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An Analysis of Panel Data From 1990-1994

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THE DYNAMICS OF MICROENTERPRISES IN JAMAICA: AN ANALYSIS OF PANEL DATA FROM 1990-1994

by

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ABSTRACT

THE DYNAMICS OF MICROENTERPRISES IN JAMAICA:
AN ANALYSIS OF PANEL DATA FROM 1990-1994

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Microenterprise have been the focal point of much research, policy, and donor agency attention in recent years. Indeed, the role and presence of microenterprises in LDC economies is now well documented, if not well understood. This study is the first to delve into the growth and dynamics of microenterprises through an econometric analysis of panel data. The data for this research come from a pioneering, five year data collection effort in the country of Jamaica.

The prevailing theory of firm growth comes from Jovanovic (1982), who's learning theory posits an inverse relationship between firm growth and the firm's size and age. Additional theory and empirical work has identified other firm, proprietor and environmental factors as important as well.

Two data sets on the same panel of firms are used for analysis. The first are five year annual data on firm employment, and the second are two year quarterly data from 1993 and 1994. Both track the same set of firms over the time period. Using ordinary least squares (OLS) Instrumental Variable econometric techniques, firm growth is first modeled as a function of

startup size, firm age, and other firm and proprietor characteristics. A dynamic model is also estimated incorporating lagged employment into the specification. There is an inverse relationship between firm startup size or lagged size and growth, but these data find only a marginal relationship between firm age and growth. Age of the proprietor is inversely related to firm growth, however. The physical location of the firm (commercial building, home, road-side) is related to firm growth, as well as the location of the parish in which the firm operates. The rural or urban location of the firm does not influence growth. Firms headed by female proprietors grow more slowly than those headed by their male counterparts in terms of employment. Technical assistance and access to credit are both only marginally positively related to firm growth.

Finally, several different model specifications were examined. A cross sectional model was estimated, and different definitions of the dependent variable were tested with some strikingly different results across the estimations. Importantly, a panel data model estimated in levels provided the most robust and stable results. Although the cost of collecting panel data may be high, these findings lend support to data collection efforts in other countries paralleling the Jamaican project.

DEDICATION

This dissertation is dedicated to my wife Gail. Her perseverance, encouragement, and faith carried this work to its' conclusion.

ACKNOWLEDGEMENTS

In this chapter of my life, a large cast of characters have played significant roles at various points in time. The names are too numerous to mention, but my debt and appreciation to each is not diminished. This work is perhaps but a footnote in their lives, but in this work their contribution is worked out in each and every line. Specific mention is due, however, to some key participants. Carl Liedholm, my dissertation chair, encouraged tirelessly, persevered in all realms of the dissertation process, and rekindled my vision for this work when the road seemed to close in. John Strauss raised the level of my technical and econometric contributions, and Don Mead provided both encouragement and important insights to improve the quality of the work right to the last revision. This entire committee always believed in me and the work, without which these words would not be written today.

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Also, my family's support, prayers, and encouragement carried me through, and for this I am extremely thankful. My boys Andrew, born in Jamaica, and Will, born in the midst of Chapter III in Illinois, provided a constant reminder to work harder and keep going. I thank my wife Gail, who endured the birth of our first child away from home, other prolonged absences on my part, and many of the other trials and tribulations attributable to graduate school. Special thanks as well goes to my parents, in-laws, and extended family for their continued understanding of my absences at family gatherings.

Finally, I am especially grateful to Ron Mogavero, who believed, encouraged, and bet on the completion of this work before the completion of his hand-crafted boat. He won the bet, but this work is in part a testimony to his friendship and many promptings.

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CHAPTER I

INTRODUCTION

The growth of microenterprises "may offer the greatest potential for reaching the poorest of the poor by creating jobs and for generating the greatest developmental impact by transforming marginal enterprises into sustainable businesses (Boomgard, 1989)". James Boomgard's comment reflects the under-girding motivation behind research targeting microenterprises. Certainly the sector of its own accord – fragmented, unaccounted for in official statistics, categorically unglamorous – doesn't cry for attention or demand an audience. The World Development Report in 1990, however, reports that more than 1 billion people in the developing world are living in poverty. That is, over one billion people are struggling to live on less than $370 per annum. The research agenda, hence, is in response to this overwhelming global need to understand and formulate solutions to an age old problem, which should be just that: an old (*sic*) problem.

Small scale industry has attracted a lot of attention in recent years, as new empirical research has revealed the robustness of the sector even amidst overall economic stagnation. Perhaps, as in 1964 with T.W. Schultz's article on agriculture, a realignment of effort will take place to capture - or set loose - some of this robustness to contribute to economic development and the

structural transformation. In the context of development, the "structural transformation" refers to the transformation of the structure of demand, trade, production and employment, and is generally manifested in three principal areas: industrialization, agricultural transformation, and migration and urbanization (Chenery, 1989). The characteristics of the transformation include increases in rates of accumulation, shifts in sectoral composition, changes in income distribution and the demographic transition. The "core" of the transformation, from Syrquin's (1989) point of view, is manifested in the accumulation of physical and human capital, and the shifts in the composition of demand, production, and employment. The above comments implicitly reflect a dynamic process of change. Thus to assess how specific policies aid or hinder the structural transformation requires a probing look beyond economic growth to the very core of what the transformation is all about.

The research agenda for microenterprise grew out of such a context. As Liedholm and Chuta report (1976), an interest in small scale firms grew out of the disappointing results of the import substitution policies of the 1950's and 1960's. By the mid- to late-1970's, the need for information and insight into the small and microenterprise sector began to be articulated. The interest in small scale firms was not limited to the developing context either. In 1979, Birch's seminal paper was published, in which he stated that "whatever else they are doing large firms are no longer the major providers of

new jobs for Americans." A source for much debate in the ensuing years, his thesis proposed that most new jobs emanated from small firms. Acs and Audretsch (1986) in fact report that in the past 20 years, the majority of new U.S. employment did come from small enterprises. The race to understand the contribution of these small and micro firms was underway.

One of the most significant early and continuing challenges to understanding small scale and microenterprises is the paucity of data available on these firms. As alluded to above, these firms typically slip through the official data collection of governments or private industry tracking performance. As several authors point out, one of the main reasons why micro firms have received so little attention: no data! (McPherson, 1992; Cabral, 1994; Mata, 1994; Reid, 1995) The research that has been done, however, has focused on several very significant issues, of which a few will be briefly reviewed here.

The most debated topic has been the validation of Gibrat's Law (1931), purporting the independence of firm size to growth. Several early investigations found evidence supporting Gibrat's Law (Hymer and Pashighian, 1962; Prais, 1956; Singh and Wittington, 1975; and Wagner, 1992). This included Mansfield's (1962) influential study, with a convincing argument that small firms that are more prone to die could bias results in favor of a negative relationship between firm size and growth. The debate rigorously continued into the late 1980's and early 1990's, however, as new

evidence mounted refuting Gibrat's law (most recently, Evans, 1987; Hall, 1987; Audretsch, 1992; McPherson, 1992; Mata, 1994, Reid, 1995). A multiplicity of theoretical perspectives have been provided to account for this and provide alternatives (see Vining, 1976; Nelson and Winter, 1978; Jovanovic, 1982;).

In the late 1980's, a fresh interest in the factors influencing firm entry, exit or survival of the firm evolved. To explore these factors, hazard or duration analysis was adopted from biostatistics and applied to data in the United States and Europe (see Dunne and Hughes, 1994; Audretsch and Mahmood, 1991; Dunne, Roberts, and Samuelson, 1989;) and to a lesser degree to data from developing countries (Cabal, 1994; McPherson, 1992; Behrman and Deolalikar, 1989). Certainly all the issues surrounding firm survival have yet to be resolved.

Apart from these main avenues of research, several equally important topics have received attention as well. A sampling of these include the question of small firm efficiency, the role of innovation in small firm growth, the entrepreneurial influence of the proprietor, data collection methodologies and definitional issues. However, as McPherson (1992) points out, much of the past work on small- and microenterprises has focused on static concerns and side stepped the very important understanding of the dynamic nature of these firms: how do the survivors grow and change over time?

The need to understand the firm growth of survivors has been clearly articulated by many different authors. In 1956, Prais recognized that a significant amount of effort needed to be put against understanding the role of surviving small scale firms. Aislabie (1992) reported that there are few stylized facts outlining firm growth. Post entry performance, according to Mata (1994) and Reid (1995), have not been studied enough. Brock and Evans (1989) suggested that the most important research for policy direction is against the puzzle of the growth of small scale firms. Liedholm and Mead (1987) identified firm dynamics as one of the main items on the research agenda for small and microenterprises in developing countries.

Some limited research has been done on these issues for survivors with U.S. data (Hall, 1987; Evans, 1987) and European data (Mata, 1994; Wagner, 1994, or Dobson and Gerrard, 1989), for example. In developing countries, some of the more recent work includes McPherson (1992) and Cabral (1994). However, the lack of panel data in developing countries has largely curtailed the ability to address these issues effectively. In order to understand firm dynamics adequately, panel data is required (McPherson, 1992; Evans, 1987), and in the developing world, panel data sets have been almost non-existent (Grootaert and Kanbur, 1995). Consequently, much recent research has unwillingly skirted the issue of thoroughly understanding determinants of growth and profitability for surviving small businesses. What characterizes the growth pattern of these firms? Which factors influence this growth

pattern over time? What are the determinants of the different growth rates among survivors? How does a firm become an incumbent? These issues are especially salient given the additional obstacles to growth faced by micro firms (Bregman, et al, 1995). Answers to questions such as these have direct policy implications, and as Audretsch and Acs (1994) suggest, the most important research to be conducted at this time relates to what happens to firms after startup.

The purpose of this dissertation is to extend the learning on firm dynamics. To accomplish this, simple measures of firm performance were collected annually on a panel of microenterprises in Jamaica over a five year period. In the final two years of enumeration, the firms were visited quarterly,[1] tracking firm employment, demographic and locational factors, and some limited flow information on firm sales or output. This represents the first extensive panel data on microenterprise covering retail sales, output, and employment, for Jamaica and the developing world.[2] As such, this research offers a more comprehensive picture of firm dynamics than previously available. This dissertation will focus on the employment dimension of firm growth. Further, Instrumental Variable and fixed effect econometric techniques are used for the first time to unpack the growth dynamic issues in a developing country. Finally, short and long run data are

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[1] A fairly complex issue relates to the definition of formal versus informal enterprise. For the purpose of this research, firm size is the only qualifying element. Any firm between 1 – 10 persons are included.

[2] Mata (1995) analyszed a panel dataset on firm growth in Portugal.

available on the same subset of firms, providing policy makers and other researchers an important window into the connection between the two.

This dissertation has two objectives. The first is to understand firm dynamics more completely. Uniquely in this work, this is accomplished through both a five year annual and two year quarterly analysis of microenterprise employment. Some of the questions asked include, what factors and firm characteristics influence a firms short and long run growth? What is the relationship between firm size, age and growth? Do technical assistance or access to credit affect growth? Although these questions have been addressed in previous research for other countries, these data provide a unique vantage point from which to address these issues. Second, how does panel data contribute to this understanding of firm dynamics? Is panel data a necessary element to an accurate characterization of firm growth? As such, these results will be compared to much of the earlier research on firm growth across both the developing and developed world. This final task in itself is identified by Brock and Evans (1989) as one of the key research agendas of the day.

Three different lines of analysis are pursued. In Chapter II, the Jamaican context is described, and a stylized, dynamic descriptive picture of the Jamaican microenterprise is presented. Specifically, the secular trends in employment and wages are examined on a quarterly basis and annual employment is examined over the five-year period. In both contexts, the

unique value of panel data is utilized to write the story. Chapter III examines long run employment growth through a traditional cross sectional OLS analysis. This approach enables direct comparison to past research as well as the ability to understand the stability of the insights over multiple years. Chapter IV extends the analysis of long and short-run employment growth by introducing a panel data model and utilizing different econometric techniques, such as Instrumental Variables, to control for measurement error. Several other potential sources of estimation bias are addressed as well. Conclusions and policy implications follow in Chapter V.

CHAPTER II

MICROENTERPRISES IN JAMAICA: A REVIEW OF RESEARCH AND ISSUES

2.1 Introduction

The data for this dissertation come from a long term study of microenterprise in Jamaica, combining several data collection exercises over a five year period. Specifically, three elements are combined. The first are the results from a national census of microenterprises in 1990 executed by STATIN, the Statistical Institute of Jamaica. This census visited 20% of microenterprises in Jamaica. The second set comes from a 1992 National Survey, again executed by STATIN, interviewing approximately 2,400 firms from the 1990 frame. The third is a Quarterly Panel Survey (QPS), a truly pioneering effort to enumerate a subset of the microenterprises visited in 1992. This panel was conducted in Jamaica from the second quarter of 1993 through the fourth quarter of 1994. Supported by funds from the Government of the Netherlands, USAID, and the Office of the Primer Minister and executed by STATIN (The Statistical Institute of Jamaica), this survey was designed to trace seasonal or quarterly changes in the level and patterns of activity of a panel of existing microenterprises in that country. Because the quarterly data collection effort extended beyond one year, the survey also aimed to provide some perspectives on the longer term growth

patterns of these microenterprises. As all three research projects were connected, the linked data between the years generates key information on a single panel of firms over a full five year period. Separately and combined, this represents a significant analysis opportunity on microenterprise.

This Jamaican QPS of microenterprises was unique and represented a truly pioneering effort. Although enterprise panel surveys have been conducted in Jamaica and elsewhere for many years, they traditionally cover only the larger firms that keep good books and records. Microenterprises have never been included in such surveys. Most of these enterprises have never been included in such surveys. Most of these enterprises do not keep books and information on them is scanty at best, difficult to obtain, and typically paints a partial picture of the firm at one point in time. The Jamaican effort thus represented the first attempt to generate dynamic data on key activity variables - employment, wages, and sales (output) - from the same group of microenterprises repeatedly every quarter. Since the firms chosen for the panel were scientifically drawn from a representative national census, the findings have national significance.

By providing such information, policymakers, donors, and those involved with microenterprises are alerted not only to the importance of these enterprises, but how they are changing. Are existing microenterprises expanding or contracting overall? Are they employing more or less workers in particular quarters? How are trading firms doing relative to those in

manufacturing? Answers to these and other important questions will be pursued in this chapter.

In this chapter, a brief overview of the Jamaican context will be given. Following this, Section 2.3 reviews the data collection methodology. This is followed in section 2.4 and 2.5 with the results from the survey, both for the quarterly and five year time frame. Some concluding remarks will follow.

2.2 The Jamaican Context

2.2.1 Economic and Policy Environment

The island of Jamaica sits just south of Cuba on the western side of the Caribbean. In the late 20th century, the island is known best for its' beautiful beaches, warm Caribbean waters, and natural beauty. Jamaica covers only 10,991 square kilometers in the shape of an oval, spanning 150 miles long to as little as 40 miles wide. The terrain varies significantly in this compact environment. Dramatic cliffs line the coast on the eastern side of the island, while the majority of the remainder enjoys beautiful sand beaches. In the east as well is the Blue Mountain range, with the highest peak exceeding 7,000 feet above sea level. The north side of the island experiences significant amounts of rain fall, while the south, in the rain shadow, contain pockets of desert flora. The island is volcanic and fairly mountainous throughout.

Jamaica is also endowed with many natural resources. Best known, of course, is the natural beauty, attracting over 1.5 million visitors each year. The island boasts large deposits of bauxite, used in the production of aluminum. The climate and soil are conducive to the production of several cash crops, such as sugar cane, bananas, and coffee. Jamaican Blue Mountain coffee is considered one of the best coffees in the world, often demanding the highest per pound coffee price on the international market.

The population of Jamaica is approximately 2.5 million, with a growth rate around one percent per annum and a population density of 234.2 per square kilometer. Roughly 31% of the current population is under 15, and the life expectancy at birth is 73.8 years. The majority of the Jamaican population is of African or Afro-European decent (90%), with the remainder of East Indian, Chinese and British or American decent (STATIN, 1993). A high number of Jamaican's migrate annually to other countries, and an equal number of native Jamaican's live in Canada, Great Britian and the United States as currently populate the island. Similar to other islands in the Caribbean, the origins of the current populace of Jamaica is mostly from abroad, as the Spanish and British eradicated the indigenous Arawak Indian population in the 1600's.

The current economic reality of Jamaica, however, is one of slow growth and stagnation, rising prices, and high unemployment. To put this in context, a brief foray is necessary into the policy climate between 1962 and

the present (see below for more detailed comments). Following the peaceful transition to independence from the British in 1962, the Jamaican economy grew at a robust rate of 5-7%. Between 1969 and 1973, for example, the average growth rate was 6.1% (Davies and Witter, 1989). In this early period, the government encouraged foreign investment and shifted away from the colonial style economy of the production of primary goods for export. In the 1970's, however, Jamaica sank into a period of stagnation and decline, principally fueled by a shift in governmental policy towards redistribution of income and the introduction of a welfare state. As Jamaica also imports 98% of its' energy needs, the oil crisis in 1972 contributed to this spiral as well. In combination, the country descended into a period of economic crisis . After a heated and violent election, the 1970's regime gave way in 1980 to a government focused on exports and high rates of private investment. In the late 1980's, the government changed hands again, but the policy climate remained consistent, with an emphasis on private investment, exports, and a de-emphasis on governmental intervention. With all of this change and shifting ground, however, growth in the late 1980's and early 1990's has hovered around zero percent, with unemployment rates above 15% and inflation around 25% (World Bank estimates).

One of the key policy developments in this analysis period has been the liberalization of the exchange rate. In the 1970's, the Jamaican dollar was pegged to the U.S. dollar (previously the British Sterling). As the

government set the rate, the real market value of the Jamaican dollar quickly fell out of equilibrium. An active black market for Jamaican dollars developed (Grosse, 1994). In September of 1991, the Government of Jamaica liberalised the dollar, causing a dramatic jump in the exchange rate from 7:1 to 25:1, soaring inflation rates (80% in 1991), and the disappearance of the black market. This change in exchange rate policy resulted in a dramatic shock to the Jamaican economy.

Overall, the economic context between 1990 and 1994 was one of stagnation, although conditions did not worsen significantly. In 1991 with the liberalisation of the exchange rate, the inflation rate hit 81%, but during the rest of the period, inflation declined to 25% and the unemployment rate fluctuated slightly around 15%. Table 2.1 summarizes the overall conditions.

Table 2.1
Macro Economic Summary for Jamaica:
1990 – 1994

Economic Measure	Year				
	1990	1991	1992	1993	1994
1) Official Exchange Rate	8.0:1 (J$: US$)	21.5:1	22.2:1	32.5:1	33.2:1
2) Unemployment Rate	15.7%	15.7%	15.7%	16.3%	15.4%
3) % Change in Consumer Prices	29.8	80.2	40.2	30.1	26.8
4) % Real GDP Growth per Capita	4.5%	-0.3%	0.5%	0.4%	-0.3%

Source 1, 3-4: IDB estimates with data from the IMF
Source 2: Programa Regional del Empleo para America Latina y El Caribe

2.2.2 The Political Climate and Microenterprise

Modern Jamaica can be traced back to the formation of the two key political parties in the 1930's and early 1940's. The JLP, or Jamaican Labor Party, has traditionally been the more conservative, with an emphasis on social and economic stability rather than change. The PNP, or People's National Party, has been more left of center, focused on redistribution of income and interested in sweeping change (Stone, 1989). These two parties have traded leadership roles in Jamaica's modern history, often resulting in dichotomous policy from one elected administration to the next.

