Sliding Along the Environmental Kuznets Curve: The Case of Biodiversity

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Abstract

Several studies have found evidence of an environmental Kuznets curve (EKC) for various measures of environmental degradation such as pollution and deforestation. We analyze this issue using threatened bird and mammal species and per capita income levels for 115 countries in 1996. For birds (but not mammals), our results indicate that an N-shaped curve exists. Birds and mammals on islands face a greater threat. For both birds and mammals, population density causes an increase in threatened species, with the effect strongest in low-income countries. More species are threatened where freedom (political rights and civil liberties) is limited.

Key terms: threatened species, environmental Kuznets curve, biodiversity, freedom

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I. Introduction

The decline in biodiversity has prompted worldwide concern in recent years. Just as dying canaries alerted miners to the lack of oxygen, the loss of biodiversity serves as a sentinel to the human race. Estimates of global rates of extinction for various species range from 10 to 1,000 times the natural rate of extinction (Wilson [36]; Nott et al. [21]). There is concern that the untapped value of many biological resources will be lost forever. Some species may be lost before their usefulness is ever known since only 1.4 million of an estimated 13 million have been identified (Heywood and Watson [13]).

Rising concern over the loss of biodiversity has prompted researchers to analyze the possible causes (Brown and Shogren [2]). In this regard, the insights from recent environmental Kuznets curve (EKC) research on environmental degradation may be enlightening. In the early 1990s several researchers presented evidence that pollution levels may exhibit an inverted-U shaped curve with respect to income (Grossman and Krueger [10]; Shafik and Bandyopadhyay [27]; Panayotou [22]; and Selden and Song [24]). According to this EKC theory, pollution levels first rise as income rises, then fall as income continues to rise. These models are often estimated using a cross section or panel data set of countries or localities that have measures of pollution concentrations. The results were interpreted, perhaps too hastily by some, as a justification for fostering growth in low-income countries. In essence, it was argued that countries could eventually "grow" out of their pollution problems. However, other researchers have criticized these conclusions (Arrow et al. [1]). In this paper we propose to further test

this EKC hypothesis using data on threatened birds and mammals. Although income is the primary variable in the EKC theory, other variables must be included in the analysis. Population density, political rights, and other variables may be significant.

Our first task is to construct a measure of the dependent variable, biodiversity loss. While it is generally agreed that no single index can completely measure biodiversity loss (Solow et al. [28]; Weitzman [35]), most researchers use habitat loss and species loss as indicators. We use the number of threatened bird and mammal species in each country as an indicator of potential biodiversity loss. Birds are useful empirically as an indicator because they have been studied as much, or more than, any other class of organisms (Collar et al. [3]) and all bird species have been reviewed. Mammals are also a useful indicator because they are the only other class for which all species have been reviewed (IUCN [16]). The IUCN [16] defines a species as threatened if it is in one of the three categories of critically endangered, endangered, or vulnerable. Reptiles, amphibians and fish are not included in this analysis because they have not been comprehensively assessed.

Our purpose is to examine the factors affecting the number of threatened bird and mammal species across all countries with available data for 1996. We review the literature in the following section. In Section III we describe the empirical model and the data set. In Section IV we present our results. A final section provides some conclusions.

II. Literature Review

Grossman and Krueger [10] were the first to posit a relationship between environmental quality and per capita income. They argue that as economic development proceeds, increasingly intensive and extensive economic activity initially leads to a sullying of the environment. Later, at higher income levels, changes in the composition and techniques of production may be strong enough to offset the greater level of economic activity, leading eventually to an improvement in environmental quality. This would imply that countries might be able to outgrow environmental problems (Holtz-Eakin and Seldon [15]).

Grossman and Krueger [10] found that for a number of types of urban air pollution, concentrations first rise with per capita income, then fall. In subsequent work, this finding of an inverted U-shaped relationship became known as the environmental Kuznets curve (EKC).[1] In the analysis of Grossman and Krueger [10], in general the "turning points" occurred around $5,000 for most air pollutants.[2] While there was some evidence of a second turning point (which would make the relationship more of an N-shape than an inverted U-shape), Grossman and Krueger [10] considered it not to be especially compelling.

Very quickly a large literature emerged that supported the EKC hypothesis. Hettige et al. [12] found evidence of an EKC using data on toxic intensity of industrial production. Selden and Song [24] showed similar results for four measures of national air quality, with turning points in the neighborhood of $10,000. Shafik [26] expanded the analysis to include other measures of environmental quality, including deforestation, various measures of water quality, and solid wastes per capita in addition to air quality

indicators. He, too, found broad support for an EKC relationship, with turning points ranging from about $3,000 to about $6,000. For some measures, Shafik [26] found evidence of an N-shaped relationship: the fecal coliform content of rivers increases until per capita income levels of about $1,375 are reached, then declines up to $11,400, after which it rises again. List and Gallet [19] find both inverted U-shaped and N-shaped curves for cross sectional state pollution data in the U.S. Wang et al. [34] find an inverted U-shaped curve for hazardous waste sites in the U.S. Like Shafik [26], Cropper and Griffiths [4] reported an EKC relationship with respect to deforestation. Grossman and Krueger [11] updated their earlier work to include many different measures of air and water quality. Once again, for most pollutants there seemed to be either an inverted U-shaped or an N-shaped relationship with per capita income, with lower turning points around $8,000. Hilton and Levinson [14] found evidence of an inverted U-shaped curve for automotive lead emissions for a panel data set across countries. Torras and Boyce [32] controlled for political rights, literacy, and income inequality in their study. For most measures, an N-shaped relationship was found to exist with peaks in the range of $3,000 to $11,000 and troughs generally around $15,000.

Early work in this literature was very cautious about the policy implications of such findings. For example, Shafik ([26], p. 770) stated that "The evidence suggests that it is possible to 'grow out' of some environmental problems. But there is not necessarily anything automatic about this – in most countries, environmental improvement has required policies and investments to be put into place to reduce degradation." In a similar vein, Grossman and Krueger ([11], p. 372) noted "...that there is nothing inevitable about the relationships that have been observed in the past."

As a result, several critiques of the EKC literature emerged, followed by several empirical studies that called into question the existence of an EKC relationship. Arrow et al. [1] pointed out that while earlier studies may indicate a correlation between economic growth and improvements in certain environmental indicators, there is no indication of a causal relationship. Arrow et al. [1] also noted that earlier work had not considered system-wide effects, and had thus ignored the possibility that environmental degradation is simply being transferred to middle-income countries. That is, the EKC result may be obtained when using cross-sectional data because the poorest countries mainly import their manufactures and so tend to not heavily pollute. At the same time the wealthier countries tend to import the "dirtier" industrial products from middle-income economies, thereby lowering the local environmental impact. Stern et al. [29] and de Bruyn et al. [6] made similar critiques of the EKC literature and also raised some econometric concerns about the earlier literature. Ekins [7] and Munasinghe [20] argued that only determined environmental policy can make future economic growth environmentally sustainable.

A number of empirical works called into question the results of the earlier literature. Several, including Suri and Chapman [31] and Rothman [23] take international trade into account. When such factors are considered, the turning points rise to very high levels (approximately $50,000 per person); this effectively means there is no EKC relationship. Using a chaos theory argument, Unruh and Moomaw [33] found that CO_2 turning points were reached not because countries hit an income threshold but because of a common historical event (e.g., oil price shocks). Given that such future shocks cannot be anticipated, the authors conclude that it would not be reasonable to

count on environmental problems taking care of themselves as economic development proceeds.

Our study involves threats to biodiversity, a different sort of environmental degradation. While Grossman and Krueger [11] suggested research in this area, ours is the first paper to consider the relationship between biodiversity and per capita income.

