to excluding insignificant variables to secure a parsimonious model one can test the restriction, proposed by Levy (1985), that $\gamma_i=\pi_i$, $\forall$ i. Imposing this restriction yields a model where changes in current dated variables have the same impact upon SME share as the lagged level terms. It implies that one may include the contemporaneous level of an explanatory variable to capture the combined impact of the lagged level and current difference terms.[xii]

As indicated, previous literature has guided us in the type of model and the variables used. Full definitions and source of our data are given in the Data Appendix.[xiii] The explanatory factors employed in the model with their proxies and anticipated sign are presented in Table II.

The structural variables used in this paper are:

- *capital intensity of the manufacturing sector* as a whole. This is measured by KLR, the capital/labour ratio of the manufacturing sector. Higher capital intensity implies "lumpier" machinery and a higher minimum efficient scale thus discouraging small firm presence. The capital assets of manufacturing industry as a whole are divided by total labour employed in the industry to obtain this measure. It has an expected negative sign.

- *economies of scale,* which we proxy with the log of the manufacturing sector's market size, LSZ (also used by TD and Schwalbach 1990). This measures the impact of larger market size upon SME share. We expect its sign to be negative, i.e. growth of the domestic manufacturing market negatively impacts upon SMEs since it is large firms that capture share through advantages of economies of scale.

- *import penetration,* IP, also used by TD, is envisaged as a barrier to entry for national firms. It is not obvious that a greater level of import penetration would be more or less favourable to SMEs than large firms. Therefore there is no expectation of sign.

We next explore three efficiency variables, the first two of which are linked:

- *the relative capital intensity of SMEs* , RKLS.
- *a pure efficiency differential* after difference in factor mix, RKLS, has been controlled for, VS.

The productivity of the SME manufacturing sector relative to large firms is split into two components, RKLS and VS. For the purposes of the model, and following TD, we derive these two efficiency variables from three stratum specific variables. These are performance measures of the relative efficiency of the SME stratum compared to the industry as a whole. RES is relative efficiency, defined as the ratio of output to labour employed, and measures labour productivity. It has two influences, the relative factor mix, or relative capital intensity (greater capital use should improve the output/labour ratio), denoted RKLS, and pure efficiency, VS. RKLS is defined as the observed capital to labour ratio of SMEs relative to that of the whole manufacturing sector. The unobservable VS is obtained as the residual of an OLS regression of RES on RKLS, see the Data Appendix. Both are expected to have positive signs since greater relative capital intensity and higher efficiency constitute competitive advantage and bring lower costs.

- the *relative labour costs of the SME manufacturing stratum*, RWS, is our other efficiency variable (also used by Miller 1986 and Ming-Wen Hu, 1999). RWS measures not only relative wages of SMEs but also the total labour costs to the employer (severance pay, insurance, social security, holidays etc). It is a measure of the average or unit labour costs. The sign on this variable is expected to be negative since higher relative unit costs of labour in SMEs compared to large firms[xiv] should, *ceteris paribus*, negatively impact on their share. As well as being an intuitively pertinent variable in its own right, we feel it is also a proxy for trade union power and the alliance between state and unions – a significant feature of the Venezuela's rigid labour markets in the formal sector.

We also wish to test for the importance of innovation. In the absence of data on patents in Venezuela INVS measures *relative investment intensity* of SMEs compared to large firms. It has also been used by TD as a proxy for *innovation*.[xv] We define it as the ratio of value added to capital employed (i.e. capital productivity) of the SME stratum compared to industry as a whole. We also expect this sign to be positive.

In addition to the above three types of variables previously used in the literature we consider a Venezuelan specific variable GDP. We are using this as a proxy for the business environment, which we feel is hostile to SMEs. We expect that Venezuelan GDP across this period is strongly correlated with falling SME share in manufacturing. In times of expansion we expect large firms to capture the majority of benefits. Conversely as GDP contracts we expect SMEs to recapture some share, not because they thrive on poor conditions - of course they do not - but because large firms contract more than they. A similar conclusion, though in the very different context of developed economies, has been reached by Spilling (1996) with respect to Norway[xvi] and Trau (1995)[xvii] with respect to Italy and key European industrial economies. Accordingly, we expect a negative sign on this variable. The negative correlation between GDP and SME share is confirmed by comparing the top left-hand quadrant of figure 1 (real per capita GDP, PCGDP), the top right-hand quadrant of figure 2 (employment share, LSS) and the bottom right-hand quadrant of figure 2 (MVA share, QSS). The significant exception to this is the 1990-1993 period where both GDP and SME share expanded – a period of brief experiment in free market reforms that allowed a more competitive and less interventionist environment to emerge thus encouraging the formation and growth of SMEs.