Jamaica gained independence from it's colonial power, Great Britian, on August 6 of 1962. "Out of many, One people," the adopted national motto of Jamaica, reflects an ideal of social cohesion, political unity, and peaceful socio-political interaction as the goal of independence. Yet since Jamaica's independence, the path has been marred by lack of identity, political and social violence, and continued polity in public policy. The violent elections of 1967 and 1980; the Rodney riots in 1968; student unrest in the 1970's; the development of the urban ghetto's serving as a flashpoint of unrest in the 1970's and 80's; all underscore the tensions present in the social, political and economic fabric of the country.

In broad stroke, public policy has directly reflected the reigning ideology of the reigning political power. The overarching paradigm, however, can best be described as an "inward looking policy," which has plunged the

country into stark economic times (Balassa, 1989). Policy objectives promoted the expansion of an export industry through tax holidays, raw material import holidays, and market monopolies. This policy tract has lead to slow growth in manufacturing while simultaneously leading to a bias against small scale industry (Fisseha, 1982). Growth of small scale firms flourished nonetheless, leading to a statement found in the five year plan (1978-1982) to pay "serious attention to small scale manufacturing."

From 1962 to 1970, the JLP party was in office, implementing economic plans to encourage foreign investment for manufacturing and encourage private investment. As alluded to above, the policies reflected the accepted structural transformation "export" policies prevalent at the time. In the 1970's the PNP came into power, shifting the emphasis towards income redistribution, welfare reform, and a more active role of government in business and development. The country fell in to a period of economic decline, however, with real GDP falling by 13% between 1975 and 1980 (Fisseha, 1982). This reflects in part the effect of the global recession in the period and wayward economic policies. After this period of deteriorating economic conditions in the late 1970's, the JLP again came to power after a violent election in 1980, implementing an even more conservative version of their policy of the 1960's.

In 1989, the PNP once again came to power. Their economic policy platform, however, coincided in broad terns with the JLP platform. Both

parties advocated a diminished role of government in business, the encouragement of private enterprise as a means to economic development, and liberalization of the Jamaican dollar. The adoption of these measures reflects in part the influence of IMF and World Bank policy directives for Jamaica. The differences in economic and social welfare reform between the two parties appears to have converged. Even with an increasing degree of similarity in ideology between the parties, the change in political parties continues, however, to define the changes in the economic landscape (Anderson and Witter, 1991).

During the period 1990 – 1994, the period of this analysis, the PNP party held power in Jamaica. As alluded to above, the policy platform of the PNP reflected a new ideology, with a shift towards smaller government, and an emphasis on private enterprise, trade liberalization, and currency reform. Significantly in this period, specific programs were put in place which focused on microenterprises.

The Government of Jamaica (GOJ) participated in several initiatives to support microenterprises, beginning with MIDA in 1991. MIDA, the Micro Investment Development Agency, was formed to assist microenterprises through technical training and credit support. In 1992, for example, MIDA funneled 40 million Jamaican dollars to microenterprises through more than 20 lending agencies. The funds supported agricultural projects as well.

Other programs include CAST, an entrepreneurial training center establish in 1986, training over 400 micro entrepreneurs in 1992. This program is currently co-sponsored by the GOJ/GON Micro Enterprise Project, a two year project aimed at providing financial services to the sector, increase the fact base on micro firms to help guide policy decision, provide training, support women and in general raise the status of micro enterprise activities. Finally, JAMPRO Entrepreneurial Centers provide a wide range of non-financial support to micro enterprises. This quasi-governmental organization assisted 99 businesses expand/start in 1992, with a projected employment impact of 732.

In summary, the years between 1990 and 1994 contain policies liberalizing the macro economic context, with a continued emphasis on private enterprise as a cornerstone of economic growth. Further, several new programs were put in place which specifically addressed the needs of the microenterprise.

2.2.3 Jamaican Microenterprise: Past Research

If research on microenterprise and small business in LDC's have suffered from a paucity of good data, then Jamaica has the good fortune of generating above average attention over the past 15 years. Several research and data collection programs have been executed. To begin with, in 1978 a national census was conducted which developed a sample frame of microenterprises. This sample frame was used for subsequent research by Yacob Fisseha. This line of research explored management characteristics of the microentrepreneurs and the constraints facing these business people on a daily basis. In 1983, the World Bank sponsored the Small Establishment Survey. This survey sub-sampled from the same frame, and collected rudimentary information on approximately 2,000 micro firms. Seven years lapsed, and then in 1990, STATIN again conducted a national census, collecting basic information on microenterprise business activity and employment. From this frame, a National Survey was conducted in 1992. This survey, administered to 2,400 micro firms, asked detailed questions on constraints to firm growth, historical questions on firm formation, and sought some basic information on employment. As will be detailed below, this current research is connected to both the 1990 census and 1992 national survey. Finally, in 1993, a dynamic study by Yacob Fisseha tracked 142 firms included in his original sample in 1980.

In 1978, the micro sector was estimated at roughly 38,000 firms, providing a livelihood for some 80,000 individuals. By 1990, this number is estimated to have jumped to 88,000 firms employing over 150,000 (STATIN, 1992), almost tripling the number of firms and doubling the employment. These are sizeable numbers for a country of only 2.3 million. Liedholm and Mead (1987) estimate, for example, that small scale manufacturing represents roughly 22% of total manufacturing GDP, or roughly 3.5% of total GDP. More significantly, 74% of all industrial employment is carried by these firms. Finally, about one-eight of the total Jamaican population are "fully or substantially" supported by these industries. Thus without even considering the linkages between this sector and agriculture or with larger firms, the microenterprise sector plays a significant role in the economic life of the country.

How can the microenterprise sector in Jamaica be characterized? To begin with, the sector is somewhat lopsided, with 52% of the firms in the sector own account and roughly 66% of the firms defined as wholesale or retail trade (see Table 2.1). By gender, the micro sector is split almost in half, with a slightly higher percentage of women working in micro firms. Finally, more firms were located in urban areas, and these firms enjoyed a slightly higher average employment than their rural counterparts. Average employment across all of these firms averaged 1.7%.[3]

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[3] Summary statistics from STATIN, 1992.

Table 2.2
Distribution of Jamaican Microenterprises in 1990:
By Employment and Industry Type

Business Category	Percent of Businesses	Industry Group	Percent of Businesses
Own-Account	73.4%	**Manufacturing**	7.4%
Small (1-4 employees)	21.8%	**Construction**	0.6%
Small (5-9 employees)	4.8%	**Wholesale, Retail Trade and Hotels**	66.4%
-	-	**Transport and Communication**	3.3%
-	-	**Finance, Insurance and Real Estate**	1.9%
-	-	**Personal Services**	20.4%
Total	100.0%		100.0%

SOURCE: STATIN, 1990 National Census

Other than the distributional characteristics of these firms, several other significant dimensions have been revealed through the recent research. To begin with, Jamaican firms utilize little family labor (Fisseha, 1982), which accounts for the high percentage (two thirds) of micro firms which closed between 1980 and 1992 due to death, retirement or migration of the proprietor (Fisseha, 1993). No family labor was in place to take up the reigns and carry on. Fisseha also described the surviving firms as tenacious, surviving the turmoil of the 1980's to survive into the 1990's, and points out that roughly 40% of the firms sampled rely on their business as a primary source of income.

Anderson's 1994 study reveals that capital shortages and poor market demand are the two most prevalent problems facing micro-enterprises in Jamaica today. Very few firms access formal credit at startup (6.1%), with an even smaller percentage obtaining working capital. The majority did not apply for loans, due to high interest rates, access to family money, or a percieved lack of loan collateral.

In sum, the microenterprise sector in Jamaica plays a major role in the local and national economy. Policy directives have not been keenly focused on the sector, in part due to a lack of relevnat data to guide the decision makers (Anderson, 1994). One of the purposes of this research is to shed more light on the microenterprise landscape leading to better policy.

2.3 Methodology and Background

The motivation for this research resulted in a Quarterly Panel Survey (QPS) of Jamaican microenterprises, one of a series of three linked studies exploring the microenterprise sector in Jamaica. The data for this work draws upon all three. In 1990, STATIN conducted a nationwide survey visiting a random sample of 20% of the country's enumeration areas. In each of the locations selected in the sample, STATIN conducted a complete enumeration of all microenterprises, collecting information on the business type and employment in each enterprise. In 1992, STATIN again conducted

fieldwork, under the direction of the University of the West Indies, on this occasion collecting more detailed information on a random sample of 2,394 enterprises chosen from the original 1990 sample of 16,000 firms. For these firms, more detailed background questions were asked, including information on the educational and training experience of the entrepreneur, access to credit, employment in the firm as well as its output. From this frame of 2,394 firms, 700 firms were randomly selected, and comprise the sample for the QPS. Table 2.3 details the sample.

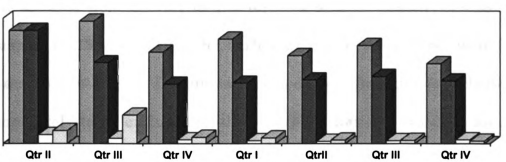
Table 2.3
Summary of Sample by Quarter
Jamaican Quarterly Panel Survey

	1993			1994			
	Quarter II	Quarter III	Quarter IV	Quarter I	Quarter II	Quarter III	Quarter IV
Firms in the sample this quarter (T)	361	391	292	334	281	313	255
Firms active this quarter (D)	361	363	275	322	274	305	243
Temporarily closed this quarter (E)	na	28	17	12	7	8	12
New Firms added this quarter (A)	na	133	75	52	27	10	9
Firms reentering this quarter from an earlier period (B)	na	na	27	89	51	89	46
Number of firms in the sample this quarter that were also in previous quarter [1] (C)	na	258	190	193	203	214	200
Firms temporarily closed that were in previous quarter (subset of above)	na	11	8	6	3	5	1

1 Firms used for analysis of quarter to quarter change.
Note 1: Row T = A + B + C
Note 2: Row T = D + E

The data in Table 2.3 reflect some of the birth pains of the QPS, with its evolving understanding of data collection difficulties, as well as the fluid nature of the microenterprise sector in Jamaica.[4] The second round, for instance, shows a high number of entrants coming into the sample, due in part to the initial difficulties encountered in locating these firms during the first round of data collection. Some of these characteristics of the sample are portrayed in Figure 2.1.

Figure 2.1 Some Characteristics of the Sample



Col 1: Total Sample
Col 2: Firms Active in this Quarter and in Previous Quarter
Col 3: Temporarily Closed
Col 4: Out of Business

Many of the firms moved in and out of the sample over the period covered by this report. Enterprises dropped out of the dataset in any quarter for one of four reasons: 1) enterprises were temporarily closed that quarter; 2)

[4] 700 firms were originally sampled, but due to data collection difficulties mentioned in the text, the active sample in any one quarter was roughly half that. These 700 firms can be accounted for by adding 361, the total number of firms active in Q1, with the sum of row A. This total of 667 firms is the

enterprises refused to answer the questionnaire that quarter; 3) enterprises were known to have permanently closed; and 4) those with no data, for other or unknown causes. The bulk of the firms with no data fall into the latter category.[5]

A particularly thorny problem plaguing this sample is the large number of firms that drop out of the sample for a quarter with no information on their status (refusal, temporarily closed, etc) during their absence. This is a particular problem in quarter IV where almost 40% of the sampled firms fell into this category.[6] The percentage of firms that fall into this category, however, declined from quarter to quarter, dropping to roughly 14% by the final quarter of 1994. During the earlier quarters, some firms were not located due to relocation or closures, whereas during the latter periods firms were more likely to be excluded as the proprietor was not available for the interview on the day(s) of the intended enumeration. This difficulty ultimately decreases the analyzable sample size and may introduce some degree of selectivity bias into the analysis.

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active sample throughout data collection. The difference between roughly 700 and 667 is due to refusals, closures, and unable to locate the business.

[5] The "unknown" firms in turn fall into three categories: 1) unknown, with no information available from the field; 2) unable to locate the business or proprietor in the given period; and 3) contact made, but not able to complete an interview in the required time period.

[6] Due to a period of bad rains with much flooding in the rural areas, many firms were not visited during this particular quarter.

A number of firms also closed their doors temporarily due to slow business conditions. The number of enterprises temporarily closed in this way reached over 7% of the enterprises with valid data in the third quarter. It is likely that a number of the "unknown" firms also fall in this category. Particularly noteworthy as well is the constant percentage of firms that fell into this "temporarily closed" category on an on going basis. This seasonal pattern of business activity suggests an underlying weakness in the economy, with firms having to shut down operations for months at a time. These seasonal fluctuations can be particularly stressful for microenterprises, as multiple family members often draw their income from one microenterprise.

The main focus of analysis in the section is on quarter-to-quarter changes among the sample firms. This analysis makes use of information for all enterprises with the relevant data for any two successive quarters. Table 2.3 shows, for example, that there were 258 enterprises that provided responses in both quarter II and quarter III. The analysis in the following sections is based on patterns of changes in such pairs of data for individual enterprises from one quarter to the next. Also note that the analysis period begins with quarter II, 1993. [7]

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[7] This reflects the decision to link the reference weeks, for which the respondents provided the relevant weekly sales (output) and wage bill data, to the quarter in which that reference week occurred. Originally, it was envisioned that the reference week would have been in the last week of the previous quarter, but timing delays and limitations in the accuracy of the respondents memory recall necessitated that the reference week would fall in the current quarter. Thus, the data collected for the first complete panel

2.4 Quarterly Dynamics: Jamaican Microenterprise

2.4.1 Quarterly Change in Employment

Employment is the indicator typically used to measure change in the level of economic activity of existing firms. It is most easily and accurately remembered by the entrepreneur and also does not need to be deflated. Employment is thus the first indicator that will be examined in the report. The term "employment" includes working proprietors and unpaid family members as well as paid employees, trainees and apprentices; paid employment is also analyzed and discussed separately.

The employment data for Jamaican microenterprise for all seven quarters are presented in Table 2.4. The data, as in all sections of the report, are presented as indices, with the second quarter of 1993 set equal to 100 in each case. The percentage change between the current and previous quarter is noted below each index.[8] The first two rows of the table report on total employment and total paid employment, and then total employment is further broken down by gender, sector, location, and establishment size.[9]

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period (April, 1993) ultimately related to quarter II rather than quarter I as originally planned. Moreover, the monthly and quarterly figures proved to be unreliable, requiring the use of the weekly data.

[8] For the disaggregated data (gender, sector, etc), each index has been linked back to employment in quarter 2 of 1993.

[9] In examining quarter to quarter change, all firms which provided valid data in both periods were included in the calculations. "Valid data" includes firms reporting positive business activity as well as those temporarily closed.

Table 2.4
Employment Patterns
Jamaican Quarterly Panel Survey

	1993			1994			
	Quarter II	Quarter III	Quarter IV	Quarter I	Quarter II	Quarter III	Quarter IV
Total employment	100	92.7 (-7.3%)	90.2 (-2.8%)	93.2 (+3.3%)	87.5 (-6.1%)	85.9 (-1.8%)	81.4 (-5.2%)
Paid employment	100	114.3 (+14.3%)	111.6 (-2.4%)	109.0 (-2.3%)	117.5 (+7.8%)	117.0 (-0.4%)	105.0 (-10.3%)
Total employment, by gender of owner							
Male-owned enterprises	100	91.1 (-8.9%)	92.0 (+1.0%)	91.3 (-.8%)	87.7 (-3.9%)	92.5 (+5.5%)	85.8 (-2.4%)
Female-owned enterprises	100	95.2 (-4.8%)	86.4 (-9.2%)	95.6 (+10.6%)	86.4 (-9.6%)	78.3 (-9.4%)	76.4 (-2.4%)
Total employment, by sector							
Manufacturing	100	99.3 (-.7%)	98.8 (-1.2%)	96.5 (-1.1%)	92.0 (-4.7%)	91.0 (-1.1%)	80.8 (-11.2%)
Trade and Commerce	100	89.5 (-10.5%)	84.2 (-6.0%)	88.6 (+5.3%)	82.5 (-6.9%)	80.0 (-3.0%)	77.5 (-3.1%)
Services, Transport, and Finance	100	104.4 (+4.5%)	107.7 (+3.2%)	108.8 (+1.0%)	102.9 (-5.4%)	104.1 (+1.2%)	96.7 (-7.1%)
Total employment, by location							
Urban	100	96.1 (-3.9%)	98.5 (+2.5%)	97.1 (-1.4%)	89.7 (-7.6%)	89.1 (-0.7%)	86.1 (-3.3%)
Rural	100	91.0 (-9.0%)	84.7 (-6.9%)	88.3 (+4.3%)	83.8 (-5.1%)	81.9 (-2.3%)	75.1 (-8.3%)
Total employment, by size							
Own Account	100	111.0 (+11.0%)	116.3 (+4.8%)	133.4 (14.7%)	125.4 (-6.0%)	125.5 (0.1%)	118.1 (-5.9%)
1-4 Employees	100	88.3 (-11.7%)	85.7 (-3.0%)	88.4 (+3.2%)	83.2 (-5.9%)	82.3 (-1.0%)	78.3 (-4.9%)
5-9 Employees	100	86.3 (-13.7%)	76.5 (-11.4%)	67.9% (-11.1%)	63.0% (-7.3%)	60.6% (-3.8%)	55.6% (-8.2%)

Note: figures in parentheses report the percentage change in employment for firms in this category since the previous quarter.
Source: Jamaican Panel Survey of Microenterprise

Overall, from quarter II 1993 to quarter IV 1994 , there is a gradual pattern of decline in employment for all the existing enterprises covered by

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Although this method allows the sample to shift over time, it generates the largest possible sample size with which to examine quarter to quarter changes.

the survey[10]. Indeed, employment in existing microenterprises was approximately 19 percent lower in quarter IV 1994 than in quarter II 1993.

The overall downtrend is reinforced when the data are examined over rolling one year time periods. In Table 2.5, the annual percentage change in employment between comparable quarters in 1993 and 1994 are portrayed. The sharpest decline, 12.5%, occurred between the 2nd quarter of 1993 and 1994. Yet, even when quarters III and IV were used as the bases for the calculation of the annual change in employment, the decline was sizable. Clearly, there was a downward trend in the employment of existing microenterprises in Jamaica over the 1993-1994 period.

Table 2.5
Year to Year Changes in Employment
Jamaican Quarterly Panel Survey of Microenterprise

Annual Change in Employment for Jamaican Microenterprise 1993 – 1994	
	Percent Change in Employment
Quarter II 1993 to Quarter II 1994	-12.5%
Quarter III 1993 to Quarter III 1994	-7.3%
Quarter IV 1993 to Quarter IV 1994	-9.8%

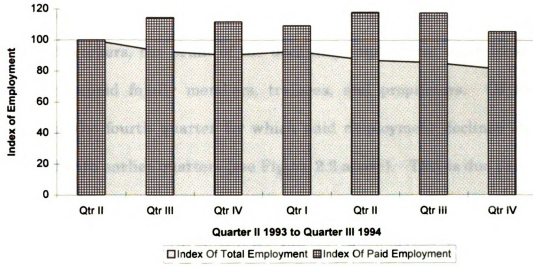
Source: Table 3.1

An irregular seasonal pattern of contraction and expansion is also evident when the data are examined on a quarter by quarter basis. The largest

[10] Consistent results in the decline in employment were similarly obtained by examining a sample of firms for which we had data for all seven quarters.

decline takes place between the second and third quarters of 1993, the first two quarters of 1994, and the last two quarters of 1994. Significantly, employment expanded in only one quarter, quarter I of 1994, which experienced a 3.3 % increase.[11] Figure 2.2 illustrates these quarterly as well as seasonal patterns.