III. Empirical Specification and Data

Data on bird and mammal biodiversity has been collected for approximately 30 years by the IUCN. The World Resources Institute began to publish these reports in 1986, although these early reports did not contain data from every region of the world. Our dependent variable, %THREAT, is the percentage of bird or mammal species that were classified by IUCN as threatened in 1996. As Table 1 shows, this variable ranges from 0% to 37% for birds with a mean of 4.5%. The percent of mammal species that is threatened ranges from 0.1% to 44%, with an average of 12.7%. The countries included in this study are shown in Appendix Table 1.

Following the literature, we hypothesize that the percentage of threatened species in a country is a function of levels of real per capita income as well as its square and cube. We hypothesize that there exists an inverted U-shaped (or possibly N-shaped) relationship between per capita income and the percent of species threatened. As countries undergo the structural changes that are part of the economic development transition, they may substitute towards industrial and agricultural technologies that are less damaging to the environment. In addition, wealthier countries are better able to afford policies designed to protect biodiversity. By including squared and cubed income

terms we allow for the possibility of inflection points. Our income variable, INCOME, is real GNP per capita in 1984 U.S. dollars and is taken from the World Bank.[3] In Table 1 we can see that this variable ranges from $56 to nearly $26,000, and averages around $3,700 in 1996. The data for threatened birds and mammals are mapped against income in Figures 1 and 2, respectively.

Besides income, we hypothesize that population density (persons per square kilometer) in a country is directly related to the percent of bird and mammal species under threat, since presumably encroachment of human beings almost surely leads to habitat loss and perhaps an increase in hunting by humans. Cropper and Griffiths [4] also found that population density had a significant effect on deforestation rates. As Table 1 shows, this variable (POPDENS) ranges from 2 to 806 persons per square kilometer for the bird data set, with a mean of 85. For mammals, it ranges from 1 to 806, with a mean of 83.

Literacy (LITER) may also impact the percent of bird and mammal species under threat as a more literate population may be more informed about the importance of protecting species. Torras and Boyce [32] also argue that countries with higher literacy rates will have a more equitable distribution of power that will lead to a greater desire for environmentally prudent policies. As Table 1 shows, this variable ranges from 13 to 99 percent, with a mean of 71% for both the bird and mammal data set.

Following Deacon [5] and Torras and Boyce [32], we include measures of political rights and civil liberties. Deacon [5] has shown that deforestation has occurred more rapidly in countries facing political unrest (e.g., political assassinations, riots, coups d'etats, etc.) or that have nonrepresentative governments (e.g., military dictator). He

surmises that these factors tend to reduce the security of property rights, thereby causing individuals to focus on the short run benefits while ignoring long run consequences. Torras and Boyce ([32], p. 148) speculate that higher degrees of freedom within a society may lead to "an induced policy response in the form of more stringent and more strictly enforced environmental standards, driven by citizen demand..." Our measures of freedom are based on Freedom House's [9] annual survey of freedom. The survey uses checklists for political rights and civil liberties to determine the degree of freedom present in each country. The political rights checklist includes questions such as "Is the head of state elected through free and fair elections?" and "Do people have the right to organize in different political parties?" The civil liberties checklist includes questions such as "Are there free and independent media?" "Are property rights secure?" The raw scores for the two checklists are converted to two seven-category scales, with 1 representing the most free and 7 the least free. We sum the two variables to create POLCIV, which ranges from two to fourteen. We hypothesize that the percent of species under threat will be higher when POLCIV is higher (i.e., lower political rights and civil liberties). As shown in Table 1, the mean for POLCIV is 7.5 for the bird data set and 8.1 for the mammal data set.

Another causal factor, related to human encroachment, is that island species are more vulnerable to pressures. About 75 percent of the mammals and birds that have become extinct in recent history were island dwelling species (Frankel and Soule, [8]). Extended isolation in a confined area (such as an island) may eventually predispose some species to extinction because they become so specialized that they cannot adapt rapidly enough to environmental changes (WRI [37]). Casual empiricism supports this

hypothesis for this data set: as shown in Figures 1 and 2, the seven highest threat countries are island nations. We include a dummy variable (ISLAND) equal to one for island countries and zero otherwise. As shown in Table 1, 14.4 percent of the countries in the bird data set are islands, while 14.7 percent of the countries are islands in the mammal data set.

In summary, we estimate models for birds and mammals as follows:

$$\%THREAT_i = \beta_0 + INCOME_i\beta_1 + INCOME_i^2\beta_2 + INCOME_i^3\beta_3 + ISLAND_i\beta_4 + POPDENS_i\beta_5 + LITER_i\beta_6 + POLCIV_i\beta_7 + \varepsilon_i$$

where ε_i is a classical disturbance term.[4] A finding that $\beta_1 > 0$ and $\beta_2 < 0$ would indicate an EKC exists (should β_3 be positive and significantly different from zero, the EKC would be N-shaped, with a second inflection point). In accordance with the discussion above, we further hypothesize that $\beta_4 > 0$, $\beta_5 > 0$, $\beta_6 < 0$ and that $\beta_7 > 0$.[5]

IV. Results

The results of the bird models are presented in Table 2. The first column presents the basic EKC regression results with the effects of island, population density, literacy, political rights and civil liberties restricted to zero. The model is significant at the 0.05 probability value and all income terms are significant. The Kuznets effect is partially correct. The threat rises with income until a local maximum is achieved at $6,509 per capita income. The threat then declines until $20,147, and rises thereafter. In essence an N-shaped curve exists (rather than the inverted U-shaped curve). Regression results for the unrestricted regressions are presented in the second column. Likelihood ratio tests of

the null hypotheses that the coefficients on the non-income variables are jointly zero can be rejected at the 99% level.[6] The income terms' coefficients are nearly identical to those in the restricted model and the turning points are nearly identical ($6,643 and $20,629). The island dummy has the expected sign: islands have 5.5 percentage points more threatened species than non-islands, ceteris paribus. Population density has the hypothesized effect on the percent of threatened bird species: each additional person per square kilometer leads to an increase of 0.015 percentage points of bird species threatened. The literacy variable is not statistically significant. POLCIV is significant: each one unit increase leads to a 0.26 percentage points increase in threatened bird species. This is consistent with Torras and Boyce's [32] and Deacon's [5] findings that greater political freedom was associated with less environmental degradation.

In Table 3 the basic EKC regression results for mammals are shown in column 1. None of the income terms are significant. The unrestricted regression results are shown in column 2. Although the significance levels of the income terms do increase substantially with additions of the other variables, none of them are significant. However, the signs tend to indicate an N-shaped curve similar to the one for birds. The island dummy variable is significant, as was the case for birds. Islands pose a 7.4 percentage points greater threat to mammal biodiversity. As in the case of birds, increases in population density significantly increase the percentage of threatened mammal species. As also was the case for birds, literacy does not have a significant effect, but POLCIV does. Countries with fewer political rights and civil liberties have a greater percentage of threatened mammal species, ceteris paribus.

In Table 4, we present the results for models that interact low and high-income dummy variables with the other variables. These models allow for the possibility that the impact of these variables may be different in low-income and high-income countries, as was suggested by Kuznets [18]. Torras and Boyce [32] tested this type of hypothesis for various pollutants. As noted in Table 1, a country is categorized as low-income if its per capita income is below the median. For the bird data set this is $848 and for the mammal data set it is $816. In comparing the results of Table 4 with Table 2 we note the income variables are still significant for the bird data, even when the additional regressors are added. The impact of the island dummy is nearly the same for low and high-income countries. Island countries have approximately 5 percentage points higher threatened birds, ceteris paribus. The population density variable is only significant for low-income countries, indicating a 0.0134 percentage points increase for each additional person per square kilometer. The literacy variable is not significant for either low or high-income countries. The POLCIV variable is statistically significant only for high-income countries, indicating a 0.32 percentage points increase for each one unit increase in POLCIV.

In comparing the results of Table 4 with Table 3, we note that the income variables are still insignificant for the mammal data after including the additional regressors. The island variable is only significant for low-income countries, indicating a 19 percentage points higher threat against mammal species on island countries. Interestingly, this effect is three times larger than the effect for the bird data. As was the case for the bird data, the population density variable is only significant for low-income countries, and the effect is of a similar size. The literacy variable is not significant, as

also was the case for the bird data. The POLCIV variable is significant for both low and high-income countries. There is a 0.42 to 0.58 percentage points increase in threatened mammals species for each one unit increase in POLCIV. As was hypothesized, less political rights and civil liberties increase the threat to mammal species.