5. Empirical Results

We use the above variables to estimate various forms of equation (1) over the estimation period 1962 – 1990. The results are reported in Table III. T-ratios are given in parentheses in the column next to the estimated coefficients. The adjusted coefficient of determination ($AdjR^2$), regression standard error (s) and Durbin-Watson statistic (DW) are also reported. In addition, there are probability values for F-versions of misspecification tests for first-order serial correlation (PFSC1), non-linear functional Form (PFF1), heteroscedasticity (PFH1), first-order autoregressive conditional heteroscedasticity (PFARCH1) and Chow's second test for predictive failure with breakpoint in 1983/84 (PFPF7). The probability for Jarque-Bera's chi-square test for normality is reported as (χ^2N2). A probability value that equals or exceeds 0.050 indicates no evidence of misspecification at the 5% level. F-tests for model reduction from model ADL1 and ADL2 are denoted by F(ADL1$\rightarrow$) and F(ADL2$\rightarrow$), respectively. The 5% critical value (denoted F5%) is given in the cell adjacent to the corresponding test statistic. Two dummy variables, one taking the value of unity in 1976 and zero otherwise (D76) and the other being unity in 1978 and zero otherwise (D78), were included in all regressions. They are necessary to remove misspecification and capture the impact of a period of substantial change in Venezuela as demonstrated by previous tables and figures.

All three models reported in Table III, denoted ADL1, ADL2 and ADL3 respectively, are free from evident misspecification except ADL1 and ADL2, which exhibit predictive failure. However, because this test involves estimating the model over a sub-sample, we believe that this misspecification may be due to the inefficiency of estimates arising from limited degrees of freedom. For example, there are only two degrees of freedom when estimating ADL1 over the sub-sample 1962 – 1983 hence we believe that the predictive failure test based upon these estimates may be questionable. In contrast, the most parsimonious model reported, ADL3, features more degrees of freedom and exhibits no evidence of predictive failure. Since ADL3 is our favoured specification and given our doubts over the reliability of the predictive failure test when degrees of freedom are extremely limited, we present our results as providing valid inference.

The first model reported in Table III, denoted ADL1, is the most general formulation and features all the explanatory variables that we consider. All of the variables' coefficients feature the expected signs (see Table III) except KLR_{t-1}, VS_{t-1} and ΔVS_t. However, because these three variables are highly insignificant, according to t-tests, we do not draw inferences about their signs. Indeed, many variables are highly insignificant so we proceed with model reduction by applying zero restrictions.

Eight variables are removed leaving ADL2. The F-test statistic for deleting these variables is 1.611, which is less than the 5% critical value of 3.23, hence we cannot reject these restrictions. All retained variables feature the expected sign and all, except LSZ_{t-1}, are statistically significant according to t-tests. The estimated coefficients of variables that are common to ADL1 and ADL2 have the same signs and are, in general, of similar magnitude. The difference in magnitude of parameter estimates for GDP probably reflects the benefit to ADL2 of increased degrees of freedom.

Removing LSZ_{t-1}, and imposing common coefficients on lagged level and differences of the RWS and GDP variables gives the model denoted by ADL3. Imposing the joint restrictions to move from model ADL1 to ADL3 and ADL2 to ADL3 yield the F-test statistics of 2.289 and 2.830, respectively. Since these are less than their respective 5% critical values, 3.07 and 2.96, we cannot reject the restrictions. All retained variables are statistically significant and exhibit the expected signs. Further, the estimated coefficients are broadly similar to those obtained from ADL1 and ADL2. The broad similarity of estimates and that F-tests cannot reject the imposed restrictions suggests that the estimates are robust across specifications. Added to the lack of evident misspecification we present model ADL3 as our favoured specification for inference.

MS argue that such an ADL specification is more appropriately interpreted as an error correction model (ECM) than partial adjustment mechanism with rational expectations. They present evidence supporting this argument for Venezuelan MVA share.[xviii] To further examine the robustness of the models reported in Table III we consider ECM representations of employment share.