Figure 2.2 Index of Change in Total Employment



A breakdown of employment into some of its constituent parts reveals important differences in the patterns of seasonal variations and secular downtrend of employment. The discussion below examines changes in

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The pattern of change from quarter to quarter was similar. The index for the seven quarters were: 100, 93.2, 86, 89.2, 82.6, 81.7, and 79.6.

[11] STATIN reports a decrease in national employment levels in 1993, but an increase in employment in 1994, particularly in the latter half of the year. In 1994, the index of employment jumped by 10 points over 1993, while the unemployment rate dropped by 5 % to 15.4%. The gainers in 1993 came

employment by labor type, gender, sectors, location, and size of establishment.

In striking contrast to the decline in overall employment is the increase in the level of paid employment over the same period, rising 5 points by the last quarter of 1994. Was this because firms with paid employment did better than those without? Our analysis could find no significant differences in the overall employment performance of those firms with paid employment and those firms with none. This result suggests that for firms with paid workers, the brunt of the declining employment must have been borne by unpaid family members, trainees, and proprietors. Of further interest is the fourth quarter for which paid employment declines sharply compared with earlier quarters (see Figure 2.2 above). This is due primarily to a decline in the manufacturing sector, which employs a higher percentage of paid workers than the other sectors.[12] Most of the growth in paid employment came from own account businesses expanding their operation by one or two employees, representing a significant percentage increase in their business.

Gender: It is noteworthy that female owned firms experienced a slightly larger decline in employment than their male counterparts over the entire

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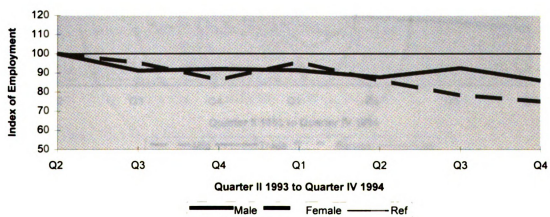
primarily in the financial services sector while the manufacturing sector continued its' decline of 1993.

period, decreasing by 23% compared with 14% for male headed firms. Female headed firms also experienced more quarter to quarter volatility. Male owned firms declined by a large 8.9% initially but then were relatively stable, while female owned firms fluctuated between negative 9.6% to positive 10.5% in any one period. Thus, female owned firms declined somewhat more dramatically overall and experienced more variability than their male counterparts. This pattern can be explained somewhat by the increased likelihood of female headed firms operating only on a part-time basis in comparison with their male counterparts.[13] Figure 2.3 below illustrates these patterns.

Figure 2.3 Change in Employment by Gender

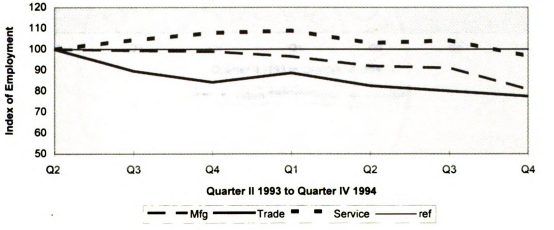


[12] Manufacturing, for example, contains 44% own account firms vs trade with over 66% own account.

[13] Patricia Anderson in "The 1992 Jamaican Microenterprise Survey" reports that overall 15.0% of female entrepreneurs work less than 7 hours a day compared with 9.7 % for male entrepreneurs. In manufacturing, this number jumps up to 27.3% for females compared to 9.7% for males.

Sector: Employment in the trade and commerce sector declined the most, a 23 percent fall, and experienced the greatest quarter to quarter fluctuations. This cyclical variation coincides with the peak in tourism during the winter months.[14] By contrast, service sector employment declined only slightly over the period, 3.7%, and actually increased in 4 of the 6 quarters. Employment in manufacturing was quite stable, typically declining only 1 percent per quarter; it did experience, however, a sizable decline, -11.2 %, in the last quarter.

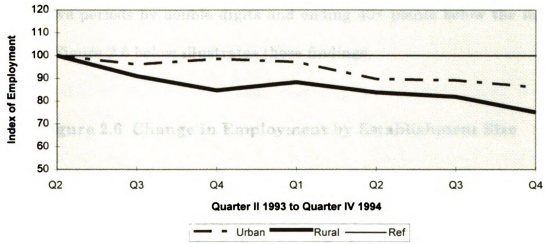
Figure 2.4 Change in Employment by Sector



[14] Roughly 30% of petty trade firms, for example, shut down their operation entirely during the "off season" compared with only 10% for wholesale trade. (The 1992 Jamaican Microenterprise Survey, pg 41)

Location: Urban[15] firms experienced less quarterly variability and declined less over the entire period than their other rural counterparts. Except for quarter II 1994, urban firms declined by less than 4% in any one period. Employment in rural firms declined 9 percent more than urban firms over the entire period with quarterly swings ranging from -9% to +4.3%.

Figure 2.5 Change in Employment by Location

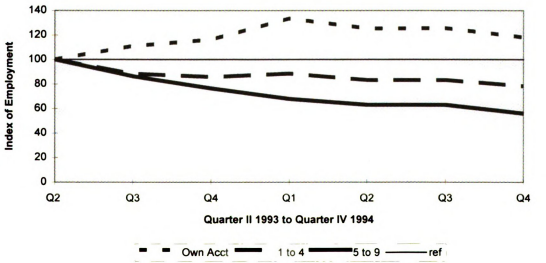


Firm Size: there were also significant patterns of change in employment by firm size (see Table 2.2). The size categories, - own account, 1-4, and 5-9 employees - are consistent with the size classification used by STATIN in its reporting of the 1990 sampling of small businesses and the 1992 Jamaican National Survey. For the purpose of this analysis, the classification of each firm's size was determined as of the time it first entered the panel. The

[15] For this report, STATIN's definition of rural and urban are used (see 1990 publication on microenterprises).

strong performance displayed by the own account firms is particularly noteworthy, showing positive employment growth in 4 of the six periods and ending 1994 18 points above the starting point in 1993. This robustness may be somewhat misleading, however, because, at least initially, one person firms cannot decline and continue to exist. Employment in both medium (1-4 employees) and larger size (5-9 employees) microenterprises declined during the period. The larger sized firms fared particularly poorly, declining three consecutive periods by double digits and ending 40+ points below the initial period. Figure 2.6 below illustrates these findings.

Figure 2.6 Change in Employment by Establishment Size



Examining the employment data by gender, sector, location, and size, it would appear that firms headed by females, operating in the trade sector, and in rural areas experienced the most significant employment declines

across the period. This pattern may reflect the higher concentration of female headed firms in the trade sector as well as the higher concentration of trade firms in rural localities. It is noteworthy, however, that male firms in rural localities performed as poorly as well, and that female headed firms in urban areas were similar to their male counterparts. This suggests that location may be of overriding importance.

Overall, it is striking that only the service sector and own account firms avoided the significant overall decline in employment from the second quarter of 1993 to the end of 1994. The volatile nature of employment for firms headed by females and those operating in the trade sector is also noteworthy.

2.4.2 Quarterly Change in the Wage Bill

Wage data on microenterprises are also typically quite difficult to obtain. The QPS generated weekly wage information for each individual working at the establishment. The detailed individual data were added together to determine the entire wage bill of the firm. This wage bill data, shown in Table 6.1, paints a similar picture portrayed by the employment and sales data; yet there are some differences. Overall, it is noteworthy that the nominal wage bill declined by 12 percent over the period, suggesting a secular decline in wages even in current dollars. The real wage bill, which has been calculated by subtracting the quarterly change in inflation from the quarterly change in nominal wages,[16] declined by almost 42% over the period. Although not quite as steep as the decline in real sales, this drop was nonetheless substantial. Finally, recognizing that the amount of paid employment increased over the period by 5 percent, there is evidence that the decline in the real wage rates of paid employees was severe. Table 6.1 and Figure 2.7 below summarize the results.

Figure 2.7 Change in the Wage Bill: Real Vs Nominal

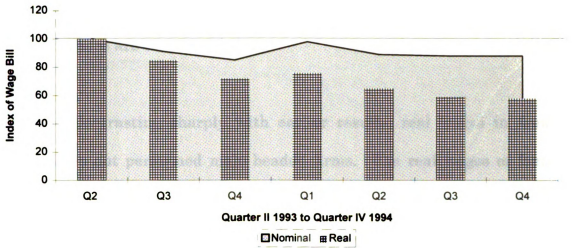


Table 2.6
Patterns of Change in Firm Wage Bill of Microenterprises
Jamaica Quarterly Panel Survey

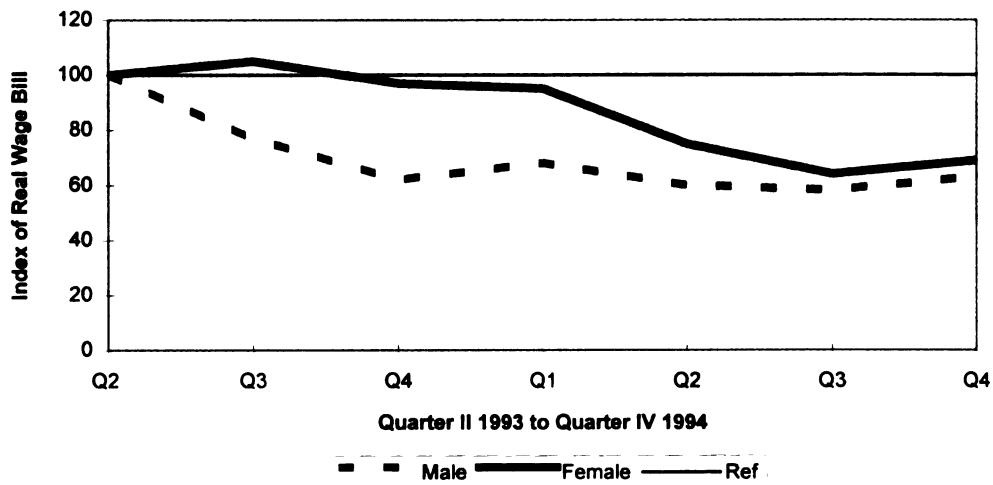
	1993			1994			
	Quarter II	Quarter III	Quarter IV	Quarter I	Quarter II	Quarter III	Quarter IV
Total Nominal Wage Bill	**100**	**90.8 (-9.2%)**	**84.5 (-6.9)**	**97.7 (+15.6%)**	**89.2 (-8.7%)**	**88.0 (-1.3%)**	**88.0 (0%)**
Total Real Wage Bill	**100**	**84.9 (-15.1%)**	**71.6 (-15.6%)**	**76.2 (+6.3%)**	**64.7 (-15.0%)**	**59.2 (-8.5%)**	**58.4 (-1.4%)**
By gender of owner							
Male-owned enterprises	100	76.9 (-23.1%)	61.9 (-19.4%)	68.2 (+10.1%)	59.5 (-12.3%)	58.0 (-2.6%)	53.4 (-7.9%)
Female-owned enterprises	**100**	105 (+5.5%)	97.3 (-7.8%)	95.2 (-2.1%)	75.2 (-21.3%)	64.4 (-14.4%)	69.2 (+7.5%)
By sector							
Manufacturing	**100**	112.9 (+12.9%)	115.8 (+2.6%)	211.9 (+83.0%)	117.5 (-44.6%)	106.6 (-9.3%)	75.3 (-29.4%)
Trade/commerce	100	72.8 (-27.2%)	62.0 (-14.8%)	58.8 (-5.1%)	52.2 (-11.1%)	43.1 (-17.5%)	51.2 (+18.8%)
Services/transport	100	91.9 (-8.1%)	71.0 (-22.8%)	69.2 (-2.5%)	67.6 (-2.3%)	73.3 (+8.4%)	60.9 (-16.9%)
By location							
Urban localities	100	85.3 (-14.7%)	61.9 (-27.4%)	78.5 (+26.8%)	51.3 (-34.7%)	53.3 (+3.9%)	52.4 (-1.7%)
Rural localities	100	86.9 (-13.1%)	94.2 (+8.4%)	92.3 (-2.2%)	91.4 (-1.0%)	74.3 (-18.7%)	76.2 (+2.5%)
By Size of Establishment							
Own Account	100	105.1 (+5.1%)	107.8 (+2.6%)	115.8 (+7.4%)	84.1 (-27.4%)	88.2 (+4.9%)	111.8 (+26.8%)
1-4 Employees	100	80.6 (-19.4%)	69.3 (-14.0%)	70.9 (+2.3%)	73.6 (+3.8%)	65.7 (-10.7%)	63.1 (-4.0%)
5-9 Employees	100	86.5 (-13.5%)	66.2 (-23.5%)	66.0 (-0.3%)	58.3 (-11.6%)	57.1 (-2.1%)	41.6 (-27.7%)

Source: Survey Data

There were important variations in real wages by gender, sector, location and firm size. These are examined below.

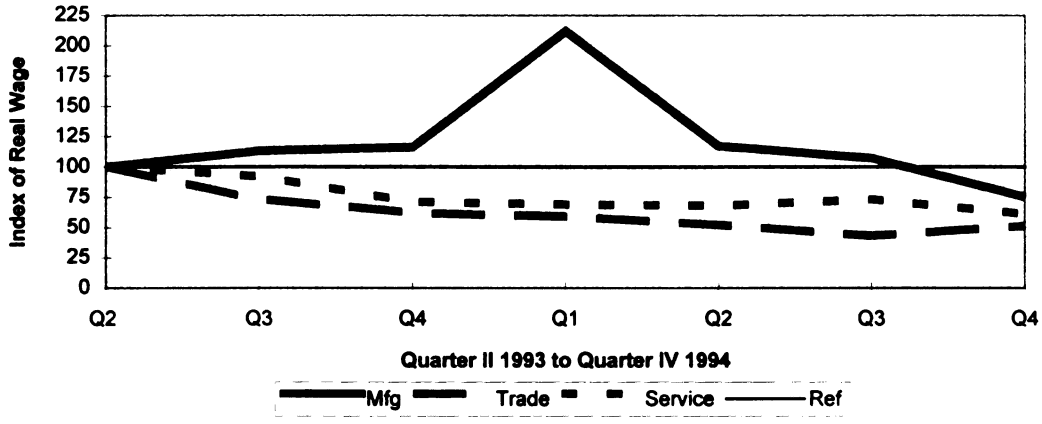
Gender: Contrasting sharply with earlier results, real wages in female headed firms out performed male headed firms. The real wages of female headed firms declined by only 30% while those of their male headed contemporaries declined by 45%. Female headed firms also experienced less quarter to quarter variability, with a steep decline only in the second period of 1994 (-21.3%); their male counterparts, by contrast, experienced extreme quarter to quarter fluctuations, ranging from -23.1% to +10.1%. Real wages in male headed firms increased in only one quarter, while those in female headed firms increased in two. Overall, this reverses the pattern demonstrated in both the sales and employment data where female headed firms experienced the greater degree of fluctuation. Figure 2.8 below displays the patterns.

Figure 2.8 Change in the Real Wage Bill by Gender



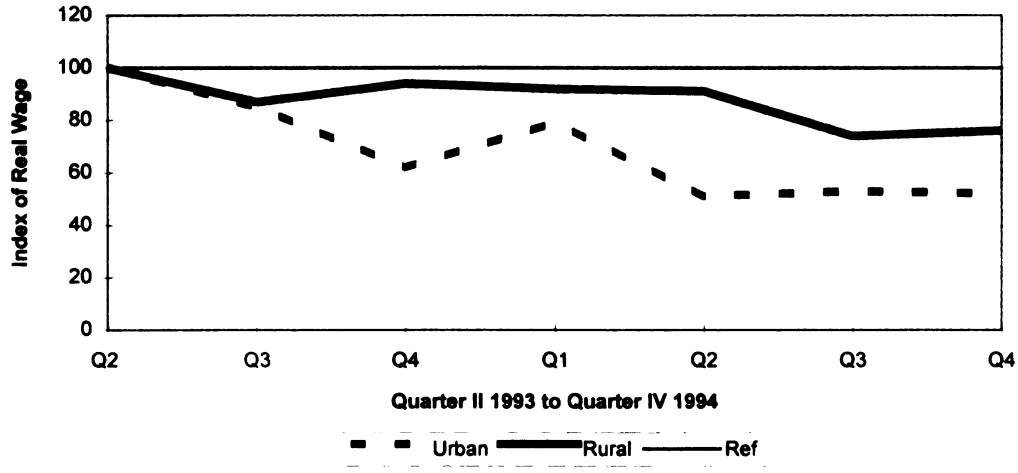
Sector: the real wage bill for manufacturing takes a roller coaster ride between 1993 and 1994. In 1993, manufacturing wages increased by 112 index points and in 1994 declined by 125 points. This dramatic pattern contrasts sharply to the fairly stable pattern observed in manufacturing sales and employment data. Nonetheless, manufacturing ends 1994 in a better position than either trade or service. Real wages in the trade sector, for instance, dropped overall by almost 50%, a bigger decline than in its employment. Further, all three sectors experienced similar erratic percentage swings in their real wage bill, with manufacturing increasing by 83% one quarter and declining 44% the next. Finally, both trade and service experienced declines in their real wage bill in each and every quarter. (See Figure 2.9 below.)

Figure 2.9 Change in the Real Wage Bill by Sector



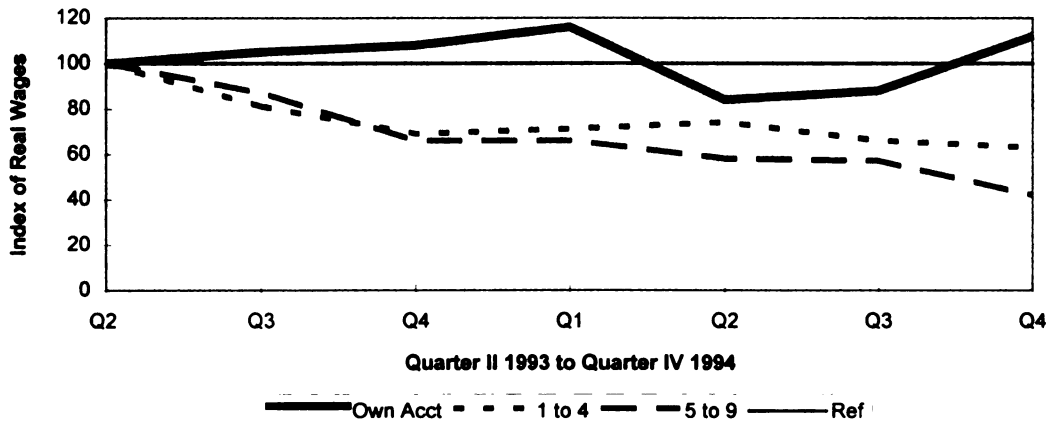
Location: another striking contrast are the differences between the real wage performance of rural and urban firms. Although urban firms faired better than their rural counterparts in employment and sales, rural firms demonstrated a more stable, less volatile real wage bill than their urban components. Urban firms, by contrast, closed the year with a wage bill nearly 50% below where they began while that of their rural counterparts decreased by roughly 25%. The patterns of real wage changes from quarter to quarter do not correspond very well to either the employment or real sales/output pattern.