V. Conclusions

The loss of global biodiversity is an issue that has concerned experts from many disciplines, and this concern has spawned a substantial amount of research into its causes. In the early 1990s, a literature emerged that examined the so-called environmental Kuznets curve. In its simplest manifestation, the EKC relates environmental degradation to per capita income levels in an inverted U pattern: that is, as per capita income levels rise, environmental degradation first increases, and then decreases. In some cases, evidence of a second inflection point was found (an N-shaped curve), in which case economic growth is ultimately associated with greater degrees of degradation.

Our paper considers the relationship between bird and mammal biodiversity and per capita income levels (1984 US$) using 115 countries in 1996. In the case of birds, our results indicate that an N-shaped curve exists. The classic EKC pattern is partially correct: as per capita income levels increase up to about $6,600, the percent of bird species classified as threatened rises. At higher income levels up to $20,600, the percent threatened falls. However, as income rises above $20,600 the percent threatened rises. In the case of mammals, the income variables are not statistically significant. Island species face a greater threat and the threat is larger for mammal species. As hypothesized

for both birds and mammals, higher population density causes an increase in threatened species. This effect is strongest in low-income countries. Literacy does not have a significant effect. Our measure of freedom is significant for both birds and mammals: more species are threatened where political rights and civil liberties are weak. This finding is consistent with the Torras and Boyce [32] and Deacon [5] studies. Furthermore, the impact of freedom is greatest for mammals.

Previous EKC research has focused on a variety of measures of environmental degradation such as pollution and deforestation. This paper is the first to examine the EKC hypothesis for biodiversity. The results indicate that the EKC effect for biodiversity may occur up to $20,600 in per capita income. Beyond that point, the threat may increase. We emphasize that our results do not imply that today's developing countries will inevitably follow these patterns. Rather, our results only show the relationships for a cross section of countries. We in no way predict that countries will "outgrow" their problems of threatened species; neither do we forecast that the upturn in threatened birds beyond $20,600 in per capita income will occur. Only a few countries have per capita incomes above $20,600. Whether other countries will experience these effects when their incomes exceed $20,600 is unknown. Furthermore, income is only one factor, and it was not significant for mammals. Other factors such as population density and political rights and civil liberties may also impact biodiversity. For example, according to Freedom House [9], from 1983 to 1998, the percent of the world's population that is free has declined from 36.3% to 21.75%. If this trend continues, the threat to biodiversity may increase. These effects also must be considered when constructing environmental policies aimed at achieving sustainable economic growth.

Table 1
Descriptive Statistics

Variable	Mean/Minimum/Maximum			
	Birds: Low Income	Birds: High Income	Mammals: Low Income	Mammals: High Income
%THREAT	.0382	.0519	.1167	.1367
	0.0026	0	.0199	.0010
	.2177	.3704	.4381	.2903
ISLAND	.116	.171	.113	.181
	0	0	0	0
	1	1	1	1
INCOME	340	7,225	339	7,135
(in per capita	56	848	56	845
1984 US$)	845	25,798	816	25,798
POPDENS	75.3	94.9	73.0	93.0
(persons per square	2.1	1.8	1.4	1.8
kilometer)	805.8	536.5	805.8	450.2
LITER	564	859	565	861
(% of adults *10)	128	298	128	298
	951	990	942	990
POLCIV	9.71	5.30	10.00	6.10
	2.57	2.00	2.57	2.00
	14.00	13.71	14.00	14.00
Sample Size	56	59	56	59
Number of Countries	115		115	

Note: The division of low and high-income countries is based on the median per capita income (1984 US$) of the countries in the sample. The median income for the bird sample is $848. The median income for the mammal sample is $816. The data for threatened species are for 1996. The data for the other variables are the 1990-1996 averages.

Table 2
Determinants of % of Bird Species Under Threat

Variable	Coefficients	
	Model 1	Model 2
Constant	0.029	-0.022
	(4.81)	(-1.36)
INCOME	$0.172*10^{-4}$	$0.164*10^{-4}$
	(2.31)	(2.50)
$INCOME^2$	$-0.175*10^{-8}$	$-0.163*10^{-8}$
	(-2.33)	(-2.61)
$INCOME^3$	$0.437*10^{-13}$	$0.400*10^{-13}$
	(2.24)	(2.56)
ISLAND	--	0.055
		(2.52)
POPDENS	--	0.00015
		(2.47)
LITER	--	.0000144
		(0.83)
POLCIV	--	0.0026
		(2.08)
Sample Size	117	115
R-squared	0.07	0.36
F-statistic	2.67	8.66
Income at Peak	$6,509	$6,643
Income at Trough	$20,147	$20,629

t-statistics are in parentheses. Estimates are corrected for heteroskedasticity.

Table 3
Determinants of % of Mammal Species Under Threat

Variable	Coefficients	
	Model 1	Model 2
Constant	0.113 (9.52)	0.260 (0.91)
INCOME	$0.48*10^{-5}$ (0.68)	$0.827*10^{-5}$ (1.10)
$INCOME^2$	$-0.62*10^{-9}$ (-0.89)	$-0.894*10^{-9}$ (-1.24)
$INCOME^3$	$0.173*10^{-13}$ (0.93)	$0.236*10^{-13}$ (1.31)
ISLAND	--	0.074 (2.69)
POPDENS	--	0.0000974 (2.46)
LITER	--	0.000032 (1.15)
POLCIV	--	0.0048 (2.54)
Sample Size	117	115
R-squared	0.01	0.22
F-statistic	0.20	4.20
Income at Peak	$4,866	$6,101
Income at Trough	$19,063	$19,166

t-statistics are in parentheses. Estimates are corrected for heteroskedasticity.

Table 4
Determinants of % of Threatened Birds and Mammal Species:
Effects for Low and High Income Countries

Variable	Coefficients	
	Birds	Mammals
Constant	-0.012	0.031
	(-0.68)	(1.01)
INCOME	$0.16*10^{-4}$	$0.838*10^{-5}$
	(1.67)	(0.85)
$INCOME^2$	$-0.152*10^{-8}$	$-0.859*10^{-9}$
	(-1.74)	(-0.93)
$INCOME^3$	$0.369*10^{-13}$	$0.225*10^{-13}$
	(1.73)	(0.98)
ISLAND (low income)	0.051	0.19
	(2.09)	(6.12)
ISLAND (high income)	0.056	.012
	(1.93)	(.49)
POPDENS (low income)	0.000134	0.00012
	(5.08)	(2.38)
POPDENS (high income)	0.000159	.0000239
	(1.36)	(0.40)
LITER (low income)	0.0000217	-0.000017
	(1.42)	(-0.61)
LITER (high income)	-0.00000235	0.000046
	(-0.1)	(1.36)
POLCIV (low income)	0.00132	0.0058
	(0.97)	(2.35)
POLCIV (high income)	0.0032	0.0042
	(1.89)	(1.99)
Sample Size	115	115
R-squared	0.37	0.39
F-statistic	5.42	6.11

t-statistics are in parentheses. Estimates are corrected for heteroskedasticity.