First we consider the order of integration of the variables using the standard augmented Dickey-Fuller (ADF) tests. Using a sample of 1963 – 1990, to allow for lags and transformations, we find that the ADF test statistics for employment share with zero and one lag are –1.578 and –1.536, respectively. Whereas the ADF test for the first difference of employment share with zero lags is –4.747. Since the 5% critical value, automatically produced by Microfit 4.0, is –2.971 this indicates that employment share is integrated of order one. MS present evidence that suggests that the explanatory variables are all integrated of order one. This satisfies the necessary condition for cointegration.

We follow the Engle and Granger (1987) two-step procedure to build an ECM. In Table IV we report two versions of a cointegrating vector that incorporates the variables included in the long run component (INVS, RWS and GDP) of our favoured ADL model, reported as ADL3 in Table III. The first cointegrating vector, denoted CV1, includes variables that are all statistically significant and feature the expected signs. The ADF test statistics for zero and one lag are –4.186 and –4.420, respectively. The five and ten percent critical values for cointegrating vectors with four variables, as reported in Engle and Yoo (1987), are –4.35 and –4.02, which suggests evident cointegration at the 10% level and, possibly, the 5% level. However, although this model is free from most forms of misspecification there is evidence of significant non-normality. Adding two dummy variables to this model (D76L and D78) removes the non-normality, and leaves an equation free from evident misspecification – reported as model CV2 in Table IV.[xix] Once again all variables feature the expected signs and are statistically significant. There is also evidence of cointegration at the 10% level, and possibly 5% level, with ADF test statistics for zero and one lag being –4.390 and –4.126, respectively.

Given cointegration we proceed by building dynamic ECMs. To do this we construct the residuals of the cointegrating vectors, reported as CV1 and CV2, which we denote as RCV1 and RCV2, respectively. These residuals are then entered, lagged one period, with differenced forms of the explanatory variables. The former ensures coherence with the long run equilibrium while the latter terms capture short run dynamics. The favoured models are reported as ECM1 and ECM2 in Table IV. Both ECMs are free from evident misspecification and include only statistically significant variables that exhibit the signs expected from economic theory. The model ECM1 includes the differences of LSZ, INVS, RWS and GDP while ECM2 includes the same difference terms except that for INVS, which was statistically insignificant. In terms of variables included in long and short run components, both ECM1 and ECM2 are virtually identical to the favoured ADL model, ADL3, reported in Table III.

To directly compare the ECMs with model ADL3 the coefficients of the cointegrating vectors are multiplied by the absolute value of the adjustment coefficients estimated in ECM1 and ECM2. They are reported in equation ECM1 and ECM2 using italic emphasis. Comparing the (implied) estimated coefficients of ADL3, ECM1 and ECM2, it is clear that they are broadly similar, indicating that the results are robust regardless of whether the models are specified in ECM or ADL form.

We draw inferences from model ADL3, although the same qualitative conclusions would have been obtained from either ECM1 or ECM2. The adjustment coefficient suggests that the change in SME share is adjusted by 74.2% of the previous deviation from target share (disequilibrium). Of the structural variables we only retain economies of scale (LSZ), while the manufacturing sector's capital/labour ratio (KLR) and import penetration (IP) were redundant because they were statistically insignificant. Relative labour costs (RWS) was the only efficiency variable retained, while relative factor mix (RKLS) and pure efficiency (VS) were excluded. Our innovation variable, enterprise modernisation (INVS) was retained, as was our country specific variable, GDP. These variables provide 88.3% explanatory power in model ADL3.

We also use model ADL3 to draw inferences regarding the determinants of the decline in SME share. Firstly SME relative unit labour costs (RWS) negatively influence their employment share and since this variable clearly has an upward trend (see the top left-hand quadrant of Figure 3) it reduces this share. Secondly, our proxy for modernisation, INVS, decreases through time (see the top right-hand quadrant of Figure 3) showing poor performance compared to large firms. Due to its positive relationship with SME share it reduces that share. Thirdly, GDP has a negative impact on employment share and, given its upward trend (see the bottom left-hand quadrant of Figure 3), decreases employment share. Thus, we have a long-term downward trend in SME share. In the case of the first two variables (RWS and INVS) we note that they are efficiency and innovation variables. The structural variable LSZ did not prove significant in this study as an explanation of decline although it does help explain the cyclical movements around the trend (i.e. it is a variable that determines short-term movements).[xx] However in general we observe that it is the same types of factors that cause SME revival in other countries that cause a decline in Venezuela. On the one hand it is the absence of efficiency and innovation measures that help explain SME relative decline. These results complement those of the other studies already mentioned. On the other hand we have pointed to the existence of a business environment hostile to SMEs. This is suggested by the 1990-1993 period – the exception that proves the rule. It was only when market reforms began to open up an uncompetitive economy that SME share could increase in a period of economic expansion.