Figure 2.10 Change in Real Wage Bill by Location



Firm Size: closely paralleling the pattern of change in employment, own account firms outperformed medium and large size microenterprises in wage bill growth, ending 1994 almost 12 points above its 1993 level. Further, real wages in own account firms increased in all but one period (quarter 2 1994), while in the larger microenterprises, real wages decreased in each and every quarter. Clearly evident across employment, real sales, and now real wage bill growth is the downward spiral of the larger microenterprises. Across all three measures, the larger firms declined, experiencing volatile swings in their quarter to quarter changes. Figure 2.11 below illustrates the results.

Figure 2.11 Change in the Real Wage Bill by Size



2.5 Five Year Retrospective on Employment

How do these quarterly findings for the 1993/1994 period fit into a longer term perspective on the performance of existing microenterprises in Jamaica? A potential clue comes from additional employment data on this same panel of microenterprises, extending back to 1990 that provides an annual picture of employment for each enterprise for June of the given year. For 1990, employment data were captured from the 1990 Census of Microenterprises which included data on total firm employment. For 1991 and 1992, data were collected through the 1992 Jamaican Microenterprise National Survey, which queried proprietors with in depth questions on firm employment for both June of 1991 and June of 1992. Since the 1990 Census Survey provided the sample frame for the Quarterly Panel Survey along with

the 1992 National Survey, all three data sources were easily linked. Over the five year period it was possible to link together employment data on 348 firms. Table 7.1 below displays the results.

Table 2.7
Levels and Annual Change in Employment: 1990 to 1994
Jamaican Microenterprise

Change in Employment between 1990 and 1994 Jamaican Microenterprise					
n=348 firms	1990	1991	1992	1993	1994
Overall	100	111.8 (+11.8%)	110.5 (-1.2%)	94.7 (-14.3%)	85.8 (-9.3%)
Employment by Sector					
Manufacturing	100	107.0 (+7.0%)	110.6 (+3.3%)	91.1 (-17.6%)	84.6 (-7.1%)
Trade	100	111.3 (+11.3%)	108.3 (-2.7%)	95.2 (-12.0%)	83.9 (-11.9%)
Service	100	115.4 (+15.4%)	116.1 (+0.63%)	95.2 (-18.0%)	91.4 (-3.9%)
Employment by Gender					
Male Owned	100	115.4 (+15.4%)	113.8 (-1.4%)	96.6 (-15.1%)	86.8 (-10.2%)
Female Owned	100	103.0 (+3.0%)	102.3 (-.7%)	92.1 (-10.0%)	83.2 (-9.6%)
Employment by Location					
Urban	100	108.7 (+8.7%)	112.9 (+3.9%)	94.4 (-16.3%)	87.3 (-7.6%)
Rural	100	114.1 (+14.1%)	109.5 (-4.0%)	97.2 (-11.2%)	84.0 (-13.6%)
Size of Firm					
Own Account	100	85.4 (-14.6%)	85.1 (-0.4%)	66.7 (-21.6%)	69.9 (+4.9%)
1-4 Employees	100	125.9 (+25.9%)	126.4 (+0.4%)	105.4 (-16.6%)	99.4 (-5.7%)
5-9 Employees	100	125.1 (+25.1%)	119.7 (-4.3%)	124.9 (+4.3%)	94.0 (-24.7%)

Source: Survey Data

Overall, the five year employment trend for this panel of microenterprises provides another picture of general decline. Employment in existing

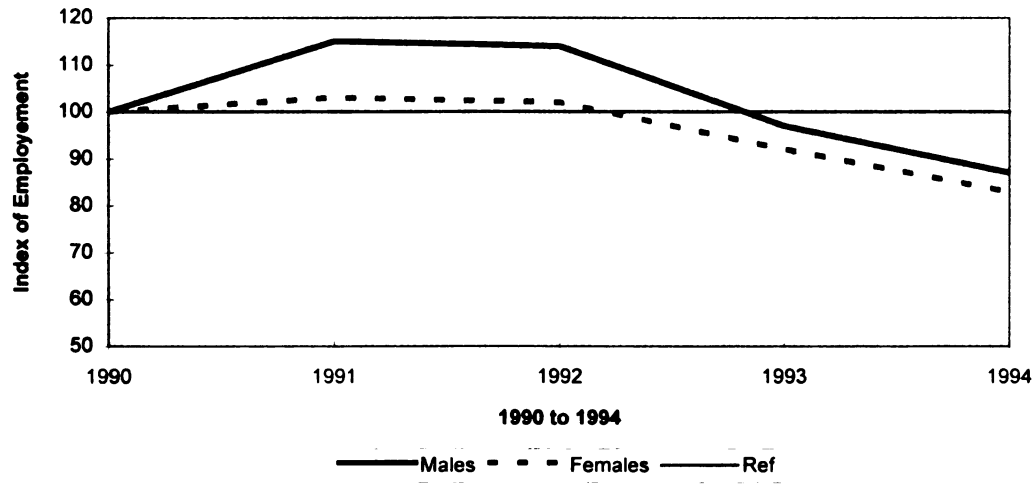
enterprises in 1994, for example, was 14.2 points lower than in 1990. Yet, this decline was not even from year to year. Employment actually increased in 1991 and decreased only slightly in 1992. Indeed, it was only in the last two years that the sharp drop in employment took place, particularly in 1993. Thus the QPS, which covered seven quarters of 1993/94, was providing a picture of microenterprises at a time when they were apparently experiencing their worst performance since 1990.

What factors might have accounted for the relatively poor performance of microenterprises during the 1990's? The macro economy clearly played an important role. Real GDP, for example, increased relatively little over the entire period, ranging from 0.7% to 1.5% per year. With population increases, real GDP per capita was stagnant, and in some years, actually was declining. Currency devaluations, increases in the inflation rate (ranging from 27 to 80 percent per year), along with increases in the sales (GCT) tax contributed to the worsening performance of microenterprises as the period progressed. Additional insights into the longer run trends can be gained from a more disaggregate analysis. Variations by gender, sector, location and firm size will thus be scrutinized.

Figure 2.12 Five Year Retrospective on Employment: Jamaican Microenterprise

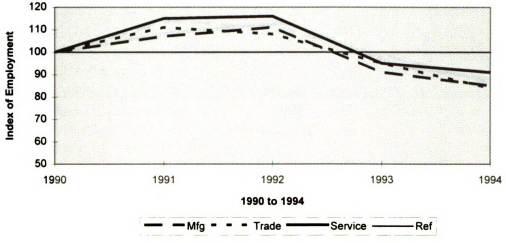
Gender: male headed firms declined less overall than their female counterparts over the five year period, the same pattern revealed in the QPS. Male headed firms, however, experienced wider year to year fluctuations over the longer period than female headed firm, opposite the pattern revealed in the QPS.

Figure 2.13 Five Year Index of Employment by Gender



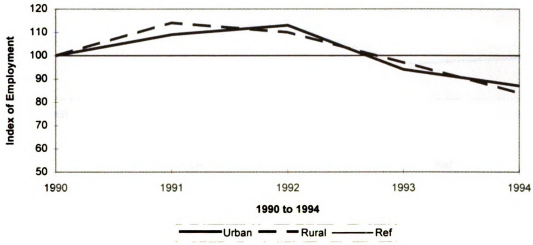
Sectors: all three sectors declined between 1990 and 1994, the service sector declining the least and trade declining the most. In striking contrast to the quarterly data, all three sectors between 1990 and 1994 followed a similar pattern varying together almost in lock-step. In particular, manufacturing departs from its quarterly pattern of near zero change, the trade sector does not demonstrate the steep decline of the quarterly periods, nor does the service sector follow a positive, stable rate of growth. Strikingly, the service sector experienced the most volatility across the five years, with a 15.4% gain in 1991 and a 18% decline in 1993. The trade sector, by contrast, fluctuated the least. Most noteworthy, all the sectors moved in tandem, increasing and decreasing by moderate swings in each of the five years.

Figure 2.14 Five Year Index of Employment by Sector



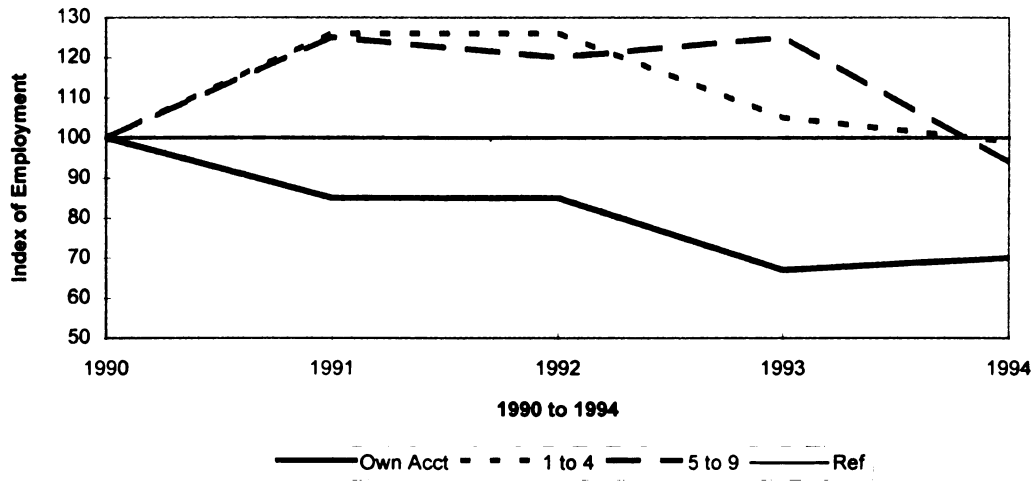
Location: rural firms outpaced urban firms in employment between 1990 and 1993, dropping below the urban employment index only in 1994. In 1991 the rural sector experienced a large percentage gain (14%) that drove this result. Notably, both urban and rural firms decreased significantly over the period and experienced wide year to year percentage swings. This corresponds fairly closely with quarterly data, which show urban firms declining less (overall), although with less quarter to quarter variability.

Figure 2.15 Five Year Index of Employment by Location



Firm Size: a distinctly different pattern of change is observed in firms of different sizes. Although all firms experience significant yearly employment volatility, the larger firms clearly outperform the own account category over the five years. Strikingly, employment in the larger firms generates an index above 100 in all years except 1994, and the intermediate sized microenterprises end 1994 with the highest index level overall (99.4). This pattern contrasts with the QPS data where the larger microenterprises fared the worst.

Figure 2.16 Five Year Index of Employment by Size



In summary, this disaggregated view of the five year picture has provided several insights not captured in the QPS. For the five year picture, however, several important nuances jump out at the disaggregated level. Most notably, manufacturing tracks much closer to the other sectors in its pattern of decline; male headed firms experience as much year to year volatility in employment as their female counter parts; urban firms as well as rural firms fluctuate significantly between years; and the larger microenterprises out-perform own account firms.

2.6 Conclusions

In this chapter, the secular trends of Jamaican microenterprises were examined both on a quarter to quarter basis in 1993 and 1994, and on an annual basis from 1990 to 1994. The analysis revealed several important variations in firm growth and change over the period, with sector, gender, and geography the most notable. Perhaps the most important insight from the analysis, however, is the wide fluctuation in quarter to quarter microenterprise performance.

Overall, employment tended down by 20 percent for this sample of firms. Female owned enterprises declined by 25%, 10 points more than their male counterparts. Urban firms faired better than their rural counterparts, and the largest firms in the sample (5-9 employees) declined by almost 50%.

By linking the QPS to earlier surveys, it was also possible to ascertain how the existing Jamaican microenterprises performed over a longer time period from 1990 to 1994. This exercise revealed that although overall microenterprise employment was lower in 1994 than in 1990, this decline was not even. Indeed, employment in existing microenterprise increased in 1991 and the sharpest decline occurred 1993 and 1994, the years in which the QPS was conducted. Thus, the quarterly results must be interpreted with this fact in mind. At the more disaggregate level, the longer

term findings revealed that the major sectors moved together much more in lock-step than indicated from the QPS.

CHAPTER III

DYNAMICS OF MICROENTERPRISE IN JAMAICA: A CROSS SECTIONAL ECONOMETRIC INVESTIGATION OF LONG TERM EMPLOYMENT GROWTH

3.1 Introduction

Firm dynamics have been the focus of much research and speculation since Alfred Marshall debated the advantages and disadvantages of small firms in the 1890's. In the context of developing economies, most of the research until recently has focused on the performance of the medium and large scale firms. Even within the United States and Europe, only larger firms have attracted careful scrutiny, unraveling the factors affecting firm growth and change. However, as a result of empirical work in recent years, attention has shifted towards the magnitude and characteristics of small and microenterprises.

In examining the growth of microenterprises, two hurdles have typically encumbered a robust examination of the characteristics and determinants of growth dynamics. Most notably, especially in the context of LDC's, is the availability of any data on these types of enterprises. Until just a few years ago, the significance of the contribution of microenterprises to a

growing economy was skirted. Further, data collection is expensive, time consuming, and difficult to manage over large areas, such as an entire country. Second, most of the study designs to collect data on microenterprises rely on retrospective surveys to generate data. This results in a high potential for measurement error, especially for data specific to firm performance.

Chapter II developed a descriptive profile of microenterprises in Jamaica, and began to flesh out how these firms have changed both in the short and long run. The snapshot of firm growth and dynamics developed there represents a new and unique perspective, due to the types of data available and the manner in which this panel data was collected.

In this chapter, long run firm dynamics will be examined for Jamaica, focusing specifically on determinants of employment growth through a cross sectional OLS analysis.[16] The objectives are threefold. The first is to examine the key relationships between firm age, size and growth in a manner consistent with other research on these issues. This will allow for direct comparisons with findings from other countries. Second, this analysis will incorporate additional human and firm capital dimensions to determine their importance to firm growth. Finally, an assessment of long run dynamics will be made, as these data cover a five year period. How do the growth equations change over time?

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[16] Parker (1991) shows that in at least 2 cases employment growth is highly correlated with growth in sales.

Two unique elements distinguish these results from earlier research. First, as a direct application of the validity (or lack of validity) of Gibrat's law, much of the recent theoretical literature posits firm growth as a function of firm startup size. However, most empirical research use beginning period size as the definition of firm startup size[17]. In most cases, this proxy is necessary as data on firm startup size are not available. As a unique contribution, the Jamaican data overcome this shortcoming as information on firm startup size are available.

Second, as discussed above, the Jamaican data provide detailed information on these micro firms over a five year period, whereas the majority of research consists of the results from one time surveys. These data provide a more complete dynamic picture of growth, capturing the change and evolution of these firms over this longer time frame. Further, the data collection instrument did not rely on retrospective data collection. This reduced the effects of measurement error in the data.

In section 3.2, an overview of the research and theory regarding firm growth will be reviewed. In section 3.3, the econometric techniques and relevant issues will be discussed. The data collection methodology and variable definition will be reviewed in section 3.4. Finally, section 3.5 summarizes the results from the cross sectional models. Conclusions are presented in section 3.6.

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[17] Beginning period size refers to the size of the enterprise at the start of the analysis period.

3.2 Theory and Hypotheses

Two interrelated lines of inquiry have received extensive attention in the literature of firm dynamics: what causes a firm to grow, and what affects firm survival (or failure). These questions are interrelated as a lack of growth has much to say of individual firm survival, and the ability of firms to survive affects the growth of firms in the aggregate. Further, both issues have significant ramifications for policy directions. The examination of firm growth has consumed much of the early research on firms, but most recently, a significant amount of emphasis has focused upon firm survival.

3.2.1 Firm Survival

At the aggregate level, average firm growth is influenced by the growth (or lack thereof) of existing firms, as well as by the complex interplay between firm growth and decline, firm death and entry. Manfield (1962) posited the importance firm exit might play in empirical investigations of Gibrat's Law, and recent empirical research has confirmed the large role firm death plays in understanding firm growth. Liedholm and Mead (1991), reviewing results of research across multiple African countries, show that death rates of small firms average around 9-10 percent per year. Behrman and Deolalikar (1989) in a study of medium and large scale manufacturing in Indonesia, found that only 50% of the firms existing in 1975 survived 10

years. In Europe and North America, research has revealed similar patterns for both large and small firms (Mata and Portugal 1994; Dunne, Roberts and Samuelson, 1989; Wagner 1994).

Duration analysis (or hazard analysis) has been utilized in several studies, both in developing and developed countries to determine which factors affect firm survival. Several important hypotheses have been explored. The most prolifically tested are the relationships between firm survival with firm age and size. For the most part, an inverse relationship between firm age and size with survival has been confirmed (Cabal, 1994; Mata and Portugal, 1994; Audretsch and Mahmood, 1991; Behrman and Deolalikar, 1989), although some exceptions have been found (McPherson, 1992).

Some other key relationships to survival have been explored as well, mostly due to unique datasets built in developing countries. Most notably, McPherson (1992) found in several African countries that neither gender or credit affected the hazard, but firm location, sector, and country did play a role. Cabal (1994) with data from the Dominican Republic, in contrast, found gender significant and location insignificant, but consistent with McPherson, different sectors obtained different hazard rates. Access to credit had no affect on survival.

A significant amount of empirical effort has been put against firm survival, exit and entry in recent years. Most of the research in Europe and

North America has centered on larger firms, for which ample data exists, but some more recent work has been focused on microenterprises in developing countries. Without going into detail or noting the exceptions, the empirical work has generally confirmed the recent theoretical innovations of Jovanovic's 1982 seminal paper. This will be discussed in more detail below.

3.2.2 Firm Growth

Firm growth, or explorations of the "life cycle" of existing firms, has received extensive treatment in the literature, principally along two lines of inquiry. The first has its' roots in what is termed "Gibrat's Law" or the Law of Proportionate Effect. This relationship has been debated and explored since the 1950's. Second, the relationship between firm age (or learning) and growth has developed within the past 15 years, principally due to Jovanovic's 1982 theoretical "learning model." Much of the research on these relationships have focused on large firms, due to the availability of data as well as a reflection of the research agenda of the day (Brock and Evans, 1989). More recently, a body of literature has surfaced examining these issues with smaller firms, in both developed as well as developing countries. McPherson (1992), however, points out that an encompassing theory of firm growth really doesn't exist. This remains the case at this writing as well.

The first of these lines of research, Gibrat's Law, proposes that firm growth is independent of firm size. If the market for a given industry

expands at a rate of 5%, then all firms in that industry, whether large or small, will enjoy a corresponding 5% growth rate. This implies a log-normal distribution of companies by size, as is considered a stylized fact by Schmalensee (1989), and can be understood in the following terms:

> A variate subject to a process of change is said to obey the law of proportionate effect if the change in the variate at any step of the process is a random proportion of the previous value of the variate.[18]

The attention given Gibrat's Law can be readily identified with two causes. The first concerns policy considerations, while the second relates to the economic theory of small business growth.