Appendix Table 1 Countries Included in Sample			
Low Income		High Income	
Angola	Malawi	Algeria	Malaysia
Bangladesh	Mali	Argentina	Mauritius
Benin	Mauritania	Australia	Mexico
Bhutan	Morocco	Austria	Namibia
Burkina Faso	Mozambique	Belgium	Netherlands
Burundi	Nepal	Botswana	New Zealand
Cameroon	Nicaragua	Brazil	Norway
Central African Rep.	Niger	Bulgaria	Oman
Chad	Nigeria	Canada	Panama
China PR	Pakistan	Chile	Paraguay
Congo	Papua New Guinea	Colombia	Peru
Cote D'Ivoire	Philippines	Costa Rica	Poland
Ecuador	Rwanda	Denmark	Portugal
Egypt	Senegal	El Salvador	Romania
Equatorial Guinea	Sierra Leone	Fiji	Saudi Arabia
Ethiopia	Somalia	Finland	Singapore
Gambia	Sri Lanka	France	South Africa
Guatemala	Sudan	Gabon	Spain
Guinea	Suriname	Greece	Sweden
Guinea-Bissau	Swaziland	Hungary	Switzerland
Guyana	Syria	Iceland	Thailand
Hispaniola	Tanzania	Iran	Trinidad
Honduras	Togo	Ireland	Tunisia
India	Uganda	Israel	Turkey
Indonesia	Vietnam	Italy	United Arab Emirates
Kenya	Zaire	Jamaica	United Kingdom
Laos	Zambia	Japan	Uruguay
Lesotho	Zimbabwe	Korea Republic	United States
		Kuwait	Venezuela
		Lebanon	

Figure 1

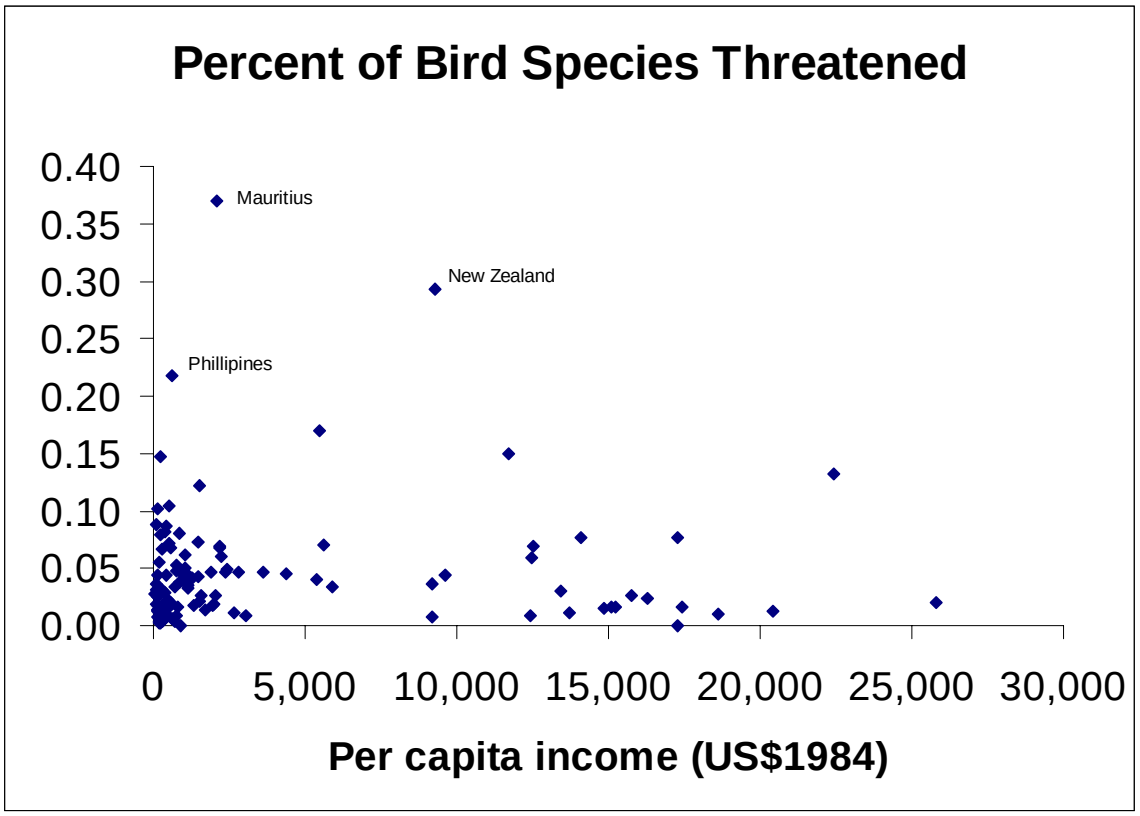
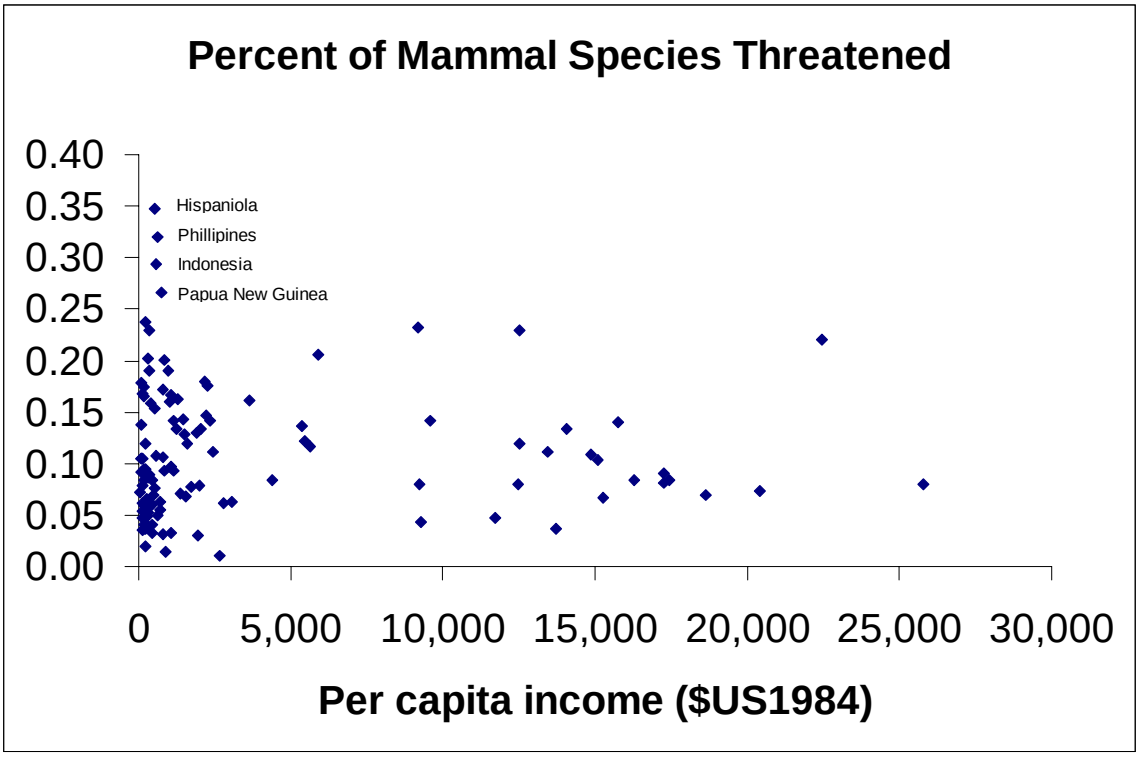

Percent of Bird Species Threatened
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Mauritius
New Zealand
Phillipines
0
5,000
10,000
15,000
20,000
25,000
30,000
Per capita income (US$1984)

Figure 2


Percent of Mammal Species Threatened
0.40
0.35
0.30
0.25
0.20
0.15
0.10
0.05
0.00
Hispaniola
Phillipines
Indonesia
Papua New Guinea
0
5,000
10,000
15,000
20,000
25,000
30,000
Per capita income ($US1984)

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Endnotes

[1] Simon Kuznets did not himself work in this area. The EKC relationship invokes his name because Kuznets [18] found a similar shape for the relationship between income inequality and per capita income.

[2] Except where noted otherwise, researchers have used PPP-adjusted income figures (in 1985 international dollars) from Summers and Heston [30].

[3] Commonly, earlier literature has used the Summers and Heston [30] income figures. Unfortunately, the Penn World Tables Mark 5.7 figures have not yet been released, and the current version does not extend to 1996.