6. Conclusion

This paper has given clear evidence of the long-term decline of Venezuelan SMEs expressed both relative to large firms (1961-1990) as well as in an absolute decline in their numbers, employment and MVA levels since 1979. There is no evidence for a revival in SME manufacturing share.[xxi] Economic modelling has concurred with previous studies [AA, TD, MS, Mata (1993) and Ming-Wen Hu (1999)] on the importance of a key group of variables. In the case of Venezuela structural, innovation and efficiency variables prove significant in explaining SME share, but unlike the economies in the above mentioned studies, it is *the absence* in Venezuela of innovation and efficiency improvements of smaller firms that helps explain their long-term decline. By contrast in these other economies these variables are often important in explaining SME revival

While economies of scale, in this study, are found to determine short-term SME employment share it is other factors that explain their long-term relative decline. In particular the failure to promote efficiency and modernisation improvements in the SME manufacturing stratum as well as the hostile business environment are found to have caused this relative decline. The reasons for the failure to promote SME efficiency and modernisation probably lies deep in the political/economic structure of the country and, we would suggest, represent a topic of future research. Nevertheless we have pointed to the growing literature that explores this question in relationship to the economic crisis of the country as a whole. However it is the absolute decline of SMEs from 1979 that points to the deep crisis of the stratum. Examination of this issue is another area worthy of future research. We have noted that the Venezuelan economy has been characterised by an uncompetitive business environment and that this is linked with SME decline.

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Data Appendix

The raw data are of annual frequency over the period 1961 to 1990.

GDP Real (1985) GDP (billions of Bolivares) transformed to make constant and current price data equal in 1984. Source: International Monetary Fund International Financial Statistics (IMFIFS) line 99b.p.

KL Real (1984) capital of large firms in manufacturing (billions of Bolivares).

KS Real (1984) capital of SMEs in manufacturing (billions of Bolivares).

LL Number of persons employed in large firms in the manufacturing sector.

LS Number of persons employed in SMEs in the manufacturing sector.

M Nominal imports of goods and services (billions of Bolivares). Source: IMFIFS line 99c.

NL Number of large firms in the manufacturing sector.

NS Number of SMEs in the manufacturing sector.

P84 GDP price deflator (1985~100) transformed into 1984~100. Source: IMFIFS line 99bip.

QL Real (1984) value added in manufacturing for large firms (billions of Bolivares).

QS Real (1984) value added in manufacturing for SMEs (billions of Bolivares).

WL Nominal average annual salaries for employees in large firms (billions of Bolivares).

WS Nominal average annual salaries for employees in SMEs (billions of Bolivares).

Source for KL, KS, LL, LS, NL, NS, QL, QS, WL and WS is Oficina Central de Estadística e Informática (1990). We use the method of linear interpolation to obtain values for missing observations.

The transformed and derived variables obtained from this raw data are given below.

KLR=(KL+KS)/(LL+LS)

INVS=(QS/KS)/[(QL+QS)/(KL+KS)].

IP=[M/(P84/100)]/(QL+QS).

LSZ=ln(QL+QS)

RES=(QS/LS)/[(QL+QS)/(LL+LS)].

RKLS=(KS/LS)/KLR.

RWS=WS/(WL+WS).

SS=QS/(QL+QS) for output share and **ES**=LS/(LL+LS) for employment share.

VS is not observable. It is obtained, following TD as the residual from the regression: $RES_t = \lambda_0 + \lambda_1 RKLS_t + VS_t$; where λ_0 and λ_1 are constant parameters estimated by ordinary least squares.

Table I: Percentage Change in Three Main Indicators

Real GDP per-capita	1961-79: 36.6% (1.7% p.a.)	1979-90: -20.6% (-1.9% p.a.)
Gross fixed capital as % of GDP	1970-78: 95% (7.7% p.a.)	1978-90: -71% (-9.8% p.a.)
Real oil income	1970-80: 212% (10.9% p.a.)	1980-90: -48% (-5.8% p.a.)