Regarding policy implications, imagine a world where small firms grew more quickly than larger firms. In an economic downturn, policies targeted to encourage small business growth would naturally lead toward a quicker sparking of employment opportunities. On the other hand, if Gibrat's Law holds, policy makers could target any business size segment and expect an equal payback.

Economic theory is equally subject to the validity (or lack thereof) of the Law of Proportionate Effect. Several major theories, for example, have presupposed it. The most significant, perhaps, is Lucas' (1978) theory on the

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[18] This definition, attributed to Aitchison and Brown (1969), is quoted in Chesher (1979).

size distribution of firms. Lucas posits the distribution of managerial ability as the driver for the coexistence of small and larger firms within a market. Firm costs are defined as $c(q)/\theta$, where θ reflects managerial ability. Firms with higher θ's have lower costs. This results in a log-normal size distribution of firms in market in equilibrium. Lucas (1967) also proposed a model of adjustment costs which could account for the distribution of firm size.

Another line of attack is characterized by Herbert Simon's comments:

> Ijiri and I have suggested that the growth of organizations may have only a little to do with efficiency..., but may be produced mainly by simple stochastic growth mechanism.... Without the introduction of empirical evidence, neoclassical theory provides no explanation for the repeated appearance of Pareto distributions of firm sizes in virtually all situations where size distributions have been studied. These observed distributions are difficult to reconcile with any notions that have been proposed for optimal firm size, but are easily explained by simple, plausible probabilistic mechanism that make no appeal to optimality.[19]

[19] Found in Simon, 1991.

These comments capture the thinking on the "stochastic" theory of firm growth. This class of models characterized firm growth as the outcome of a series of lucky draws from a random distribution. Scherer (1980), for example, matched outcomes of probabilistic simulations with marketplace reality and found a consistent pattern across experiments.

Some of the empirical evidence supporting Gibrat's law include Hart and Prais (1956), Simon and Bonini (1958), and Contini and Revelli (1989) and Wagner (1992) in some instances. McPherson (1992) points out, however, that recent empirical evidence has more generally refuted Gibrat's law, leaving the door open for new theories of firm growth. Some of these empirical studies will be reviewed in more detail below.[20]

Several new models of firm growth debuted in the late 70's and early 80's[21], but Boyan Jovanovic's (1982) represents the most influential new arrival. The key parameter to the model, similar to Lucas' (1978) model, relates managerial efficiency to firm cost:

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[20] Some of the studies rejecting Gibrat's Law include Hymer and Pashigian (1962), Singh and Whittington (1975), Chesher (1979), Evans (1987), Hall (1987), Dunne, Roberts and Saumuelson (1989), Dunne and Hughes (1990), Mata (1994), and Reid (1995). The classic approach to addressing the question was established by Prais (1956), and followed by Chescher (1979) and others. Hall (1987) and Evans (1987) followed a different tact in modeling growth as the dependent variable. A very innovative approach is followed by Stanley, et al (1994), who borrowed Zipf Plots from Physics, and proved Gibrat's law in fact does not hold.

[21] Also consider Kihlstrom and Laffont (1979) or Pakes and Ericson (1987).

$$TotalCost(q_t) = C(q_t) * S(\theta + \varepsilon_t)$$

where q refers to output, θ refers to managerial ability and ε are firm specific costs. Firms only learn their level of managerial ability (or firm efficiency) over time, so as time passes and they learn more of their own immutable ability, their guesses as to the value of θ becomes more accurate. Younger firms, not knowing the value of θ, might possibly grossly over or underestimate it's value, resulting in the potential for higher rates of growth to hit the optimal level of q. On the other hand, older firms which have successfully determined the value of θ, produce at or close to their optimal level and consequently experience slow growth.

The appeal of Jovanovic's model is both intuitive and empirical. At the intuitive level, the theory suggests a learning disequilibrium, resulting in the potential for rapid small firm growth to achieve a stable path. On the empirical side, firm "learning" can easily be proxied by firm age. This approach has been followed by many authors (Hall, 1987; Evans, 1987; McPherson, 1992; Cabal, 1994), and is adopted here as well. Several other recent theoretical frameworks have been proposed more recently and bear discussion even though they do not offer hypotheses testable by these data.[22]

[22] None of the new theories are specific to either micro firms or on LDC's.

A slightly different formulation of Jovanovic's model, for example, comes from Pakes and Ericson (1988), who term Jovanovic's theory a "passive learning" model. Fundamentally, Jovanovic depicts θ, or managerial ability, as immutable. Managers who have extraordinary "ability" observe and correct output correctly and grow more quickly. Other firms do not. Pakes and Ericson posit a model in which firms can invest in *research and development.* Successful firms in the process grow and obtain a large size, while the others exit. Hence small firms that just start the discovery process are the most likely to grow.

Cabral (1995) adopted Jovanovic's learning model, but added sunk costs to more thoroughly flesh out the negative relationship between firm size and growth. Cabral assumes that each firm is endowed with a variable cost function

$$s_t C(q_t / s_t)$$

where q is quantity and s is the firm's efficiency type at age t. As in Jovanovic's model, firms are price takers and price is constant in all periods. By making two assumptions, however, Cabral proves that this formulation can be consistent with Gibrat's Law, but only for a special case:

Assumption 1: $L < F < H$

Assumption 2: $E(s_2 \mid s_1) = s_1$

Regarding assumption 1, if $s_1 = L$, then firms will exit the market as the robability of survival is zero. Alternatively, if $s_1 = H$, firms have a 100 % probability of staying. Firms with $s_1 = F$ have a probability of survival equal to $0 < \alpha + \beta < 1$. Profit maximization, given the above cost function, shows that q1 and s1 are proportional. In a proof, Cabral show that for firms with L or H probabilities, Gibrat's law holds, while for firms of efficiency type F Gibrat's law can be violated.[23]

Cabral adds, however, that firms must build capacity at a cost of k per unit, and that this cost is totally sunk. This results in the following: in each period, before choosing q_t, firms much choose capacity K_t and pay $k(K_t - K_{t-1})$, where K is the cost of capacity. If this is true, Cabral argues, then Gibrat's law will not hold.

In a stylized framework like this, we can imagine large firms with a zero probability of failure. This zero probability would encourage larger firms to invest in their optimal capacity from the start. In contrast, small firms face a positive probability of exit, encouraging them to invest in small increments up to their long range capability. If they invest a lot in their first period with a positive probability of failure, then they face a high potential loss if their level of s_1 is quite low. Firms that succeed stay in the market and

continue to invest at a proportional cost of k to their $K_t - K_{t-1}$ capacity adjustments; hence, these small firms experience a "supra-normal" growth rate.

The theoretical constructs of both Jovanovic and Cabral offer reasonable explanations for the failure of Gibrat's law. Obtaining data on firm "sunk costs" or a proxy for such poses difficulties for empirical testing, however, especially in lesser developed countries where data is difficult to obtain.

Cressy (1996) proposes another dimension pertinent to the growth of new entrants. Citing the work of Frank (1986) and Hudson (1990), Cressy suggests that pre-entrepreneurial income drives new firm growth and survival rates. Dropping the "learning" model paradigm, he develops a model with firm growth as a function of pre-entrepreneurial income, age of the proprietor at startup (to proxy human capital), other business characteristics, and target income growth. More specifically:

$$e_0 = (1+k) f(w_0, a_0, x_0) c_0^{\alpha}$$

[23] Cabral's argument parallels that of Mansfield (1962).

where k is income growth, w is pre-entrepreneurial income, a is age of proprietor at startup, x is other firm characteristics, and c is initial cash flow of sales. Taking a second order log log expansion, Cressy tests this framework in a manner comparable to Evans (1987a). Cressy finds pre-entrepreneurial income to play a significant role in firm growth, but is unable to validate the relationship with the age of the proprietor.

One argument against Cressy's model might be that the "pre-entrepreneurial" income variable is just a fancy proxy for managerial ability or proprietor learning. Further, in discarding Jovanovic's learning model, a very strong intuitive explanation of firm growth is lost.

Another dimension of firm growth not touched upon by any of these authors is the relationship between firm growth and profitability. Dobson and Gerrard (1989) modeled the growth of firms in the Leeds engineering sector with profitability as a dependent variable. Building on what is termed the Penrose effect (Penrose, 1959), the theory behind the model posits that there is a trade off between firm growth and firm profitability. If you choose one, you have to trade away some of the other. It is easy to see the potential effect firm age might play on this relationship as well. Older firms, for example, may choose growth in their early career, and profitability later as long as they survive. Dobson and Gerrard found a negative relationship between growth and profitability with profitability defined as the ratio between operating profits and sales, but a positive relationship between the

two with profitability defined as the ratio of operating profits to net total assets. This latter result is consistent with other findings (Cubbin and Leech, 1986, and Grinyer and McKiernan, 1983). Their framework is broadly consistent with the Marris growth model and Mueller's life cycle theory of firm growth.

Arrighetti (1994) proposed a two firm typology to explain differences in firm growth. Briefly, O-D firms are defined as low efficiency, low cost firms or industries where little or no growth is required after startup to turn a normal profit. For O-D firms, for example, initial startup capital is typically not a problem. S-O-D firms enter at a sub-optimal size and need to grow in order to survive. These firms are typically in more technologically advanced industries, for example. Through the use of cluster analysis and some other descriptive statistical techniques, Arrighetti showed this typology can be useful in explaining differences in growth rates. For the Jamaican sample of microenterprises, the majority (if not all) of the firms fit the O-D typology as described by Arrighetti. In fact in most LDC's, microenterprises would fit this criterion. This dichotomy doesn't add much to the debate in LDC's.[24]

There are several other significant factors which affect growth that have not been specifically included in theoretical models. These include the role of credit in firm growth, educational background of the proprietor, gender, location of the firm, macro economic factors, and customer types.

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[24] See Davies, et al (1992) for a review of several other potential firm typologies.

Several of these will be touched on briefly below, followed by hypotheses testable with the Jamaican data.

Access to appropriate credit and financial resources has been a hot topic for microenterprise programs in recent years. Although the financial needs of microenterprise in most instances are small in absolute numbers (Liedholm and Mead, 1987), the significance of the role of credit cannot be understated. The need can be identified at multiple junctures, from startup to operating capital (Rhyne and Otero, 1994), but since the entrepreneurs of these enterprises typically lack assets as collateral to a traditional bank loan, special programs have been designed to provide credit. Reed and Befus (1994) also point out the significance of what they call "transformation lending," or obtaining the necessary capital to grow the microenterprise into a small business.

For Jamaican microenterprises, only small percentages of the firms reported accessing formal credit as a source of startup capital. Anderson (1994) reports that between 0.7% to 16.7 % of the microenterprises accessed funds through commercial banks or other programs, depending on sector (see Table 3.1), with the majority of funds coming from personal savings or the sale of assets. Another source of funds for micro-entrepreneurs not reported in Anderson's study is through the Jamaican black market (Grosse, 1994). Access to some form of credit appears to be an issue for many Jamaican microenterprises.

Table 3.1
Main Sources of Starting Capital for Jamaican Microenterprises

Industry	Local Savings	Sale of Assets	Commerical Bank Loan	Solidarity Program	Credit Union
Manufacturing	86.6	14.9	4.1	4.8	1.9
Construction	60.9	13.0	4.3	8.7	-
Wholesale Trade	73.3	16.7	16.7	10.0	-
Retail Trade	88.6	14.9	6.2	5.5	1.3
Petty Trade	86.2	9.0	0.7	4.1	1.4
Restaurants, Hotels	94.3	14.6	5.7	5.1	3.8
Transport	69.4	8.3	31.9	4.2	5.6
Professonal Services	79.2	11.3	13.2	9.4	1.9
Social Services	100.0	23.6	23.6	7.3	1.8
Personal Services	82.3	26.8	2.6	2.9	2.9
Motorcar Repairs	95.6	17.3	2.9	6.4	2.3
Other Repairs	82.7	5.8	9.6	9.6	-
Total N=2017	86.6	16.6	6.1	5.1	2.1

SOURCE: 1992 National Survey
a. Table adopted from Anderson, 1994, pg 98.
b. All numbers are percentages and each cell is not mutually exclusive. If a firm accessed funds from both savings and a commercial lender, then they are double counted in relation to a constant base.

The gender of the proprietor is another significant dimension of the microenterprise landscape. Liedholm and Mead (1987), pooling information across several African countries, highlight the large percentage of enterprises headed by females. Downing (1990) points out that the constraints and

responsibilities of female proprietors is different than their male counterparts, potentially influencing firm performance and survival. In Jamaica, Hotchkiss and Moore (1996) report that gender compensation differentials in the formal sector approach 20%, with females receiving significantly lower mean salaries than their male counter parts. Other research in Jamaica has measured this differential closer to 50%. Anderson (1994) finds that female proprietors are more likely to have multiple businesses and are less likely to obtain formal credit than male run microenterprises. Gender should be examined as a dimension of microenterprise growth.

The location of the firm is another relevant dimension. Different market conditions between regions, or between urban and rural areas can affect firm performance. Further, the physical location of the firm, whether it's a home business, roving, or in a bustling shopping complex may determine the firms growth potential. Strassman (1987) reports, for example, that home based enterprises in commercial areas generate more income than their counterparts in rural areas. Schmitz (1995) found that firms that grow in clusters have a greater potential for growth, suggesting that commercial versus home business or urban versus rural might play a role in the growth equation.

This leads to several testable hypotheses on the factors which influence firm growth:

1. Firm growth is inversely related to firm age (Jovanovic, 1982).
2. Firm growth is inversely related to firm size (startup size, Jovanovic, 1992).
3. The location of the firm will either hinder or contribute firm growth. This applies to rural/urban location or the physical characteristics of the firm.
4. The age of the proprietor is inversely related to firm growth, as a measure of human capital formation (Cressy, 1996).
5. The firms historical access to credit, either for startup or operating funds, should positively influence firm growth.
6. Beyond the individuals human capital, the gender of the proprietor should affect firm growth.
7. Further defining the human capital of the firm, the educational level of the proprietor should determine firm growth.

In the next section, the econometric issues involved in building a model of this sort will be raised. Following this, the variables used for the analysis will be described in detail.

3.3 The Econometrics of Panel Data

A huge volume of empirical research exists which examines the growth of firms as functions of startup size, firm age, and other firm or market characteristics. In most of these studies, the data have been cross sectional and OLS has been the choice for analysis. Panel data, however, present distinct advantages over cross sectional data in the examination of firm dynamics and opens the door to additional econometric techniques and data manipulations to address some estimation problems.

To begin with, panel data provide some unique analysis advantages to either cross section or time series data. A brief list includes a reduction in the collinearity among explanatory variables (Baltagi, et al, 1992), a better control of the effects of missing variables (Hsiao, 1986), but more significantly for this research, a better means of discerning the processes governing growth and understanding the dynamics of change (Ashenfelter, et al, 1985, and Hsiao, 1986). Ben Porath (1973) uses the following example: cross sectional data tells the story that on average, fifty percent of women in the United States are in the job market. What the cross sectional data does not reveal, however, is if all women transition in and out of the work force roughly half the time, or if one group of women is consistently employed with the other not participating. Regarding firm growth and dynamics, the

application is clear. Examining the pattern of change for an individual or firm over time results in a better understanding of the dynamic process.

The advantages alluded to above can be obtained by leveraging several econometric techniques, data manipulations, or variable definitions. The results are more efficient estimates than cross sectional OLS can deliver. One of the main short comings of OLS can been seen in the following panel model specification:

Equation 3.1

$$y_{it} = \alpha + \beta' x_{it} + \gamma' z_i + \mu_{it}$$

where x_{it} and z_{it} are vectors of exogenous variables. The OLS regression of y_{it} on x_{it} and z_i yields unbiased and consistent estimates of α, β and γ. However, if z_i are unobservable and the covariances between x_{it} and z_i are not zero, the coefficients on x_{it} will be biased. This is a heterogeneity bias, common, for example, in the estimation of male-female wage gaps (Polachek and Kim, 1994) or any data which might contain unobservable individual characteristics. With cross sectional data, this bias cannot be corrected perfectly. With panel data, however, firm specific variables could be introduced, the variables could be first differenced or estimated with mean deviations to eliminate the source of the bias to produce an unbiased and

consistent estimate of β. An example can be visualized in the following covariance transformation[25]:

Equation 3.2

$$(y_{it} - \bar{y}_t) = \beta'(x_{it} - \bar{x}_t) + (\mu_{it} - \bar{\mu}_t)$$

Sweeping out the means removes the bias introduced by the unobservable variables which vary through time. Transformations such as this are not possible with only one cross section of data or with a single time series[26]. Panel data hold out the hope at least of producing consistent unbiased estimates.

Two common specifications used in the panel data literature are the fixed and random effects models.

Equation 3.3

$$y_{it} = \alpha_i + \beta x_{it} + \gamma z_t + \lambda q_i + \mu_{it}$$

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[25] First differencing, in this context, could remove the effect of the unobserved variable z which is constant through time but varying across individuals. Mean deviation, on the other hand, removes the effect of unobserved variables.

[26] Deaton (1985) and others have developed techniques to mock panel data with a series of cross sections.

In this general panel specification, all three possible types of panel variables are depicted: X_{it} varies over time and firms (output, employment, raw material costs), z_t varies only over time (interest rates, exchange rages, GNP), and q_i varies only over firms or cross sections (demographics). When α_i is treated as a fixed constant, the model is referred to as a fixed effect model. Alternatively, a random effect model treats α_i as a random variable. Although both assumptions have their own appeal in certain contexts, the assumptions made regarding the orthogonality of the effect to the exogenous variable(s) drives much empirical research into the fixed effect camp (Ashenfelter, Deaton, and Solon, 1984). If the unobserved effect is indeed correlated with any exogenous variable, the fixed effect formulation still results in unbiased and consistent results, whereas the random effects estimator will be biased. As seen in equation 3.2 above, the fixed effect model "sweeps" the bias out. The problem with either first differencing or mean deviation for the fixed effect model, however, is the eradication of the time invariant variables from the model, which are often some of the key variables of interest. The choice between the fixed and random effects model becomes in part one of the efficiency of the estimates balanced against the objectives of the research.

For all the benefits of panel data, they also come laden with several problems, and in the words of Ashenfelter, Deaton, and Solon (1984), there is little "justification for the mindless enthusiasm that is sometimes expressed

by econometricians" for the collection and analysis of panel data. Some of the most serious issues affecting panel data include attrition bias, measurement error, serial correlation, data collection cost, non-reporting, and border, seam and rotation bias (Ashenfelter, et al, 1984; Hsiao, 1986; Lillard and Smith, 1986). Some of these problems can introduce significant bias into the analysis. The first two of these are the most relevant for these data, and will be dealt with in turn.

The intuitive effect of attrition bias is obvious. If systematic patterns of individuals or firms drop out of the panel sample or decline interviews, the panel can become lopsided and reveal results that pertain not to the population or intended sample, but to a unique sub-sample of firms. The existence of attrition bias is difficult to ascertain and even more difficult to control for. For these data, several potential sources of attrition bias exist. Firm deaths, moving firms, the remote location of some firms, and logistical problems with the enumerators, who were depending on public transportation much of the time. Several recent studies of firm dynamics have tested for the effect of attrition bias on estimates and found little or no effect (Hall, 1987; Evans, 1987; Dunne, Roberts and Samuelson, 1989; Wagner, 1992). In section 4.5 below, the role of attrition bias in these data is addressed following Hall(1987).