[4] Previous EKC studies used fixed or random effects models. This method cannot be used here because the data are only available for 1996 when all bird and mammal species were first comprehensively assessed.

[5] Since the percent of species under threat may be affected by the values of these variables over time, we use the average value of these variables (INCOME, POPDENS, LITER, and POLCIV) over the 1990-1996 period.

[6] The χ^2-statistics are 40.32 and 56.38 for birds and mammals respectively.

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Structural Adjustment and Small Enterprises: The Case of Zimbabwe

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1.0 INTRODUCTION

Micro and small enterprises (MSEs)[2] are an inescapable feature of the economic and social landscape of most developing economies. Typically, developing countries have a large number of MSEs, and these employ a substantial proportion of a country's working age population. Recent nationwide surveys in several African countries show that between 16% and 33%[3] of each country's working age populations work in MSEs. Furthermore, a substantial amount of income is typically generated by these activities, both at the household and at the national level. In a recent study of Kenyan MSEs, Daniels (1999) estimated that the MSE sector contributes 13% to national income.

Among scholars, policy-makers and donor agencies there has been an increasing awareness of the importance of the MSE sector in the development process. Indeed, many governments in Africa have explicitly included MSE programs as part of their national economic plans. However, while much is known about the nature and magnitude of the MSE sector in many African countries, much less is known about how these sectors evolve over time. A particular problem involves the relationship between the MSE sector and structural adjustment. In recent years, many developing countries have been compelled by external and internal imbalances to radically alter their macroeconomic policies. How does the implementation of these policies affect the MSE sector? How does the influx of workers into the MSE sector resulting from retrenchments of civil servants and employees of state-owned enterprises change the face of the sector? To what extent do the changes in macroeconomic variables affect MSEs? Many such questions, although important, have not been studied or answered.

Beginning in about 1991, the government of Zimbabwe began a structural adjustment program. In that same year, a nation-wide survey of MSEs was conducted in Zimbabwe. Repeat surveys using the same methodology and sample areas were repeated in 1993 and 1998. In principle, these surveys present a unique opportunity to learn about the relationship between the structural adjustment process and the MSE sector. However, it should be noted from the start that it will not be possible to fully understand the effects of structural adjustment on the MSE sector, since other events occurred both within and without Zimbabwe over the same period, including the drought of 1991-92 and the ongoing AIDS pandemic.[4] These and other events make it difficult to parse out the relationship between structural adjustment and the MSE sector. Nevertheless, some lessons can be learned from a close examination of the data.

2.0 ECONOMIC REFORM IN ZIMBABWE

After independence in 1980, Zimbabwe's socialist government set out an ambitious plan to remedy the extreme income inequality and poverty that had resulted from earlier pre-independence policies. At first, these efforts met with some success. Minimum wages were introduced, free primary education was made universally available, and secondary education was subsidized to a great extent by the government. Free health care for the very poor was also introduced in the early 1980s (Stoneman, 1989).

[1] The author gratefully acknowledges the helpful comments from participants at the 1999 meetings of the Eastern Economic Association. The comments from an anonymous referee of this journal were likewise most useful.

[2] For purposes of this paper, MSEs are defined as income generating manufacturing, commercial or service activities that market at least half of their production, and that employ 50 or fewer workers.

[3] See, for example, Daniels (1999) for a discussion of the Kenyan case, Liedholm and Mead (1993) for information on Lesotho and Swaziland, and McPherson (1998) for the case of Zimbabwe.

[4] It can be surmised that many of the changes in the MSE sector between 1991 and 1993 were drought-related. By focusing on the 1993-98 period, however, we should be able to glean some information about the effects of structural adjustment on MSEs.

As a result, over the 1980s primary school enrollment reached nearly 100%, infant and child mortality rates were halved, and almost every child received immunization (Marquette, 1997). Of course, these poverty reduction programs were expensive, and were mostly financed by government borrowing. Despite substantial loans from the World Bank, budget deficits rose in the 1980s (see Table 1). Not surprisingly, this situation created tremendous inflationary pressures.

In addition to fiscal imbalances, Zimbabwe's had other macroeconomic problems during the 1980s. Protection of domestic industries, begun before independence, continued in the post-independence period. Zimbabwe's exchange rate was overvalued, resulting in a shortage of foreign exchange. Furthermore, the economy was tightly regulated in a number of ways, including domestic price controls, minimum wages, and laws that made it nearly impossible to fire a worker (Marquette, 1997).

Because of these mounting economic difficulties, the government of Zimbabwe eventually accepted the recommendations of the World Bank, embarking on the Economic and Structural Adjustment Program.[5] Beginning in 1991, ESAP included several important reforms. First, agricultural pricing and marketing were liberalized. Second, price controls were phased out and statutory wage regulations were largely abolished (Gibbon, 1995). In addition, labor regulations were simplified, and the government began to intervene less frequently in the hiring and firing of workers (Kapoor et al., 1997). Third, efforts were made to cut public expenditure, through retrenchments of government workers, through cost-recovery systems, and through a reduction of subsidies to state-owned enterprises (Gibbon, 1995). Fourth, Zimbabwe successfully lowered her marginal tax rate from over 60% to under 40% (Kapoor et al., 1997). Despite some successes in fiscal reform, Zimbabwe has yet to approach the stated goal of reducing the share of the budget deficit in GDP to 5% (Government of Zimbabwe, 1996). Nonetheless, inflation was reduced to under 20% per annum by 1997 before rising again in 1998. Fifth, international trade and exchange rates were liberalized. A final piece of ESAP was the Social Dimensions of Adjustment Programme, which was designed to minimize the impact of ESAP on the poorest groups (Government of Zimbabwe, 1996). This program was of dubious effectiveness, especially prior to 1995 (Marquette, 1997).

While some progress was made in economic reform, especially in areas of deregulation, the reform process was never completed. In any case, although in the longer term ESAP may bring prosperity to most Zimbabweans, in the 1990s it contributed to substantial difficulties for Zimbabwe's poor. According to the 1995 Poverty Assessment Survey, real wages declined by 36% from 1990 to 1995, and poverty levels have increased. Events in Zimbabwe in the late 1990s demonstrated that the patience of Zimbabweans with ESAP had run thin. Indeed, the violent riots that occurred in the latter part of 1997 and again in early 1998 were largely protests against higher taxes and the increases in the prices of staple commodities.

As mentioned earlier, a complication that must be faced in examining the effects of structural adjustment on the MSE sector involves exogenous factors. One of the most important is the severe drought of 1992. Coming at the same time as the new ESAP reforms, the drought caused a severe contraction in Zimbabwe's economy: real GDP fell by 5.3%, although some observers were reportedly felt the true figure was substantially higher (Gibbon, 1995). Government revenues were substantially smaller, while expenditures (largely related to drought relief) rose. As a result, the annual inflation rate peaked at over 40% in 1992. Similarly, the AIDS pandemic also likely has led to lower GDP and higher government expenditures.

3.0 POSSIBLE EFFECTS OF ESAP ON ZIMBABWE'S MSE SECTOR

The MSE sector in any country is tremendously heterogeneous. There are many different types of MSEs, and many different sorts of people who are involved in these businesses in numerous distinct ways. MSEs are started and operated for a multitude of reasons, with some proprietors simply attempting to eke

[5] Technically, a program called ZIMPREST succeeded ESAP. Officially launched in 1996 but never completely implemented, ZIMPREST continued the reforms begun under ESAP. For clarity, ESAP is used to represent both programs.

out a subsistence, and others trying to escape poverty and "graduate" into the formal sector. There are in addition many more motivations for involvement in the sector.

Because of this heterogeneity, sorting out the effects of Zimbabwe's ESAP on the MSE sector is not a simple exercise. In this section, we suggest several ways in which the structural change of the 1990s might have affected the shape and size of the MSE sector. This will lead to several hypotheses that we can examine using data from the MSE surveys.