Table II: Explanatory Factors, their Proxies and Expected Signs

Variable	Variable Type	Explanatory factor	Proxy	Sign
ES	Adjustment	SME share	Employment share ES=LS/(LL+LS)	Negative (lag)
KLR	Structural (barriers to entry)	Capital intensity	Capital/Labour ratio KLR = (KL1+KS)/(LL+LS)	Negative
LSZ		Economies of scale	Manufacturing sector's market size LSZ = ln(QL+QS)	Negative
IP		Import penetration	Total imports/Total production IP = [M/(P84/100)]/(QL+QS)	Any
RKLS	Efficiency	Relative factor mix	Relative capital intensity RKLS =(KS/LS)/KL	Positive
VS		Pure efficiency	Efficiency differential after controlling for factor mix VS	Positive
RWS		Relative labour costs	Relative wages RWS = WS/(WL+WS)	Negative
INVS	Innovation	Modernisation and innovation.	Relative investment intensity INVS=(QS/KS)/[(QL+QS)/(KL1+KS)].	Positive
GDP	Country specific	Prejudicial business environment	GDP	Negative

Notes to Table II. The first column specifies the title of each variable, the second column gives the explanatory factor it is intended to capture while the third column details proxy used to characterise its effect. The fourth column indicates the sign of a variable's coefficient in model (1) expected from economic theory. The term "(lag)" refers to the expected sign of the lagged value of that variable.

Table III: Estimated Autoregressive Distributed Lag Models

Model →	ADL1		ADL2		ADL3	
Sample →	1962 – 1990		1962 – 1990		1962 – 1990	
Dependent Variable →	ΔES_t		ΔES_t		ΔES_t	
	Coefficient	t-ratio	Coefficient	t-ratio	Coefficient	t-ratio
Intercept	0.217	(0.769)	0.564	(4.959)	0.549	(10.109)
ES_{t-1}	–0.310	(–1.510)	–0.737	(–5.567)	–0.742	(–10.061)
LSZ_{t-1}	–0.041	(–1.308)	–0.021	(–1.228)		
ΔLSZ_t	–0.114	(–2.756)	–0.111	(–4.978)	–0.125	(–6.631)
$INVS_{t-1}$	0.054	(0.337)	0.050	(3.186)	0.048	(3.804)
$\Delta INVS_t$	0.090	(0.693)	0.026	(1.675)		
RWS_t					–0.223	(–4.379)
RWS_{t-1}	–0.035	(–0.362)	–0.168	(–3.090)		
ΔRWS_t	–0.155	(–1.025)	–0.217	(–3.230)		
GDP_t					–0.0005	(–7.699)
GDP_{t-1}	–0.00004	(–0.240)	–0.0004	(–4.103)		
ΔGDP_t	–0.0001	(–0.695)	–0.0005	(–5.523)		
KLR_{t-1}	0.057	(0.449)				
ΔKLR_t	–0.168	(–0.632)				
$RKLS_{t-1}$	0.101	(0.918)				
$\Delta RKLS_t$	0.035	(0.313)				
VS_{t-1}	–0.069	(–0.228)				
ΔVS_t	–0.188	(–0.888)				
IP_{t-1}	–0.012	(–1.369)				
ΔIP_t	–0.022	(–2.249)				
D76	0.027	(3.431)	0.027	(4.254)	0.022	(3.493)
D78	–0.030	(–2.232)	–0.043	(–7.531)	–0.044	(–6.886)
$AdjR^2$	0.933		0.914		0.883	
S	0.0045		0.0051		0.0060	
DW	2.303		1.499		1.707	
PFSC1	0.548		0.423		0.587	
PFFF1	0.511		0.967		0.315	
$P\chi^2N2$	0.768		0.965		0.643	
PFH1	0.800		0.485		0.548	
PFARCH1	0.718		0.466		0.706	
PFPF7	0.000		0.004		0.288	
F(ADL1→)			1.611	F5%=3.23	2.289	F5%=3.07
F(ADL2→)					2.830	F5%=2.96

Notes to Table III. Probability values are reported for misspecification tests. The statistics F(ADL1→) and F(ADL2→) are F-tests for imposing the restrictions required to obtain the specified model from equation ADL1 and equation ADL2, respectively. The 5% critical values for these F-tests are given in cells adjacent to the test statistics.