Measurement error, if it exists, is a problem for any type of data or estimation technique. For panel data, however, measurement error can

result in extreme coefficient bias. Ashenfelter (1984) uses the worst possible scenario to describe the potential bias. For a sensitive variable, say household income, the data collected for each individual might be reported at random (or laden with error). The calculation of the change between two random numbers will grossly exaggerate the dynamic process. Pischke (1995), for example, reports excess variability in individual household data reporting income; a large portion of this "excess variability" is due to measurement error. Hence, the ratio between the measurement error variance to the total variance will be quite large. For an OLS estimate, by contrast, this ratio will be quite small. Given other less extreme scenarios, panel data may introduce lesser amounts of bias into the estimates.

A solution to the measurement error problem is the use of instrumental variables (IV). IV estimation has been suggested in many different ways (Hausman, 1984; Hsiao 1986, review many different techniques; Chamberlin, 1981). By definition, an IV variable, Z, is a new variable such that

Equation 3.4

$$p\lim(\sum z_i \varepsilon_i)/n = 0$$

This criterion is met by a second lag on the dependent variable($y_{i,t-2}$) or by ($y_{i,t-2} - y_{i,t-3}$) (Hall, 1987; Hsiao, 1986).[27]

In summary, a cross sectional data set analyzed with OLS techniques, followed by a large body of past empirical research on firm growth, contains some potential estimation problems. Several of these problems can be addressed through the use of panel data. In the analysis which follows, cross sectional models of firm growth are considered first. This will enable more direct comparisons to past research and serve as a baseline to compare to panel data models. OLS will then be utilized in a panel data model, including an instrumental variable approach to correct for measurement error. This will serve as good measure of the bias introduced by cross sectional data, OLS, and measurement error. To correct for heteroskedasticity, the Huber correction is applied, and firm age is incorporated into most of the models (firm age serves as a firm level variable which can capture heteroskedastic effects in OLS). A fixed effect and first differenced OLS model are also considered, but the results from these models are untenable. An unbalanced panel was used for all estimations, mostly for the purpose of maximizing the analyzable sample size.

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[27] For these data, $y_{i,t-2}$ was used, as the other specification erodes the sample size available for analysis.

3.4 Data Definitions

The dependent variable for the employment models that follow were either the natural log of employment, or the natural log of growth in employment between two years (see explicit definition below). All the models are in log log form, to minimize correlation between variables, capture appropriately non-linear multiplicative relationships, and ease interpretation of the variables. The exogenous variables were defined as follows (all continuous variables are in natural logs):

Time Varying Variables

Firm Startup Size: the number of employees at firm startup.

Lag on employment or lag of employment growth.

Firm age/Firmage ^{2}: the age of the firm and the firm age squared, in years.

Firm Age* firm size: interaction term between firm size and age (note the two definitions of firm size).

Seasonal Variables: controlling for seasonal or macro economic effects

Time Invariant Variables

Gender: dummy variable for male or female proprietor

Age of Proprietor: nine dummy variables for the proprietors age.

Pre Education: dummy variable for level of education completed.

Post Education: dummy variable for business training obtained by the firm after startup.

Startup Credit: dummy variable for firms which obtained startup capital from a lender.

New Credit: dummy variable for firms which obtained a loan from a lender after startup.

Parish: fourteen dummy variables for the parish the firm operates in.

Location: nine dummy variables to describe the physical location of the firm.

Rural or Urban: dummy variable to indicate the urban or rural location of the firm. The definition for rural or urban follows STATIN's classification, which follows the U.N. classification of localities of less than 20,000 for rural.

Not all of these variables are used in each analysis, but the definition of the variables is consistent across model runs. The time varying variables capture the important dimension between firm size, age and growth.

Several other variables capture other human capital characteristics of the firm. The education and training variable, as well as the variable on proprietor age fall into this category. Next are two variables that detail the firms success in obtaining credit, either at startup or post-startup for operational or expansion purposes.

Finally, several variables characterize the firms physical location. The country of Jamaica is divided into 14 parishes. Each parish is a different mix

of rural and urban areas, and this dimension of firm location is captured in the rural/urban dummy. The firms actual physical location is characterized by another series of dummies. These variables describe if a firm is located in a commercial building, a yard, a private house, in the market, etc.

3.5 Employment Growth: A Cross Sectional Analysis of Jamaican Microenterprise between 1990 and 1994

3.5.1 Introduction

In this section, a formal review of the relationship between firm growth, startup size, and firm age in the Jamaican context will be examined. The analysis follows the majority of the earlier research from other countries on this topic, utilizing a cross sectional analysis with OLS as the principal econometric technique. As the focus in this section is on a five year span of data, the issues addressed here should be considered long run effects.

As mentioned above, several important questions can be addressed in this section. At the most basic level, what is the relationship between firm growth and firm age and size, and how do these estimates compare with results from other countries? Does the inverse relationship between firm growth, and age and size hold? Secondly, how do human capital and other firm characteristics such as location or access to credit influence firm growth? Finally, this cross sectional analysis spans a five year period, yielding insights into the robustness of the estimates, and their consistency or change

over time. What are the long term dynamics of the MSE sector? The firms examined here consist strictly of survivors.

An additional econometric issue will be addressed as well. In the empirical literature, the dependent variable in the firm growth equation is modeled in one of two ways, in levels (the log of employment) or as a transformation into annual growth (the natural log of annual employment growth). Both definitions characterize employment growth, but the latter suffers from a negative correlation of the dependent variable with firm startup size and firm age, two of the exogenous variables. By comparing both approaches, the magnitude of this bias can be ascertained.

In section 3.5.2, a cross sectional model will examine firm growth with log employment used as the dependent variable. In section 3.5.3, roughly the same model specification will be used, changing the dependent variable to the natural log of firm growth. Both sections review results for each year between 1990 and 1994. Conclusions follow in section 3.6.

3.5.2 Five Year Cross Sectional Results: Log Employment

To begin with, these data will be analyzed in a manner consistent with the majority of earlier research on firm growth, through an OLS cross sectional analysis with the dependent variable defined as the natural log of employment. Defined in this way, firm growth is growth in employment since firm startup. Some of the research addressing firm growth in this way

include Prais (1956), Wagner (1992), Lever (1995) and Reid (1995) to name a few (see Table 3.4 for more details).[28] Each of the years is modeled separately.

This first cross sectional approach adopts two different model specifications. The first (equation 3.5) is a simple model and corresponds the most closely with previous studies testing for the validity of Gibrat's law. The second specification (equation 3.6) incorporates other time invariant dimensions, including demographics of the proprietor and firm.

Equation 3.5

$$\ln employment_i = \alpha + firmstartupsize_i + firmage_i$$

Equation 3.6

$$\ln employment_i = \alpha + \ln startupsize_i + \ln firmage_i + \\ + gender_i + ageproprietor_i + preeducation_i + posttraining_i + precredit_i \\ + postcredit_i + location_i + parish_i + ruralurban_i$$

[28] Many of the earlier studies model firm growth based upon net assets or capital employed. For microenterprises in LDC's, this type of data is almost nonexistent. Most firms do not practice any type of record or book keeping.

Table 3.2
Cross Sectional Model of Employment: Jamaican Microenterprise, 1990 thru 1994

Variables	Year of Analysis				
	1990 n=354	1991 n=360	1992 n=368	1993 n=318	1994 n=284
Dependent Variable	ln Employment				
Ln Startup Size	.5328031 (10.590)	.8845678 (24.668)	.8320861 (19.687)	.597368 (11.567)	.5910784 (11.200)
Ln Firm Age	-.0640387 (-1.705)	.0061898 (0.186)	-.005256 (-0.144)	.0464051 (0.951)	-.0072965 (-0.130)
Constant	.5110044 (5.169)	.2432232 (2.728)	.2959694 (2.947)	.1663147 (1.210)	.2904917 (1.802)
R Squared	0.2574	0.5716	0.5217	0.3050	0.3023
F Value	59.77 (0.0000)	307.84 (0.0000)	206.23 (0.0000)	67.27 (0.0000)	62.91 (0.0000)

Source: 1990 Census, 1992 National Survey, Jamaican Quarterly Panel Survey
Values in parentheses are t values.
The Huber correction of variance is used in all years.

Table 3.3
Complete Cross Sectional Model of Employment: Jamaican Microenterprise, 1990 thru 1994

Variables	Year of Analysis				
	1990 n=345	1991 n=360	1992 n=359	1993 n=311	1994 n=277
Dependent Variable	ln Employment				
Ln Startup Size	.439889 (7.905)	0.803507 (17.013)	0.733143 (13.892)	0.523619 (8.848)	0.541599 (9.642)
Ln Firm Age	.0058346 (0.135)	0.06174 (1.559)	0.080363 (1.899)	0.143725 (2.352)	0.09653 (1.404)
Gender of Proprietor	-.1829679 (-2.861)	-0.14925 (-2.732)	-0.17412 (-3.038)	-0.12476 (-1.884)	-0.18744 (-2.631)
Age of Proprietor					
<20	*	*	*	*	*
20-24	.5213594 (2.578)	(dropped)	-0.19501 (-1.382)	0.830963 (4.438)	0.1691 (0.850)
25-29	.552959 (3.166)	0.248257 (1.828)	-0.03925 (-0.278)	0.580294 (3.476)	-0.23694 (-1.332)
30-34	.8024992 (4.501)	0.284105 (2.241)	0.073812 (0.532)	0.777878 (4.509)	-0.01019 (-0.055)
35-39	.5970606 (3.421)	0.247811 (2.127)	0.016924 (0.133)	0.592237 (3.991)	-0.04172 (-0.251)
40-49	.5392764 (3.062)	0.113017 (1.016)	-0.16567 (-1.223)	0.543858 (3.572)	-0.24466 (-1.522)
50-59	.5403868 (2.908)	0.088312 (0.699)	-0.17226 (-1.251)	0.453122 (2.471)	-0.27041 (-1.353)
60-69	.4216193 (2.212)	0.125915 (1.006)	-0.21334 (-1.525)	0.441643 (2.382)	-0.26696 (-1.354)
70+	.4712388 (2.060)	-0.05212 (-0.328)	-0.32426 (-1.710)	0.463959 (2.136)	-0.32974 (-1.453)
Education	.01842490 (0.300)	-0.00818 (-0.151)	-0.00854 (-0.153)	-0.07463 (-1.022)	-0.08977 (-1.216)
Business Training	.0072192 (0.075)	0.059362 (0.609)	0.177403 (1.901)	0.123436 (1.009)	0.047725 (0.377)
Startup Credit	-.0128757 (-0.107)	-0.05165 (-0.512)	-0.02768 (-0.268)	0.104465 (0.788)	0.06264 (0.486)
New Credit	.0971723 (0.948)	0.112713 (1.170)	0.144289 (1.494)	0.151908 (1.469)	0.048692 (0.492)

Parish					
Kingston	*	*	*	*	*
St. Andrew	.097146	-0.00441	0.102681	0.074805	0.195895
	(0.645)	(-0.031)	(0.748)	(0.438)	(1.160)
St. Thomas	.0324596	0.132176	0.138636	-0.15606	-0.17912
	(0.143)	(0.726)	(0.692)	(-0.509)	(-0.590)
Portland	-.050654	0.011744	-0.07967	0.212306	0.935016
	(-0.176)	(0.054)	(-0.516)	(0.674)	(4.101)
St. Mary	-.1567723	-0.01162	-0.02436	-0.16586	-0.13256
	(-0.892)	(-0.066)	(-0.136)	(-0.792)	(-0.792)
St. Ann	-.181158	0.062301	0.080959	-0.11219	0.033411
	(-1.203)	(0.415)	(0.538)	(-0.644)	(0.179)
Trelawny	.2997303	-0.15999	-0.18897	-0.65919	-0.23129
	(0.747)	(-0.773)	(-0.886)	(-3.023)	(-0.885)
St. James	.0151643	0.004446	-0.00392	0.045876	-0.0361
	(0.108)	(0.035)	(-0.031)	(0.286)	(-0.184)
Hanover	-.1604284	-0.19086	-0.1578	-0.21862	-0.19152
	(-0.885)	(-1.489)	(-1.205)	(-1.297)	(-1.104)
Westmoreland	-.1057035	0.025464	0.007379	-0.25581	-0.32387
	(-0.712)	(0.169)	(0.050)	(-1.407)	(-1.655)
St. Elizabeth	-.312715	-0.14696	-0.12573	-0.27179	-0.33426
	(-2.343)	(-1.204)	(-1.019)	(-1.769)	(-2.167)
Manchester	-.0506963	-0.0234	0.034811	-0.09911	-0.07658
	(-0.352)	(-0.174)	(0.260)	(-0.573)	(-0.429)
Clarendon	-.0693708	0.0052	-0.02667	-0.03599	-0.05077
	(-0.398)	(0.036)	(-0.173)	(-0.211)	(-0.272)
St. Catherine	-.1852519	0.048727	0.058552	-0.17479	-0.13128
	(-1.388)	(0.341)	(0.420)	(-0.979)	(-0.694)
Location					
Private Home	*	*	*	*	*
Private Yard	.102782	0.094743	0.200044	0.264695	0.160563
	(1.083)	(1.258)	(2.333)	(2.714)	(1.647)
Leased Land	.4762091	0.356134	0.415528	0.67353	-0.03085
	(3.389)	(2.065)	(2.337)	(4.033)	(-0.195)
Open Land	.0678048	0.564813	0.312048	0.421895	0.371207
	(0.325)	(1.858)	(2.434)	(2.175)	(1.978)
Roadside	.1214862	-0.00063	0.142309	0.319297	0.134012
	(0.863)	(-0.006)	(1.310)	(2.060)	(0.877)
Commercial	.1845714	0.156006	0.210638	0.272745	0.102472
Bldg.	(2.526)	(2.828)	(3.948)	(3.494)	(1.275)
Market	-.076066	0.041048	0.099942	0.215489	0.045759
	(-0.706)	(0.310)	(0.752)	(1.424)	(0.313)
School Gate	.4272104	0.216045	0.214667	0.167754	0.065947
	(1.609)	(1.040)	(1.451)	(1.076)	(0.469)
Other	.4012704	0.113018	0.121026	0.289116	0.205623
	(2.516)	(1.203)	(1.279)	(1.446)	(0.987)
Rural/Urban	-.1704202	-0.07376	-0.09383	-0.0339	-0.05177
	(-2.650)	(-1.321)	(-1.625)	(-0.454)	(-0.689)
Constant	-.0707647	-0.02473	0.157551	-0.67235	0.332288
	(-0.315)	(-0.150)	(0.794)	(-2.943)	(1.298)
R Squared	0.4229	0.6387	0.6231	0.4344	0.4497
F Value	8.97	32.89	26.27	15.67	24.30
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Source: 1990 Census, 1992 National Survey, Jamaican Quarterly Panel Survey
Values in parentheses are t values; Sandwich estimator of variance applied in all years.

Tables 3.4 – 3.5 report the cross sectional results for the models in natural log levels. The coefficient for each variable is listed, followed by the t value in parentheses. For these cross sectional results, the R squares vary between .26 and .64, and in each model the F statistic indicates the hypothesis of no difference between coefficients should be rejected. The Huber correction for heteroskedasticity is applied in all of these models[29]. For these estimations, the interaction term for firm age has been dropped as they were highly insignificant[30]. This interaction was adopted by Evans (1987) to capture the non-linear learning relationship posited in Jovanovic's (1982) learning model. Appendix I contains some of the expanded models.

First, the relationship between firm size and growth follows the inverse relationship posited by Jovanovic's learning model. A coefficient for $\beta < 1$ indicates that smaller firms grow faster than larger firms, $\beta = 1$ supports proportional growth, and $\beta > 1$ indicates larger firms grow faster (an explosive system). The coefficient for firm startup size is less than one and significant in all years, which means that there is a negative relationship between total firm growth since startup and startup size. The coefficient for startup size varies between .532 and .884 for the first model and between 0.440 and 0.804 in the extended model. This evidence clearly refutes Gibrat's

[29] Referred to as the sandwich estimator of variance, this technique has been credited to both Huber (1967) and White (1980, 1982).

law. The coefficients on size for the extended model are consistent and slightly deflated, reflecting the additional variance explained by the added variables. The consistency in the results underscores the stability of the model and the probable absence of multicollinearity in the data.

Comparing this result to other studies with a similar definition of the dependent variable, the result is consistent (Reid, 1995; Lever, 1995), both in sign and magnitude of the coefficients. Significantly, both of these studies modeled firm growth as employment and not net assets. Wagner (1992) reports a coefficient much closer to 1, but this work focused on firms of a much larger scale. Further, estimates based upon net asset growth report coefficients much closer to 1 as well.

An additional important aspect concerns growth dynamics across years. Specifically, the coefficients on firm size fluctuate on a year to year basis, but remain consistent in magnitude (always an inverse relationship) and sign. For 1991 and 1992 in particular, firm startup size obtains a much weaker negative relationship with firm growth. One plausible explanation for this deviation can be found in the macro economy. In 1991, the Jamaican dollar was liberalised. Consequently, the exchange rate jumped from 8:1 to 32:1, with the inflation rate soaring from 25% to 81 % and a corresponding slide into negative GNP growth (see table 2.1).[31] If, for instance, access to

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[30] One exception to this was the result for 1990. See Appendix I for the details.

[31] Hay and Louri (1994) suggest that inflation is the most detrimental macro shock for mircoenterprises.

credit became tenuous in this period of contraction and this dimension is correlated with the startup size/growth relationship, then an argument for the shifting coefficients can be obtained. There is no hard evidence to explain the fluctuation, but these extraordinary macroeconomic shocks in this period provide a plausible explanation.

A second key result relates to firm age. For this sample, firm age in the short model is statistically insignificant for each year estimated (additionally see footnote 13), and significant only in 1993 for the extended model. Further, the sign on the coefficient suggests a positive relationship with firm growth. This conflicts with several other empirical studies (Reid, 1995; McPherson, 1992; Evans, 1987), and does not support Jovanovic's theoretical model. Looking across years, the sign in the short model fluctuates between a negative and positive sign, but regardless, the variable is insignificant throughout. This result, if it holds, contains very important implications for the life cycle theory of the firm.

Very significantly, however, the relationship between the age of the proprietor and firm growth is significant, although the signs on the coefficients vary somewhat across the years. First of all, the coefficients are jointly significant in some of the years, with several individual ages significant as well.[32] This result supports a firm life cycle effect, and if the age of the proprietor is posited as a proxy for learning, then this provides a

[32] The F statistic for the joint significance of Age of Proprietor variable is 3.36, 1.58, 2.04, 4.20, and 1.99 for the years 1990 through 1994, respectively.

link to Jovanovic's theory. Jovanovic's posited negative relationship, however, finds support only in results for 1992 and 1994 (negative coefficients). Second, the results across the years fluctuates substantially, with the sign flipping from positive to negative in 1992 and 1994. In a broad sense, there is a consistent trend in the coefficients, however. Younger proprietors affect firm growth more positively (or less negatively for 1992 and 1994) than the oldest proprietors. This has intuitive appeal, and evidence in other countries supports this trend (McPherson, 1992, for Botswana). Overall, age of the proprietor plays an important role in explaining firm growth, and for these data supercedes firm age.