By most accounts, ESAP resulted in lower real incomes. Given the generally slow (and occasionally negative) growth in real GDP over the period and continued high rates of population growth (roughly 2.5% per year), real per capita most likely fell over this period. Even if there were slight gains in per capita incomes it seems likely that these accrued mainly to the wealthier end of the income distribution. As noted above, the 1995 Poverty Assessment Study Survey reports that real wages and the incidence of poverty increased over the ESAP period. Still, the effects of decreased consumer income on the MSE sector are not completely clear. If the products of the MSE sector are normal goods, then the lower purchasing power of consumers might be expected to translate into a decreased demand for such products. It may be the case, however, that many sorts of products produced by the MSE sector are inferior goods. That is, as purchasing power declines, demand for these products actually increases, as consumers substitute away from higher priced goods produced by the formal sector or by other countries and towards MSE-produced goods. For example, as real incomes fall, Zimbabweans might be expected to buy more second-hand or MSE-produced clothing rather than that sold by the formal sector.

The liberalization of Zimbabwe's international trade regime is quite likely to have affected her MSE sector as well, although the overall effects are ambiguous. A reduction in trade barriers likely led to lower import prices and a greater availability of imports. This could have hurt MSEs in import-competing sectors, but could have been helpful to MSEs that use imported inputs. Mumbengegwi (1993) suggests that since "informal sector" MSEs generally produce simple consumer goods for the domestic market, these are much less likely to be hurt by import competition than are larger "formal sector" MSEs. On the other hand, the liberalization of the exchange rate led to a substantial weakening of the Zimbabwe dollar. One effect of a weaker domestic currency is that imported goods will become relatively pricier, and as a result one might expect a substitution toward MSE-produced goods. However, this is true only for products that are substitutes for imports: where imports (especially inputs) are complementary to the production processes of MSE products, the weaker Zimbabwe dollar will not be welcome news. Again, the overall effect is not clear *a priori*.

In addition, ESAP was a time of fiscal austerity, as discussed in the previous section. One way that Zimbabwe's MSE sector was likely affected relates to retrenchments, both of civil servants and of workers in formerly state-owned enterprises or elsewhere in the economy. While the initial target of reducing the size of the civil service by 25% was not met by 1995, progress was made. Indeed, some 25,000 Zimbabweans had been retrenched by mid-1993 (Brand, et al., 1995). Furthermore, the target of reducing the civil service wage bill from 17% to 13% of GDP by 1995 was met (Government of Zimbabwe, 1996). In addition, prior to the ESAP years some new entrants into the labor market were absorbed each year into the public sector. In short, the supply of labor to the MSE sector surely increased during the implementation of ESAP, due to both factors. We should therefore expect an increase in total employment in MSEs, resulting either from increases in the number of MSEs or in the average size of MSEs, or both. Retrenchments may have had another effect on the shape of the MSE sector as well, given that the majority of those retrenched were male. Women have traditionally dominated Zimbabwe's MSEs. As ESAP was implemented, some men may have started MSEs, perhaps competing with female entrepreneurs. Other men may have joined existing MSEs owned by women, so that the proportion of female-owned MSEs could be expected to decline over time. Overall, it seems likely that the role of women in the sector has declined in the 1990s.

The liberalization in agriculture described above might also reasonably be expected to have affected the MSE sector. For example, if the returns to farming rose as a result of structural adjustment, then some Zimbabweans who were engaged in MSE activity might have switched to agriculture, either as farmers or as laborers, resulting in a decrease in the size of the rural MSE labor force. In addition, any increase in the returns to farming could have led to an increased demand for rural MSE products. However, many rural Zimbabweans depend heavily on remittances from family members in urban areas.

Such remittances are likely to have fallen over the 1990s, given the lower real incomes discussed above and the retrenchment exercises. Should this be the case, demand in rural areas for MSE products may have decreased even more than demand in urban areas. Given these competing effects it is not possible to know *a priori* how changes in agriculture might have affected MSEs.

In summary, there are a number of issues that can be examined using the survey data from 1993 and 1998. First, how did the lower purchasing power of consumers affect the number and types of MSEs? Second, how did the MSE sector change in response to lower import barriers and a weaker Zimbabwe dollar? Finally, how did the MSE sector adapt to the retrenchment exercise under ESAP? As noted above, the data will not allow conclusive statements to be made regarding these issues, but the survey results are suggestive nonetheless.

4.0 SURVEY METHODS AND SAMPLE SIZE

The data analyzed in the following section were generated by three countrywide surveys of micro and small enterprises. Each employed the same sampling method, permitting a comparison of results across time. Specifically, these surveys used a stratified cluster sampling approach. In preparation for the 1991 survey, the country was divided into several strata. These included urban high density, low density, industrial and commercial areas, small towns, and rural areas. In addition, smaller towns designated by the government as growth points[6] were included as a separate stratum. Once these seven strata were designated, a number of small enumeration areas within each (the enumeration areas used by the national census were adopted) were randomly selected. Trained enumerators visited every household and business within each selected area to ascertain whether a business was in operation. This method allows for an extrapolation of results to the national level. The 1993 and 1998 surveys applied the same methods and visited most of the same enumeration areas as in 1991.[7] It should be noted, however, that due to resource constraints no effort was made to track individual MSEs over time. Detailed descriptions of the surveys' methods can be found in McPherson (1991), Daniels (1994), and McPherson (1998).

The 1998 survey visited 19,933 households or shop sites. At these sites data on 7,369 existing MSEs were collected. In 1993, the survey visited a total of 11,762 households and shops, collecting information on 5,356 existing enterprises. 14,035 sites were visited during the 1991 survey. 5,575 primary MSEs were identified and enumerated, and limited information was collected on an additional 1,194 secondary enterprises.

5.0 CHANGES IN THE MSE SECTOR, 1991 – 1998

5.1 Magnitude

A comparison of the surveys indicates that Zimbabwe's MSE sector underwent dramatic change in the 1990s. As one can see from Table 2, the estimated total number of such MSEs in 1991 was nearly 868,000. By 1993, this figure had jumped by 8.5% to approximately 942,000. Although structural reforms may have had something to do with this jump, more likely this was the result of the 1992 drought, which surely forced many small-scale farmers to enter the MSE sector. Indeed, most of the additional MSEs were in rural areas. From 1993 to 1998, the total number of MSEs fell by 8.7%. It is also interesting to note that this shrinkage in the number of MSEs was entirely a rural phenomenon: over the 1993-98 period the numbers of urban MSEs **rose** dramatically.

These changes led to a remarkable alteration in the distributional structure of MSEs: whereas 29.3% of all MSEs were located in urban areas in 1991, fully 38.5% of MSEs were so located by 1998. This change is likely the result of the fact that urban populations were growing considerably more rapidly than rural populations (by some accounts twice as fast). Furthermore, traditionally many businesses are

[6] Such towns were given special consideration with respect to infrastructure, and various incentives (especially tax breaks) were given to businesses locating there.

[7] The 1991 survey visited MSEs in 58 enumeration areas. For reasons of resource constraints, the 1993 and 1998 surveys returned to 40 of these.

begun and supported with remittances from family members working in the urban areas.[8] As noted previously, it seems likely that these remittances shrank in the 1990s. A final possible explanation for the declines in rural MSEs involves liberalization in agriculture. The number of rural MSEs may have decreased since the ESAP may have led to increased returns to farming.

5.2 Employment

Further information can be gained by an examination of changes in employment in the MSE sector. Table 3 shows that employment in this sector grew between 1991 and 1998. Nevertheless, it is also instructive to examine where this employment growth occurred. Despite shrinking 2.0% from 1991 to 1993, urban MSE employment rose nearly 52% from 1991 to 1998. After growing markedly prior to 1993, rural MSE employment shrank thereafter. Over the entire period, rural MSE employment increased by 9.0%. Given that the numbers of MSEs grew at a slower rate than employment both in rural and urban areas, it must be the case that average firm sizes rose. Indeed, the average MSE increased in size[9] from 1.56 workers in 1991 to 1.91 in 1998. This means that MSEs in 1998 were on average some 22% larger than in 1991.