Table IV: Estimated Error Correction Models

Model →	CV1	ECM1	CV2	ECM2
Sample →	1961 – 1990	1962 – 1990	1961 – 1990	1962 – 1990
Dependent Variable →	ES_t	ΔES_t	ΔES_t	ΔES_t
Intercept	0.691 (21.491)	0.003 (2.446)	0.731 (20.491)	0.0007 (0.280)
$INVS_t$	0.062 (3.265)	*0.040*	0.052 (3.769)	*0.040*
RWS_t	–0.180 (–2.399)	*–0.117*	–0.198 (–3.100)	*–0.151*
GDP_t	–0.0007 (–17.534)	*–0.0005*	–0.0008 (–17.163)	*–0.0006*
ΔLSZ_t		–0.090 (–6.066)		–0.062 (–2.920)
$\Delta INVS_t$		0.025 (2.109)		
ΔRWS_t		–0.237 (5.675)		–0.385 (5.676)
ΔGDP_t		–0.0005 (–7.895)		–0.0004 (–3.515)
$RCV1_{t-1}$		–0.650 (–6.609)		
$RCV2_{t-1}$				–0.761 (–3.252)
D76		0.024 (4.392)		
D76L			0.020 (2.330)	
D78		–0.042 (–8.098)	–0.040 (–4.671)	–0.040 (–4.256)
$AdjR^2$	0.979	0.922	0.990	0.748
s	0.0115	0.0049	0.0080	0.0088
LL	93.585	117.840	105.504	99.519
PFSC1	0.265	0.270	0.409	0.426
PFFF1	0.314	0.988	0.780	0.624
$P\chi^2N2$	0.000	0.979	0.754	0.075
PFH1	0.123	0.548	0.061	0.370
PFARCH1	0.755	0.431	0.801	0.894
PFPF7	0.615	0.623	0.106	0.914
DF	–4.186		–4.390	
ADF1	–4.420		–4.126	

Notes to Table IV. The coefficients reported in italic emphasis in the ECMs are the products of the cointegrating vectors' estimated parameters and the absolute values of the estimated adjustment coefficients given in the ECMs. This allows a comparison of the estimated long run coefficients with those reported for the ADL models given in Table III. The Engle and Yoo (1987) DF (no lags) critical values for testing a cointegrating vector with four variables are –4.35 (5%) and –4.02 (10%).