Table 3.4 The Relationship Between Size and Firm Growth

Defintion of Dependent Variable in Levels						
Author	**Period**	**Size Variable**	**Business Type**	**Country**	**Sample Size**	**β**
Singh and Whittington 1975	1948-1960	Net Assets	Non-financial Companies	U.K.	1955	1.06
Samuels (1965)	1950-1960	Net Assets	Mfg firms with >200	U.K.	322	1.07
Prais (1976)	1951-1958	Employment	Mfg firms with >200	U.K.	4300	1.08
Hart (1965)	1958-1960	Net Assets	Mfg Companies	U.K.	1312	1.02
Aarnovitch and Sawyer (1975)	1958-67	Net Assets	Non-Financial	U.K.	233	.99
Kumar (1984)	1960-65	Net Assets	Non Finacial	U.K.	1747	.96
Samuels and Chescher (1972)	1960-65	Capital Employed	All Companies	U.K.	183	.92
Storey et al (1987)	1971-1975	Net Assets	Single Plant Mfg	U.K.	265	.81
Wagner (1992)	1978-1980	Employment	Mfg	Germany	1051	.98
Dunne and Huges (1994)	1980-1985	Net Assets	Assorted Industries	U.K.	1696	0.93
Lever (1995)	1977-1986	Employment	Manufacturing (industry level model)	Netherlands	67 Industries	0.559
Reid (1995)	1985-1988	Employment	All types	Scotland	73	0.63
Chesher (1979)	1969	Capital	Industrial and Commercial	U.K.	183	1.012
Defintion of Dependent Variable: Growth						
Dunne, Roberts and Samuelson	1963-1982	Employment	Multiple Industries	U.S.	703	-0.292
Hall (1987)	1973-1979	Employment	Manufacturing	U.S.	1349	-0.98
McPherson (1992)	1990-1992	Employment	Multiple Industries	Multiple African Countries	1,300 – 5,500	-107 to 5.890
Mata (1992)	1984-1987	Employment	Manufacturing	Portugal	1752-3308	-.021
Evans (1987)	1976 – 1980	Employment	Manufacturing	U.S.	9221	-.072

a. In Lever model, the model is specified in levels and run in first differences. b. For Reid, micro firms with less than 10 or less employees were considered.
c. McPherson's model is not in ln ln form, but in raw levels. Only micro firms with less than 50 were considered;

A third set of results correspond to proprietor characteristics. Certain demographic dimensions of the proprietor provide important explanatory insights to firm growth as well, although some of these results are not as consistent across the years. For starters, the results for gender reveal that female headed firms negatively effect firm growth. This is particularly problematic in the micro sector, given the number of firms headed by females and the predominance of female headed households in Jamaica. This builds on the finding in Chapter II, which suggested that female headed firms experienced slower employment growth than their male counterparts. Those results also suggested, however, that these firms also experienced important advantages over their male counterparts, which needs to be contextualized when interpreting the importance of this finding.[18]

With the marginal exception of 1992, education, either formal school or specific business training, had no effect on firm growth. In 1992, business training was positively related to firm growth and marginally significant. This is an important result given the large emphasis placed upon microenterprise training programs in Jamaica. Actual access to credit played no role in firm growth.

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[18] Gustafson and Liedholm (1995) detail a strong sales and output performance of female headed firms, in contrast to languishing male headed firms.

The last set of results relates to firm location. Both parish and location are jointly significant or marginally significant in all of the years.[19] With a few exceptions, however, only a few of the individual locations yield statistically significant results. First of all, the majority of the parishes exhibited a negative relationship with firm growth, but only the results for Saint Elizabeth were statistically significant, with a strong negative effect on firm growth. Saint Andrew, which incorporates some of the urban area of Kingston, is the only parish with consistently positive coefficients. Regarding the physical location of the firm, individual significant coefficients obtained for firms on either leased land or in commercial buildings. The coefficients on these variables varied considerably from year to year, however, with no apparent consistent directional inspiration. With the exception of 1990, the rural or urban location of the firm does not discriminate on firm growth. In 1990, however, rural firms were negatively related to firm growth. In sum, location plays a significant although marginal role in firm growth, although the lack of consistency in the results across time make drawing definitive conclusions on dynamics difficult.

In sum, four key conclusions characterize the cross sectional model in natural log levels: one, startup size is inversely related to firm growth ($\beta<1$). Secondly, firm age does not explain firm growth, although age of the proprietor does. Thirdly, gender matters in firm employment growth, with a

[19] The F statistics for firm location are 2.66, 1.66, 2.77, 3.43 , and 1.93. The F statistics for parish are 1.47, 1.83, 1.45, 1.67 and 4.16 for 1990 through 1994

negative relationship revealed for female headed firms. Finally, the location of the firm is important, but the lack of consistency in the results across time render definitive implications impossible. These findings have crucial policy and empirical implications. But how robust are they when the dependent variable is defined in a different manner?

3.5.3 Five Year Cross Sectional Results: Growth in Employment

A slight deviation from the above approach parallels several other recent studies on firm growth (Hall, 1987; Evans, 1987; Dunne, Roberts, and Samuelson, 1989; Arrighetti, 1994; Cressy, 1995), which have defined the dependent variable as the natural log of employment growth. Defined in this way, the dependent variable can be understood as the annual growth in employment since startup. As alluded to above, however, this specification is subject by definition to a negative correlation with the dependent variable resulting in a biased coefficient on firm startup size and age. Both are found on the right and left hand size of the growth equation (see definitions below).

By examining this specification, two crucial insights are gained. One, a more direct comparison with these recent studies is achieved. Two, the effect of defining the dependent variable in this way can be gauged. One very notable difference to the above results: the interaction term for firm age is left in as some of these coefficients are significant with this specification.

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respectively.

The partial derivatives of growth with respect to firm startup size and firm age are consequently reported.

The definition of firm growth used here is consistent with Evans (1987) and Dunne, Roberts, and Samuelson (1989).

Equation 3.7

$$\ln employment = \alpha + \beta X + \gamma Z + \varepsilon$$

with

$$\ln FirmGrowth = (\ln employment_{it} - \ln startupsize_{i,t0}) / firmage$$

where α is a constant, X is a vector of time and cross sectional varying variables, Z is a vector of time invariant variables, and ε is the error term (see specification 3.4 and 3.5 for details on the exogenous variables).

Table 3.5
Cross Sectional Model of Employment Growth: 1990 thru 1994

Variables	Ending Year for Growth Model				
	1990 n=354	1991 n=360	1992 n=368	1993 n=318	1994 n=284
Dependent Variable	ln Annual Growth from Startup				
Ln Startup Size	-.2960843 (-5.329)	-.0422646 (-2.232)	-.0465315 (-2.698)	-.1177187 (-4.292)	-.1201862 (-4.427)
Ln Firm Age	-.206484 (-2.710)	-.0333079 (-1.062)	-.026136 (-.955)	.0000492 (.001)	-.0272202 (-.546)
Ln Firm Age Squared	.0274899 (1.943)	.0023201 (.450)	.0010431 (.815)	-.0030934 (-.409)	.0012247 (.153)
Ln Firm Age * Startup Size	.0967071 (4.693)	.011851 (1.888)	.0120388 (.034)	.0315852 (3.578)	.0322358 (3.782)
Constant	.3727841 (3.804)	.0939525 (2.031)	.0859612 (2.085)	.0459734 (.669)	.086056 (1.132)
R Squared	0.3256	.0656	.04722	.1512	.1727
F Value	15.45 (0.0000)	6.94 (0.0000)	8.09 (0.0000)	14.10 (0.0000)	13.59 (0.0000)
Partial Derivatives					
Firm Startup Size $_{\text{at mean}}$	-0.07538	-0.01342	-0.01631	-0.03477	-0.03287
Firm Age $_{\text{at mean}}$	-0.03233	0.085812	-0.01465	-2.4E-06	-0.00428

Source: Survey Data
Values in parentheses are t values.
Derivatives for startup size and firmage coefficients were evaluated at the mean.

Table 3.6
Complete Cross Sectional Model of Employment Growth: 1990 thru 1994

Variables	Ending Year for Growth Model				
	1990 n=345	1991 n=351	1992 n=359	1993 n=311	1994 n=277
Dependent Variable	ln of Annual Growth from Startup				
Ln Startup Size	-0.31172 (-5.191)	-0.06311 (-2.983)	-0.062 (-3.387)	-0.12819 (-4.421)	-0.14148 (-5.126)
Ln Firm Age	-0.24244 (-3.218)	-0.06222 (-1.743)	-0.04878 (-1.577)	-0.02509 (-.507)	-0.03858 (-.631)
Ln Firm Age Squared	0.037031 (2.512)	0.008415 (1.383)	0.006207 (1.177)	0.002724 (.326)	0.003911 (.385)
Ln Firm Age * Startup Size	0.097682 (4.400)	0.016347 (2.317)	0.014457 (2.391)	0.03244 (3.455)	0.037491 (4.371)
Gender	-0.03036 (-2.530)	-0.0175 (-2.829)	-0.01533 (-3.019)	-0.01571 (-2.343)	-0.0202 (-3.019)
Age of Proprietor					
<20	*	*	*	*	*
20-24	0.390534 (7.174)	(dropped) 0.0293	0.004839 (.312)	0.151611 (6.561)	0.000896 (.040)
25-29	0.42787 (7.572)	(1.493) 0.035716	0.026735 (1.560)	0.128983 (6.354)	-0.02685 (-1.370)
30-34	0.438975 (7.997)	(2.073) 0.031663	0.038704 (2.295)	0.150487 (7.171)	-0.00803 (-.437)
35-39	0.415571 (7.134)	(1.979) 0.015525	0.031633 (2.177)	0.132264 (7.142)	-0.00271 (-.146)
40-49	0.411261 (7.954)	(1.041) 0.01337	0.014291 (1.004)	0.126823 (7.044)	-0.02228 (-1.307)
50-59	0.404875 (7.609)	(.835) 0.01268	0.012685 (.849)	0.119133 (5.975)	-0.02613 (-1.365)
60-69	0.376242 (7.115)	(.847) 0.00393	0.008421 (.587)	0.114148 (5.859)	-0.03099 (-1.658)
70+	0.377791 (7.920)	(.259)	0.00509 (.328)	0.116791 (6.056)	-0.02934 (-1.633)
Education	0.007239 (.647)	0.002529 (.395)	0.002266 (.399)	-0.00384 (-.560)	-0.00612 (-.954)
Business Training	0.002216 (.158)	0.007504 (.650)	0.017927 (1.826)	0.010113 (.912)	0.004581 (.427)
Startup Credit	0.015664 (.890)	-0.00304 (-.287)	-0.00345 (-.353)	0.014812 (1.181)	0.009064 (.806)
New Credit	0.008378 (.596)	0.01217 (1.144)	0.014562 (1.514)	0.012158 (1.377)	-8.9E-05 (-.011)

Parish					
Kingston	*	*	*	*	*
St. Andrew	-0.00379	0.009142	0.018678	0.009645	0.012109
	(-.150)	(.688)	(1.558)	(.611)	(.831)
St. Thomas	-0.00123	0.012234	0.010593	-0.01201	-0.01903
	(-.035)	(.874)	(.783)	(-.672)	(-1.093)
Portland	0.024051	0.003441	-0.00838	0.017458	0.093476
	(.339)	(.110)	(-.458)	(.462)	(4.983)
St. Mary	-0.02974	-0.00323	-0.00235	-0.00468	-0.00984
	(-1.066)	(-.221)	(-.176)	(-.282)	(-.698)
St. Ann	0.000601	0.02164	0.023628	0.001415	0.011478
	(.028)	(1.304)	(1.583)	(.087)	(.690)
Trelawny	0.149678	-0.01867	-0.0168	-0.0697	-0.01928
	(1.503)	(-.853)	(-.850)	(-2.577)	(-.976)
St. James	0.024672	0.00977	0.006722	0.012986	0.003477
	(.966)	(.780)	(.596)	(.926)	(.188)
Hanover	-0.01455	-0.00957	-0.00629	-0.01156	-0.01091
	(-.541)	(-.799)	(-.562)	(-.736)	(-.738)
Westmoreland	-0.00086	0.007647	0.005927	-0.01163	-0.02456
	(-.039)	(.536)	(.461)	(-.716)	(-1.511)
St. Elizabeth	-0.03701	-0.00669	-0.00476	-0.01443	-0.02121
	(-1.694)	(-.582)	(-.454)	(-1.079)	(-1.631)
Manchester	0.022508	0.01014	0.013604	0.00567	-3.2E-05
	(.836)	(.621)	(.956)	(.324)	(-.002)
Clarendon	0.002229	0.013303	0.011387	0.006611	-0.0024
	(.088)	(.792)	(.824)	(.446)	(-.153)
St. Catherine	-0.00514	0.015487	0.011837	-0.00296	-0.00634
	(-.288)	(1.130)	(.977)	(-.195)	(-.401)
Location					
Private Home	*	*	*	*	*
Private Yard	0.018178	0.006446	0.015161	0.020886	0.009736
	(1.200)	(.756)	(1.720)	(2.212)	(1.128)
Leased Land	0.05967	0.022611	0.028751	0.052695	-0.01228
	(2.689)	(1.383)	(1.959)	(3.406)	(-.959)
Open Land	0.002987	0.034634	0.019369	0.025205	0.024489
	(.113)	(1.554)	(1.690)	(1.922)	(1.621)
Roadside	-0.00339	-0.00711	0.00461	0.025794	-0.00059
	(-.121)	(-.470)	(.354)	(1.436)	(-.038)
Commercial	0.023209	0.01389	0.015585	0.025466	0.005213
Bldg.	(1.688)	(2.105)	(2.919)	(3.203)	(.678)
Market	0.015813	0.007214	0.010631	0.022714	0.006352
	(.674)	(.747)	(1.102)	(2.047)	(.634)
School Gate	0.1156	0.034992	0.023744	0.015718	0.001317
	(1.990)	(1.243)	(1.532)	(1.201)	(.112)
Other	0.036173	0.011132	0.008025	0.022346	0.011234
	(1.350)	(.938)	(.775)	(1.102)	(.556)
Rural/Urban	-0.01795	-0.00485	-0.00462	-0.00036	-0.00346
	(-1.394)	(-.685)	(-.733)	(-.046)	(-.460)
Constant	-0.0043	0.099972	0.077748	-0.06864	0.128909
	(-.063)	(2.120)	(1.959)	(-1.040)	(1.497)
R Squared	.4680	.1980	.2649	.3197	.3468
F Value	145.80	1.57	2.32	59.08	5.52
	(0.0000)	(0.0000)	(0.0000)	(0.0000)	(0.0000)

Partial Derivatives					
Firm Startup Size at mean	-0.08879	-0.02332	-0.02571	-0.04089	-0.03994
Firm Age at mean	-0.02424	-0.01272	-0.01011	0.006262	0.001575

Source: Survey Data
Values in parentheses are t values; Parial derivatives are calculated at mean values.
All equations estimated using the sandwich estimator of variance.

Tables 3.5 and 3.6 report the results for both the short and extended models. The coefficient for each variable is listed, followed by the t value in parentheses. The model is significant for all years, and the R squares range from .05 to .47. The Huber correction is applied in all instances. In general, these models exhibit lower R squares and F statistics compared to the model in log levels. In reviewing the results, comments will first focus on the interpretation for Jamaican microenterprise, followed by a discussion of model performance compared to the specification in the prior section. In general, the results are fairly consistent across the models, with the caveat that firm age obtains strikingly different results.

First, these results indicate again that firm startup size is inversely related to firm growth. As the interaction terms remain in this model, the partial derivative between startup size and firm growth reveals the relevant relationship. These values range between -.01 to -.08 in the different years. The pattern of the fluctuation in the coefficient is similar to the pattern for the model in levels, and as discussed above, this may reflect the shifts in the macro economy over the time period. These results match with any number

of earlier studies on the relationship between firm startup size and growth (see Table 3.4). Specifically, Mata (1994) and Evans (1987) report coefficients of -.021 and -.072 respectively. Dunne, et al (1989) reports a coefficient of -.29. The sign on this coefficient, however, indicates a slightly smaller negative relationship with firm growth than the previous model, reflective of the negative bias introduced into the estimation with this definition of the dependent variable.

Second, the most striking deviation from the previous findings is with regard to firm age. To begin with, the coefficient on firm age is at least marginally significant in all of the years (in 1990, F=12.55; 1991, F=3.21; 1992, F=4.08; 1993, F=4.08; and 1994, F=9.00). This stands in direct contrast to the previous model results, where the hypothesis of no relationship between firm growth and firm age could not be rejected. Further, the coefficient on firm age is negative (1990 - 1992) or positive and close to zero (1993-1994), which again contrasts with the previous results but is consistent with some of the most recent findings in the literature confirming a negative relationship with firm growth (Evans, 1987 or Mata, 1994, for example). Similar to the context of firm size and growth, the most plausible reason for the result in this research is the negative correlation between the dependent variable and the firm age variable. This draws into question, however, the results from many of the previous studies which have landmarked the result on firm age as support for several very important theoretical models. For

these Jamaican data, the bias effects the sign and significance on the coefficient.[20]

The other results from this model are broadly consistent with the findings and discussion from the previous section, and hence will not be reviewed here. However, two elements surface that do bear mention, both relate to 1992: the dummy variable business training and access to new credit become weakly significant. A surprising finding at this point has been the lack of importance of both education and access to credit to firm growth. Education is an important measure of human capital accumulation, as well as innate ability, desire for success, and other dimensions. In this analysis, firm age and age of the proprietor also measure some aspects of these dimensions. Access to credit, on the other hand, may simply suffer from under reporting of information on this sensitive topic. In either case, the results for 1992 can be at least recognized as pointing toward the possibility

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[20] To provide clarity to this issue, a fixed effect model was estimated to yield an unbiased estimate of firm age. In a fixed effect model, if all of the explanatory variables are exogenous, the covariance estimate is best linear unbiased. Even in the case where there are omitted individual attributes, which is likely the case with the Jamaican data, the fixed effects estimates do not suffer. For this estimation, however, only the firm age variable is modeled. This is because all of the time invariant variables drop out in a fixed effect model, and a lagged variable (and interaction) on firm size is dropped to avoid the negative correlation in the model. The results of this examination, however, yielded a model with a very low R squared and F value, and coefficients on firm age and firm age squared which were insignificant (the results can be found in Appendix B). This result is consistent with the outcome of the first model specification, where the null hypothesis for firm age cannot be rejected (equation 3.1, table 3.2). Although this result cannot refute the outcome of the second model, it builds support

of relevance. More focused research on both of these issues is needed to unravel these questions.

Finally, the model in log levels from the previous section capitalizes on several advantages. First, the negative bias resulting from the inclusion of startup size and firm age on both sides of the equation is manifested in biased estimates on both of the variables. Second, the predictive power of the second set of models clearly suffers, with falling R squares and F values for model significance. Although these measures don't represent the definitive measure of the best model, the inconsistent results in the age and size variable do point to the strengths of the previous specification.

3.6 Conclusions

This chapter examined long term growth dynamics through the lens of a cross sectional analysis. In so doing, classic questions were addressed on the drivers of firm growth, such as the relationship between growth and firm size or age. Two different approaches were adopted, enabling a comparison to the bulk of previous research, as well as providing insight into how the two approaches affect the results. Further, as the data covered a five year time span, a unique cross year viewpoint was achieved.