The finding that MSE employment expanded more rapidly than the total number of MSEs also leads to another observation: the size distribution of MSEs changed considerably between 1993 and 1998 (see McPherson, 1998 for details). The share of one-person operations in total MSEs fell from 78% in 1993 to 58% in 1998. The share of firms with 2 to 4 employees more than doubled over the same period, as did the 5 to 9 worker size category. This is significant: Liedholm and Mead (1987) present evidence that MSEs enjoy a dramatic increase in efficiency and productivity when they expand beyond the 1-person level.

The finding that MSE employment rose from 1991 to 1993 suggests that the drought forced many Zimbabweans who had been employed in the agricultural sector to start MSEs as a means of subsistence, especially in rural areas. Daniels (1994) and Liedholm and Mead (1998) suggest that this sort of expansion of the MSE sector is not likely to be a positive sign, since the additional workers are unlikely to be especially productive, as they are forced into the sector by desperation. Effectively, the MSE sector acts as a sponge in such times as the 1991-93 period, absorbing the unemployed or underemployed.

The growth in employment after 1993 is more likely to be the result of the changes that came about as part of the ESAP. Over the 1993-98 period, rural MSE employment shrank. This may be the result of MSE employees returning to agricultural work, given that returns to agriculture may have been higher (due to ESAP, but also due to the better climatological conditions). The rural shrinkage may have also been partly due to the continued rapid rural-to-urban migration. Over the same period, urban MSE employment increased by nearly 55%. Once again, there may be several factors at play here. For example, some of this expansion may have been demand driven, resulting perhaps from the substitution of urban-dwellers towards MSE-produced products, or because imported goods might have become more expensive. Such demand-driven growth might have made MSEs more profitable, encouraging expansion of existing MSEs, as well as new entries. Liedholm and Mead (1998) might deem this sort of growth to be a positive sign. However, some of the employment expansion may have been the indirect result of the retrenchment of civil servants and employees of state-owned enterprises. Retrenched workers may have begun new MSEs, or have joined existing MSEs. The relative productivity of such new workers and firms is unclear.

5.3 Sectoral Distribution

The 1990s were also years of great change in the types of MSEs existing in Zimbabwe. Manufacturing firms became substantially less important. Table 4 shows that in 1991, 71.6% of all MSEs were involved in some sort of manufacturing work. By 1993, this figure had dropped to 65.0% and by early 1998 only 42.4% of MSEs were in manufacturing lines. Table 4 also includes information on the average annual change in the numbers of MSEs within each sector. Since 1991, only the chemicals and

[8] These remittances may have been substantial: respondents in the 1996 AIMS survey remitted more than Z$6,000 annually to family members, although that survey did not establish what percentage of the funds were used for business purposes.

[9] The average number of workers per firm includes any working proprietors.

plastics, fabricated metal, and other manufacturing subsectors increased in size, although each of these represented a small absolute number of enterprises. Most of the decrease in the share of manufacturing was due to the shrinkage in numbers of firms in the wood and wood products, food and beverage processing, and textile manufacturing subsectors. Given the large number of firms involved in textiles, it is this subsector that saw the greatest loss in numbers of MSEs. As noted in Section Three, this phenomenon perhaps may have been due to the increased degree of import competition (especially from imported second-hand clothing) resulting from Zimbabwe's trade liberalization. If this is the cause, it suggests that the increase in import competition outweighed any substitution towards MSE-produced manufactures that might have resulted from the weaker Zimbabwe dollar, at least in the textiles subsector.

While manufacturing's share was falling, trade-related activities were exploding in importance. From 1991 to 1998, the proportion of MSEs engaged in trade more than doubled, reaching 45.2%. This translates into an average annual growth rate in the number of trade-related MSEs of nearly 12.0%. The majority of this change was at the small-scale vending level. This upswing in trade may have been the result of one or more of the changes caused by structural adjustment. First, the fall in real incomes may have led many Zimbabweans to substitute towards products sold by MSEs and away from products sold by larger domestic industries or imports. Second, the greater availability of imports due to trade liberalization may have lowered costs of retailers selling imported products (e.g., second-hand clothing). In addition, the retrenchments in the formal sector may have led to an increase in the employment in and the number of MSEs as the retrenched seek to join existing MSEs or start new ones. Services also increased in importance, although by 1998 that share was still below 5%.

5.4 The Role of Women

Part of the dramatic change in Zimbabwe's MSE sector in the 1990s involved the gender of MSE proprietors. As Table 5 makes clear, the total number of women-owned businesses fell 3.8% per year between 1991 and 1998. While one or more women owned 58.1% of enterprises in 1998, women owned nearly 75% of MSEs in 1991. There was also a massive shift by female proprietors out of manufacturing-related operations and into trading, and to a lesser extent, service-oriented firms. Over the 1991 to 1998 period, there were 15.2% fewer female-owned manufacturing enterprises, while the number of female-owned MSEs in the trade sector increased by 9.7%. The shift of women-owned enterprises into the trade sector and away from the manufacturing sector is also evident in Table 6. While 78.1% of female owned firms were involved in manufacturing in 1991, only 47% of women-run firms were similarly occupied in 1998. Indeed, by 1998, more female run enterprises were involved in trade than were in manufacturing. This is in marked contrast to the situation in 1991.

While the survey does not provide definitive explanations of the decreased role of female proprietorship in Zimbabwe, several possibilities suggest themselves. First, the retrenchment that occurred as a result of structural adjustment mainly involved men. This affected female-owned MSEs in at least two ways. Some retrenched men surely started MSEs, and these may have driven out some female-owned businesses. In addition, some retrenched men may have joined existing enterprises owned by their wives. These reconstituted businesses would no longer be counted as female-owned in the surveys. Second, if the changing economic environment led to greater competition in the MSE sector, female proprietors may have been less well equipped to handle the changes given their relative lack of access to business training and credit. Third, much of the decrease in the proportion of female-owned business was due to the rapid decline in textile and wearing apparel manufacturing, a sector traditionally dominated by women. Finally, given women's traditional roles as caregivers, it is possible that the AIDS pandemic was responsible for some of the observed changes in the MSE sector during the 1990s.

6.0 CONCLUSIONS

Zimbabwe changed rather dramatically during the 1990s. Part of the changes that took place was the result of the ESAP. Other changes can be attributed to any number of other events, including the 1992

drought and the AIDS pandemic. As a result, reasonable people could reasonably quarrel with any effort to link changes in the MSE sector with ESAP. Nevertheless, some cautious statements can be made.

Once we account for the drought in 1992, the number of Zimbabwean MSEs did not really change over the 1991 to 1998 period. However, there was a dramatic increase in the number of urban MSEs, and a substantial reduction in the number of rural ones. Aggregate employment in the MSE sector increased over the ESAP period, disproportionately in urban MSEs. Evidently, some event or combination of events in the 1990s caused Zimbabwe's MSEs to become larger and more urban. Could it be, at least in part, that ESAP was responsible? Perhaps, for example, the decline in real incomes of potential MSE customers resulting from ESAP led to an increased demand for MSE-produced products as consumers substituted away from higher-priced formal sector goods. It could also be that the depreciation of the Zimbabwe dollar made consumers substitute MSE-produced products for now-pricier imports. Retrenched workers may have started new MSEs in urban areas or joined existing ones. In addition, urban-to-rural remittances from former government employees may have fallen, causing rural MSEs to fold.

The 1990s also witnessed dramatic change in the types of MSEs operating in Zimbabwe. The decline in relative importance of manufacturing partly may have been the result of greater availability of imports due to trade liberalization (the weaker Zimbabwe dollar notwithstanding). Similarly, the tremendous jump in MSEs engaged in commerce (especially vending) may have be the result of better access to imported inputs (as in the case of second-hand clothing). It could also be the case that retrenched workers turn to vending, given that the skill requirements may be relatively lower.