Figure 1: Real Per-capita GDP, Establishment Numbers and Share

Figure 2: Employment Numbers, SME Employment Share, SME MVA and MVA Share

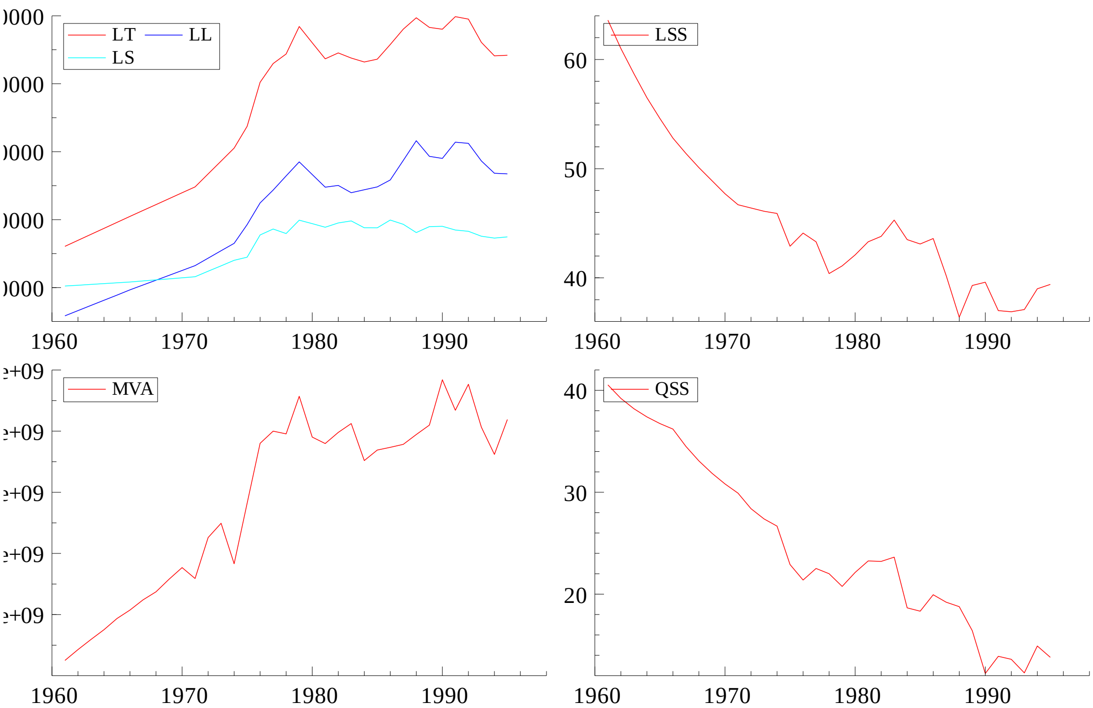
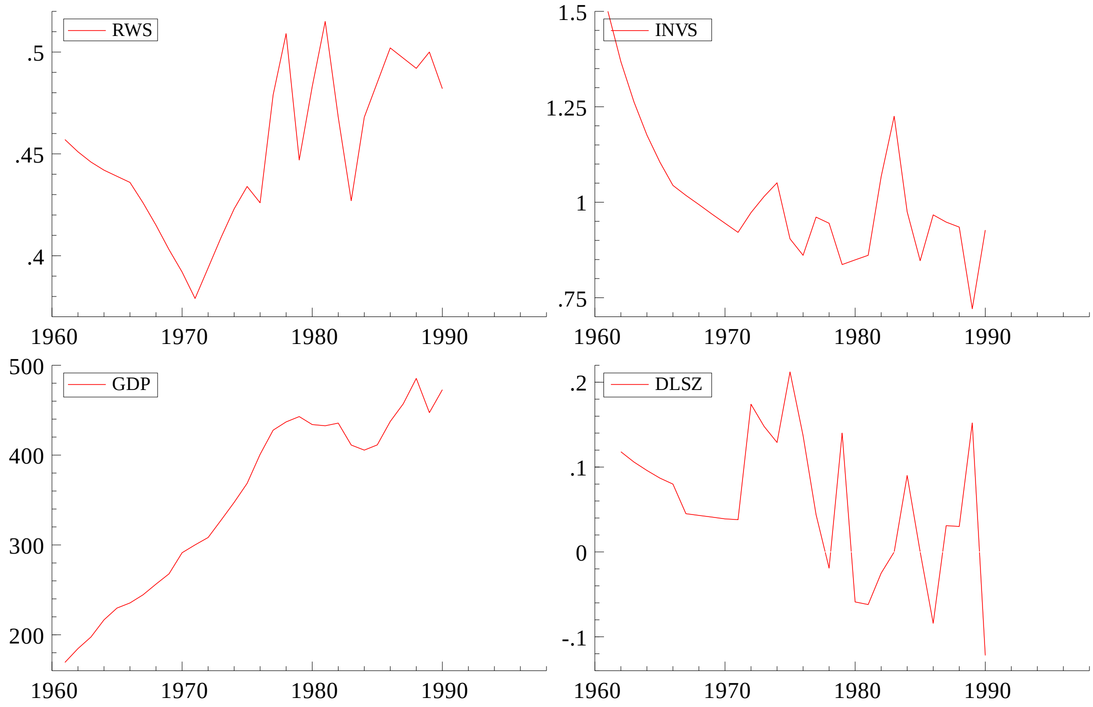


Figure 3: Determinants of SME Employment Share



Endnotes

[i] SMEs are defined in Venezuela as establishments employing up to 99 workers.

[ii] This has sometimes been expressed as a hypothesis of a U or V shaped time series.

[iii] Different studies vary in their definition of SME size although almost all use the same variable – employment numbers. Acs and Audretsch model different size categories up to 500 employees. Both Coi and Dowling 1998 (UK) and Ming-Wen Hu 1998 (Taiwan) define SMEs as less than 100 employees, while Nugent 1994 (Korea) examines both small firms (5-19) and medium size firms (20-199). Trau 1995 (Italy) considers firms from 10-100.

[iv] However Tambunan (2000) employs data on developing countries. However most of it is not available after the late 1970s.