The 1990s also saw changes in the role of women in the MSE sector. Once nearly three-quarters of all Zimbabwean MSEs were female-owned; by 1998 this proportion was just above half. Conceivably some sort of change in the traditional role of women could explain this, and the AIDS pandemic has surely played some role. However, it seems quite plausible that these changes are related directly and indirectly to ESAP. Greater competition from retrenched workers (who are mostly male) may have caused some female-run businesses to fold. Other MSEs once controlled by women may have had a retrenched husband join.

These findings, though far from conclusive, are certainly suggestive. Much work remains to be done in this area. For example, a deeper understanding of how profits and sales may have changed over the ESAP period could provide additional evidence regarding some of the hypotheses presented in this paper. Some estimates of how sensitive particular MSE sectors are to changes in incomes and prices would also be invaluable.

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Table 1
Selected Macroeconomic Indicators for Zimbabwe, 1981-1998

	GDP growth (annual %)	Gov't Deficit (% of GDP)	Exchange rate (Z$/US$)	Inflation (annual change in CPI)	Real interest rate[1]
1981	13.9	5.9	0.7	13.2	-5.7
1982	2.8	10.5	0.8	10.6	3.9
1983	1.6	6.3	1.0	23.1	-10.3
1984	-1.7	10.1	1.3	20.2	-9.9
1985	8.2	7.3	1.6	8.3	1.7
1986	1.6	8.1	1.7	14.5	-4.2
1987	-1.6	10.5	1.7	12.5	-2.9
1988	9.7	9.2	1.8	7.4	2.3
1989	6.3	8.0	2.1	12.9	-4.0
1990	1.9	6.7	2.5	17.4	-8.6
1991	2.4	7.1	3.4	23.3	-9.2
1992	-5.3	11.3	5.1	42.1	-13.5
1993	4.6	9.1	6.5	27.6	1.8
1994	4.4	6.9	8.2	22.2	4.5
1995	-1.8	10.1	8.7	22.6	3.3
1996	8.1	6.8	9.9	21.4	0.2
1997	3.7	NA	11.9	18.8	-0.2
1998	NA	NA	20.8	28.5	-0.5

Sources: The IMF's International Financial Statistics and the Reserve Bank of Zimbabwe's Quarterly Economic and Statistical Review.
1 The real interest rate is the difference between the deposit interest rate and the rate of consumer price inflation
2 Estimate from Kapoor, et al. (1997)

Table 2
Number of MSEs in Zimbabwe: 1991-1998

Stratum	Number of MSEs in Zimbabwe			Percentage Change in MSEs, 1991-93	Percentage Change in MSEs, 1993-98	Percentage Change in MSEs, 1991-98
	1991	1993	1998			
Urban	254,667	255,541	331,251	0.3%	29.6%	30.1%
Rural	613,117	686,403	529,078	12.0%	-22.9%	-13.7%
Total	**867,784**	**941,944**	**860,329**	**8.5%**	**-8.7%**	**-0.9%**

Source: McPherson (1998)

Table 3
Number of Persons Employed in MSEs, 1991-1998

Stratum	Number of Persons Employed in MSEs in Zimbabwe			Percentage Change in Employment, 1991-93	Percentage Change in Employment, 1993-98	Percentage Change in Employment, 1991-98
	1991	1993	1998			
Urban	408,319	400,210	620,036	-2.0%	54.9%	51.9%
Rural	942,589	1,146,728	1,027,628	21.7%	-10.4%	9.0%
Total	**1,350,908**	**1,546,938**	**1,647,664**	**14.5%**	**6.5%**	**22.0%**

Source: McPherson (1998)

Table 4
Changes in the Sectoral Distribution of MSEs, 1991-1998

Sector	Sectoral Distribution of MSEs			Annual Growth Rates of MSEs, 1991-93	Annual Growth Rates of MSEs, 1993-98	Annual Growth Rates of MSEs, 1991-98
	1991	1993	1998			
Manufacturing, Total	71.6	65.0	42.4	-0.7	-12.0	-8.4
Food and Beverage	7.5	4.9	5.3	-17.2	-0.3	-5.6
Textiles	34.3	32.8	20.1	1.9	-13.4	-8.6
Wood and Wood Products	21.1	18.1	9.4	-3.6	-17.2	-12.9
Chemicals and Plastics	0.2	0.2	0.4	4.1	13.9	10.8
Non-Metallic Mineral Processing	3.9	4.1	1.3	6.6	-28.6	-17.5
Fabricated Metal	2.3	2.9	2.6	15.7	-4.6	1.7
Other Manufacturing	2.4	1.9	3.3	-7.6	11.4	4.9
Construction	4.3	3.1	1.0	-12.3	-28.2	-23.2
Trade, Total	21.1	28.2	45.2	18.6	8.8	11.9
Retail Trade	20.4	27.5	44.6	19.0	9.1	12.2
Restaurants, Hotels, Bars	0.6	0.7	0.6	11.8	-5.7	-0.1
Transport	0.1	0.2	0.6	38.7	23.3	28.2
Renting Rooms and Flats	*	*	6.8	**	**	**
Services	2.9	3.5	4.0	13.5	1.0	4.9
All Sectors	**100**	**100**	**100**	**4.1**	**-2.1**	**-0.1**

* less than 0.1% ** not available

Table 5
Percentage of MSEs That Are Female-Owned By Sector and Growth Rates

Sector	Percentage of MSEs That Are Female-Owned			Annual Growth in Number of Female-Owned Firms		
	1991	1993	1998	1991-93	1993-98	1991-98
Manufacturing, Total	80.2	74.2	62.1	-4.6	-15.2	-15.4
Foods and Beverages	98.9	80.2	37.6	-27.7	-22.4	-24.1
Textiles	95.9	90.4	85.9	-1.1	-11.5	-8.2
Wood and Wood Products	75.0	59.4	43.6	-15.2	-25.8	-22.5
Paper, Printing, and Publishing	0.0	29.1	0.0	**	**	**
Chemicals	0.0	86.0	29.8	**	-3.3	**
Non-Metallic minerals	10.4	71.3	27.8	102.9	-46.9	0.4
Fabricated Metal	0.0	5.5	1.3	**	-39.5	**
Other Manufacturing	4.1	29.0	44.3	90.2	21.6	43.3
Construction	9.8	18.2	2.5	18.7	-72.4	-43.6
Trade, Total	69.9	72.1	60.4	20.2	4.8	9.7
Wholesale Trade	0.0	12.4	*	**	**	**
Retail Trade	69.4	72.2	60.9	21.0	5.3	10.3
Hotels, Restaurants, Bars	91.8	70.6	20.5	-1.3	-36.0	-25.1
Transport	0.0	3.8	16.7	**	51.7	**
Renting Rooms or Flats	100.0	67.0	26.7	**	**	**
Services	24.1	43.8	46.5	43.4	2.1	15.1
Total, All MSEs	**73.3**	**70.7**	**58.1**	**2.3**	**-6.6**	**-3.8**

* less than 0.1% ** not available

Table 6
Distribution of Female-Owned MSEs

Sector	Distribution of Female-Owned MSEs		
	1991	1993	1998
Manufacturing, Total	78.1	68.5	47.0
Foods and Beverages	7.8	5.6	2.8
Textiles	46.9	42.2	33.9
Wood and Wood Products	19.5	15.3	6.6
Paper, Printing, and Publishing	0.0	*	0.0
Chemicals	0.0	0.3	0.3
Non-Metallic minerals	2.8	4.1	0.7
Fabricated Metal	0.0	0.2	0.1
Other Manufacturing	0.9	0.7	2.6
Construction	0.7	0.8	*
Trade, Total	19.3	28.6	47.3
Wholesale Trade	0.0	*	*
Retail Trade	19.0	27.9	47.1
Hotels, Restaurants, Bars	0.4	0.7	0.2
Transport	0.0	*	0.1
Renting Rooms or Flats	0.0	*	2.3
Services	1.9	2.1	3.2
Total, All MSEs	**100.0**	**100.0**	**100.0**

* less than 0.1%
** not available