[v] The statistics of this paper have been obtained from official census material collected by the Oficina Central de Estadística e Informatíca (Caracas, Venezuela – OCEI). Data for profit across our whole time period are not available.

[vi] Venezuelan statistics cover establishment not firm numbers. Since the vast majority of firms are single establishment we believe this does not present a problem.

[vii] However there were increases in average employment size especially in the first period. Large firms began in 1961 with an average size of 298 while SMEs average employment size was 14 employees. By 1979 large firms had grown to an average size of 356 while SMEs had 21. By 1995 large firms had declined to an average employment size of 330 and small firms had risen slightly to 25.

[viii] Absolute numbers of firms is clearly a limited piece of information but nevertheless it is very important since it speaks of the vitality of a sector. Long-term stagnation of the numbers of firms in the SME stratum is a strong indication of something seriously wrong in the business environment

[ix] GDP, which does not fall into these groups, was also found to determine SME share.

[x] The reason for this change in the dependent variable is as follows. Many studies only examine SME share with respect to one variable – either output or employment share. However these two variables may have opposing trends. For example SME employment share may be decreasing while output share is increasing – possibly a sign of increased relative labour productivity in the SME stratum. For example the Korean figures for SME employment and MVA share from 1963-1988 have opposing trends:

Employment % share	1963	1988
Medium size firms (20-199 employees)	37.4	40.1
Value added % share	1963	1988
Medium size firms (20-199 employees)	33.5	30

(Source Nugent 1996)

Here we observe that medium size firms saw an increase in their employment share but a drop in their value added share. Perhaps it is for this reason that Nugent tests for both these variables as the dependent variable in this thorough study. An unambiguous test should refer to both variables in order to have a clear picture of what is happening to SMEs.

[xi] The model could not be estimated up to 1995 due to the data constraints with respect to the crucial capital assets data series upon which many explanatory variables are based. This was due to changes in its definition so that the authors were not confident that reliable splicing could be effected.

[xii] Since, with the restriction imposed, $\pi_i X_{it} = \pi_i X_{i,t-1} + \gamma_i \Delta X_{it}$, $\forall$ i.

[xiii] Our raw data is in the form of 3 digit SIC sectors which are aggregated into stratum (i.e. SME and large firm stratum). Although we have this breakdown into 3 digit sectors for share of output similarly disaggregated data is not available for all our explanatory variables. Hence we do not employ a panel analysis.

[xiv] Venezuela has had a long history of minimum wage legislation as well as a battery of workers rights. These are applied to SMEs and large firms in the same measure thus negatively impacting on SMEs relative costs.

[xv] AA originally employed patents as a measure of innovation. This is probably the best measure. However this data is not available in Venezuela. Following later work, such as TD, we use a related variable, modernisation, which is proxied by capital intensity.

[xvi] Spilling (1996 p.401) with respect to Norwegian SME increasing share comments "Rather than being attributed to the strengths of SMEs, the growing share of SMEs may be interpreted as a result of industrial weakness."

[xvii] Trau comments… "Data shows that in the course of the '80s the main industrial countries of Europe- with the notable exception of Germany – have experienced a further reduction in the average size of manufacturing firms, which was declining since the mid '70s. Yet in all the countries concerned the increase in the relative "weight" in the employment shares of small enterprises is associated with an overall decline of employment levels in absolute numbers (smaller firms do not succeed in making up for the whole amount of job losses in the industrial sector)." (Trau, 1997, p273).

[xviii] This study confirms the results of the previous study by MS of Venezuelan SME manufacturing *value added* share since variables in all three major categories of explanatory factors, structural, efficiency and innovation, are statistically significant in both analyses. However, there are differences in terms of the particular variables that are significant in each study. This reflects the different dependent variable employed in each study and that model reduction is only conducted in the present paper. Nevertheless, the inferences are broadly robust across these two studies.

[xix] The dummy variable D76L takes the value of unity from 1976 to 1990 and is zero otherwise.

[xx] Since DLSZ is not trended (stationary), see the bottom right-hand quadrant of Figure 3, it is not economies of scale that cause the decline in Venezuelan SME share according our favoured model.

[xxi] However one could choose a short time period such as 1974-1983 and find such a trend. SME share tended to fall in periods of fast growth in the economy and fall less rapidly (and sometimes increase) in times of GDP stagnation.