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for rejecting firm age by itself as a key defining dimension of growth for Jamaican microenterprise.

Three important findings sum up the results. First, the Jamaican data clearly refute Gibrats law for this sample of firms, although the magnitude of the inverse relationship was small in magnitude in most of the years. Secondly, The model in levels reveals that firm age is not negatively related to firm growth as posited by Jovanovic (1982), although the age of the proprietor is related to firm growth. Finally, the results on firm age appear sensitive to the definition of the dependent variable leading to some contradictory results. In the remaining sections, this potential bias will be accounted for.

The next chapter extends this analysis by again tapping into the richness of panel data. In the following chapter, long and short run dynamics will be addressed through some common panel data econometric techniques, hopefully to shed some additional light on these complex issues. Further, some of the potential bias and estimation difficulties inherent in these type of data will be addressed.

CHAPTER IV

A PANEL DATA MODEL OF LONG AND SHORT RUN DYNAMICS FOR JAMAICAN MICROENTERPRISE

4.1 Introduction

The last chapter related some key insights of firm growth based upon a cross sectional OLS analysis. By reviewing the performance of these micro firms over time, some light was shed on aspects of firm dynamics. The models presented thus far, however, have been linear static and not truly dynamic. A genuine dynamic model by definition incorporates elements of a firms past performance into the specification. This type of analysis is not possible in a cross sectional approach. Panel data presents the potential for this type of analysis, and provide several additional analytical benefits, only a few of which have been fully exploited thus far.

The objectives of this chapter are threefold. The first objective is to re-examine the firm startup size and growth conundrum utilizing a panel data model. The analysis adopted here fundamentally extends the cross sectional analysis of Chapter III by incorporating all the years into an OLS regression. As this analysis follows the same specification as the model in employment levels, the results here should highlight the added insight of incorporating the time dimension into the regression framework.

The second objective, an extension of this analysis, forges new ground as panel data econometric techniques will be utilized to explore firm growth, both in the long and short run. Significantly, a dynamic model of firm growth will be introduced, incorporating a lagged dependent variable into the model specification.[36] Further, the models thus far have assumed that the variables are measured without errors. This assumption is somewhat suspect, due to recall error on the part of the proprietor and other sources of error. For this analysis, an Instrumental Variable (IV) approach will be introduced to account for this type of error.[37] Additionally, very few theories of long run growth for micro firms have been developed (McPherson, 1992; Evans, 1987), and even less discussion has focused on short run growth issues. The discussion here hopes to shed some light on the connection between the two.

The final objective addresses the effects of attrition bias on this data.[38] Panel data does not come without some special restrictions, and perhaps one

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[36] A lagged dependent variable model is in essence equivalent to a Koyck distributed lag after appropriate transformations. However, in a lagged dependent variable model, the principal estimation challenge appears when the disturbance is generated by white noise. This results in a disturbance term that is essentially an MA (1) process. To yield consistent estimates of the parameters, an IV approach is required.

[37] Additionally, an OLS lagged dependent variable model will be inconsistent. Hsiao (1986) shows, however, that an appropriate choice of an IV variable will result in consistent estimates.

[38] Another issue is firm heterogeniety (firm fixed effects), which theoretically play a significant role in this data. A few comments in this regard are in line. A fixed effect model was fitted to the above data, with very poor model results. The model is not reported here, in part because a fixed effect model with a lagged dependent variable does not produce consistent estimates. Even with the poor model fit, however, the result on lagged employment was in line with the one other study leveraging this technique to examine firm

of the most troublesome data problems introduced by the use of panel data is the issue of attrition bias. In the final section, the general approach adopted by Hall (1987) will be used to address the issue.

In section 4.2, the firm startup size panel model is reviewed. Sections 4.3 and 4.4 examine long and short run firm dynamics, respectively. Panel data estimation issues are dealt with in section 4.5, followed by conclusions.

4.2 A Panel Data Econometric Approach to Firm Startup Size and Firm Growth

This section extends the analysis of the previous chapter by re-examining the relationship of firm growth to firm size and age in a panel data model using OLS. The same model specifications are used, with the added advantage of multiple observations on each firm over time. Seasonal dummies are also incorporated. As the variables in this regression are all

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growth. Mata (1994) found that the coefficient on firm size obtained a negative relationship to firm growth, but with a sizeable adjustment in coefficients from the OLS estimate. The coefficient on the Jamaican data was -.39; Mata's estimate was -.54. The firm fixed effects were highly significant. An IV fixed effect model was also fitted. Here again, very poor model results obtained, and additionally, the coefficients were very sensitive to the choice of instrumental variable. Polachek and Kim (1994), in modeling household income in a fixed effect framework, found their results very sensitive to the choice of the IV variable. The Jamaican data were too limited to leverage these techniques. Great promise is held out for this type of analysis, however, as the method deals with several important estimation issues that arise in panel datasets.

time invariant,[39] the typical transformations available to correct for some data problems are not available. As such, the contribution of this section is to search for the added insights of a panel data OLS model. Equation 4.1 details the specification.

Equation 4.1

$$\ln employment_{i,j} = \alpha + \ln startupsize_{i,j} + \ln firmage_{i,j} + 4seasonals_{i,j} + gender_i + ageproprietor_i + preeducation_i + posttraining_i + precredit_i + postcredit_i + location_i + parish_i + ruralurban_i$$

The model results are in Table 4.1 below. As above, two models are presented, a short model which only includes firm size, firm age and seasonal variables as explanatory variables, and an extended model taking into account firm and proprietor characteristics. A logarithmic expansion of the growth function was estimated for both models. The extended model improves the model fit slightly, with an R squared of .48 compared to .40. For both models, the Huber correction for heteroskedasticity accounting for clustering of firms is applied.

[39] Firm age is the one exception, and this is dealt with elsewhere in the text.

Table 4.1
Five Year OLS Employment Growth Model

	Model 1 N=1684 379 firms		Model 2 N=1643 370 firms	
	Coefficient	**P value**	**Coefficient**	**P value**
Dependent Variable	**ln employment**		**Ln employment**	
Startup size	.6962719	19.710	.6170117	15.911
Firm age	-.0128839	-0.424	.0661368	1.969
Gender of Proprietor	-	-	-.1574036	-3.697
Age of Proprietor	-	-		
<20			*	*
20-24			.268101	2.460
25-29			.2608241	2.386
30-34			.4158768	3.722
35-39			.3105838	3.072
40-49			.1892112	1.759
50-59			.16435	1.352
60-69			.1355531	1.143
70+			.0790258	0.547
Educational Level	-	-	-.0263523	-0.603
Post Ed Busin. Training	-	-	.0750184	0.997
Startup Credit	-	-	.0133315	0.155
Post Startup Credit	-	-	.1135461	1.467
Parish	-	-		
Kingston			*	*
St. Andrew			.0866349	0.807
St. Thomas			.0163732	0.085
Portland			.0857377	0.461
St. Mary			-.1034706	-0.806
St. Ann			-.0224107	-0.193
Trelawny			-.1747776	-1.045
St. James			.003377	0.033
Hanover			-.187618	-1.822
Westmoreland			-.1207025	-1.064
St. Elizabeth			-.2415492	-2.513
Manchester			-.0462043	-0.416
Clarendon			-.0403963	-0.346
St.Catherine			-.0723765	-0.664

Firm Location	-	-		
Private Home			*	*
Private Yard			.162951	2.577
Leased Land			.3825079	3.323
Open Land			.3622509	3.220
Roadside			.1441124	1.921
Commercial Bld			.1913614	4.186
Market			.0711994	0.812
School Gate			.286635	1.423
Other			.2335346	2.203
Rural/Urban	-	-	-.0855591	-1.869
Seasonals	.0760083	2.405	.0590485	1.831
	.0736933	2.363	.0511123	1.589
	-.040665	-1.195	-.0692273	-2.000
	-.0595526	-1.588	-.0888224	-2.319
Constant	.3119695	3.863	-.0529923	-0.357
R squared	0.3970		0.4812	
F value	81.07 (0.0000)		24.95 (0.0000)	

Source: STATIN Survey Data

a. Figures in parentheses are the t probabilities

Overall, these results are congruent with the cross sectional analysis. First of all, the inverse relationship between firm growth and firm size is confirmed ($\beta<1$). Similarly, the coefficients on the age of the proprietor are jointly significant and positive, with individually significant coefficients for the younger cohorts. The results for gender, firm location, and parish are all significant, and the education of the proprietor and access to firm credit continue to lack explanatory power in the model. In the broad stroke, this model confirms the majority of the findings from the log employment in Chapter III.

Three differences appear in these results, however. First, in the short model firm age is insignificant, but in the extended model, the relationship

with firm growth is "weakly significant"[40] and marginally positive. The result on firm age has been inconsistent across the models, ranging from highly insignificant and negative to significant and positive. The relationship between firm age and growth for Jamaica remains somewhat unclear.

Second, the seasonal dummies are significant across the five year period. This reflects the significance for microenterprises of the deviations taking place from year to year in the Jamaican economy, and confirms the importance of the fluctuations observed in the year to year analysis of Chapter II. In themselves, the dummies don't offer any actionable insights, but does point to the sensitivity of these micro firms to seasonal effects.

Finally, the rural or urban location of the firm obtains weak significance as well, with rural firms negatively related to firm growth. In contrast, the cross sectional analysis revealed a rural/urban result consistently and unequivocally insignificant. Again, by incorporating the entire time frame into the analysis this subtle effect on firm growth becomes apparent.

In summary, this panel model did not provide inherently different results from the cross sectional analysis. The additional "weakly significant" results hardly justify in itself the added expense and effort involved in collecting this type of data. But the data specification adopted in this chapter mirrors the cross sectional analysis (with the exception of the seasonal term). As such, it does not tap into some of the important benefits that panel data

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[40] This phrase is used by Arrighetti (1995)

have to offer. In the next section, the model specification will be changed to include a lagged dependent variable, and introduce new estimation techniques to provide better insights into dynamic issues.

4.3 Long Term Employment Growth Revisited: A Panel Data Lagged Dependent Variable Approach

4.3.1 Introduction

Firm dynamics have been considered extensively above, mostly from the vantage point of how a firm changes and reacts to change over time. In this section, firm dynamics will be modeled explicitly, by the inclusion of a lagged dependent variable. Further, the models in the next two sections use Instrumental Variable techniques in estimation, to control for measurement error in the regressor and thereby obtain consistent and efficient estimates of the OLS coefficients.

The use of lagged employment represents a unique approach in the investigation of firm growth. Section 4.3.2 reviews the results, followed by conclusions in section 4.3.4. In Section 4.4, a similar approach will be used to unpack short term dynamics.

4.3.2 Five Year Dynamic Employment Model: Results

These data are unique as they span a period of five years, and further, they provide detailed insights into firm dynamics over the period as they track employment on the same group of firms. The model specifications adopted here are similar to the those above, with two exceptions: firm startup size is dropped and a lagged dependent variable is added to capture the year to year dynamic effect. Equation 4.2 details the specification, and Table 4.2 reviews the results:

Equation 4.2

$$\ln employment_{i,t} = \alpha + \ln employment_{i,t-1} + \ln firmage_{i,t} + 5seasonals_t + gender_i + ageproprietor_i + preeducation_i + posttraining_i + precredit_i + postcredit_i + location_i + parish_i + ruralurban_i$$

Two models are presented below. The first column summarizes an OLS lagged dependent variable model. The second column review an OLS IV model, using an additional lag on employment as an instrument (Hsiao, 1986; Hall, 1987). Based upon the choice of instrument, the analyzable sample size shrinks to 869 observations and 339 firms. Both models are constrained to this sample size so the results can be more appropriately compared. The findings are not affected by the decreased sample size, however. This is demonstrated in an alternative OLS model which does not constrain the

sample (see results in Appendix B). Finally, findings are only presented for a model excluding the firm age nonlinear and interaction terms. These variables were insignificant when added to the model, and hence dropped from consideration (see Appendix B).

Table 4.2
Five Year ln ln Dynamic Employment Model: Jamaican Microenterprise, 1990-1994

Coefficients	OLS Model 1 n=869 338 firms	OLS IV Model 2 n=869 338 firms
Dependent Variable	**ln employment**	**ln employment**
Ln lagged employment (t-1)	.787118 (35.638)	.8084351 (27.899)
Ln Firm Age	.0245622 (1.145)	.0219542 (1.048)
Gender of Prop	-.043786 (-1.830)	-.0369045 (-1.551)
Age of Proprietor		
<20	*	*
20-24	-.4537308 (-6.963)	-.4556488 (-7.094)
25-29	-.6665265 (-9.542)	-.6732817 (-9.545)
30-34	-.5352847 (-7.946)	-.5449269 (-7.932)
35-39	-.5706178 (-9.308)	-.5787424 (-9.306)
40-49	-.6191627 (-10.737)	-.624691 (-10.883)
50-59	-.6587063 (-9.687)	-.6616356 (-9.869)
60-69	-.6600146 (-9.723)	-.6613702 (-9.920)
70+	-.6398738 (-8.384)	-.639256 (-8.504)
Level of Education	-.009941 (-0.383)	-.0110496 (-0.435)
Post – Education Business Training	.0004343 (0.013)	-.0015957 (-0.048)
Startup Credit	.0498556 (1.294)	.0450554 (1.214)
Post-Startup Credit	.0471863 (1.378)	.0428418 (1.273)

Parish		
Kingston	*	*
St. Andrew	.0770678 (1.347)	.0728824 (1.287)
St. Thomas	-.0621149 (-0.706)	-.0666472 (-0.783)
Portland	.0755952 (0.625)	.0740498 (0.616)
St. Mary	-.1041558 (-1.605)	-.1084765 (-1.699)
St. Ann	-.0206224 (-0.341)	-.0246243 (-0.411)
Trelawny	-.2013154 (-2.406)	-.196786 (-2.371)
St. James	.003109 (0.051)	.0033352 (0.056)
Hanover	-.0588212 (-0.971)	-.0564228 (-0.956)
Westmoreland	-.0973743 (-1.441)	-.0970599 (-1.463)
St. Elizabeth	-.079697 (-1.547)	-.0792561 (-1.573)
Manchester	-.0006133 (-0.010)	.0000972 (0.002)
Clarendon	.0023012 (0.037)	.0009705 (0.016)
St.Catherine	-.0422042 (-0.744)	-.046546 (-0.830)
Location of Business		
Private Home	*	*
Private Yard	.0744865 (2.116)	.0702571 (2.009)
Leased Land	-.0008855 (-0.015)	-.0107978 (-0.194)
Open Land	-.1308237 (-1.018)	-.1365694 (-1.020)
Roadside	.1321281 (2.222)	.131509 (2.243)
Commercial Bld	.0698569 (2.485)	.0622446 (2.220)
Market	.0655286 (1.487)	.062072 (1.489)
School Gate	.064718 (1.229)	.0570277 (1.160)
Other	.1134357 (1.443)	.1099734 (1.426)
Rural or Urban	.0076436 (0.290)	.0118417 (0.469)

Seasonals	- - .1147208 (1.580) -.0007968 (-0.010) .0455494 (0.603)	- - .1059489 (1.443) -.0094401 (-0.121) .0392187 (0.517)
Constant	.5675724 (5.227)	.5764395 (5.304)
IV Variable Used		
Lagged Employment (t-2)	NO	YES
R squared	0.7184	0.7180
F Value	129.88 (0.0000)	215.57 (0.0000)

Source: STATIN SURVEY DATA
Note: All values in parentheses are t values.

Overall, the model performed well, with an R squared of .72 for both models, and an F ranging from 129.88 to 215.57, significant at the 99% level. This is an improved fit compared to the cross sectional model, and the IV result reflects a slightly improved fit over the OLS model. The Huber correction adjusting for clusters of firms was used in both models. The model results were consistent and stable across different sample schemes and specifications. This contrasts with the cross sectional model which was sensitive to changing specification, time and variable definitions.

The IV estimation was introduced to correct for the presence of measurement error, but the results reveal little evidence of bias due to measurement error or the deleterious effects of introducing a lagged

dependent variable. Between the models, the shift in the magnitude of the coefficients is minimal, and in only one case does the sign change (education). In that case, however, the coefficient is insignificant and close to zero. Measurement error plays a very small role in these results. Given that measurement error poses so many problems in panel data (Ashenfelter, 1986; Hsiao, 1986), this result validates the data and enumeration methods used.

The overall findings reveal some common ground and important differences to the cross sectional OLS model. Similar to the models of section 4.2, significant results obtain for firm size (lagged employment), gender of the proprietor, age of the proprietor and location. However, these five year data also reveal several differences with the earlier models, both in the magnitude of some of the coefficients as well as in the significance of some additional variables.

To begin with, the dynamic relationship between lagged employment and employment follows the inverse pattern observed in the previous model between startup size and employment. The coefficient on lagged employment is less than one and significant in both models, indicating a clear negative relationship between lagged employment and growth. The IV specification does not change the coefficient appreciably. Measurement error, therefore, does not play a large role in coefficient bias for startup size. The negative relationship between prior year firm size and growth can be interpreted as an additional refutation of Gibrat's law. Even over a short period of time, firm

size and growth follow the negative relationship posited by Jovanovic and others.

Second, the coefficient on firm age, similar to the cross sectional model, is not significant and is positive. As discussed above, this is contrary to the evidence from several other countries and the theoretical model of Jovanovic. Further the non-linear relationship between firm age and growth is refuted in these results (Appendix II). However, the categorical variable for the age of the proprietor is jointly significant (F=16.58, P>F = .0000).[41] In both models, the coefficients for age of the proprietor have a negative sign with a trend toward an increasing negative magnitude. In other words, firms with older proprietors grow slower, but older firms don't necessarily grow slower.[42] Although the trend in the coefficients between the youngest to oldest proprietors doesn't follow a linear or even consistent trend, the youngest proprietors do consistently grow faster than the oldest (-.45 to -.63, youngest to oldest respectively).

A third result regards firm credit, and is laden with caveats. The result is found in Appendix II, where the full sample OLS models are reviewed. In these models, there is a positive relationship between

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[41] This F value is for the OLS IV model.

[42] In another approach to unpack the firm age finding, a fixed effect model was run with just firm age as the explanatory variable. In a fixed effect model, firm heterogeneity is accounted for in the firm fixed effects, implying these effects will not be confounded with firm age. The model results revealed a negative but insignificant coefficient on firm age and firm age squared, highly significant fixed effects, but a very poor model fit (low R squared and F statistic). This model did not bring resolution to this issue.

employment growth and credit, both for startup and post-startup credit. Importantly, this model reports a significant relationship between startup credit and firm growth (t value = 2.205), and a nearly significant relationship between post-startup credit and growth (t value = 1.767). These results, however, become insignificant in the IV model. Disappointingly, the driver of the insignificant IV result cannot be fully understood, as it can be due to declining sample size or to measurement error corrected by the IV estimation. This finding, however weak, has significant implications for GO or NGO programs which desire to influence the growth of microenterprises.

Fourth, the location of the firm is an important determinant of firm growth. Both the physical location of the place of business and the parish the business operated in is significantly related to firm growth. The parish variable is jointly significant (F = 1.87, P>F = 0.0403), and only two coefficients on parish obtain individual significance. This might reflect the differing levels of macroeconomic growth occurring in the different localities. Regarding the physical location of the firm, firms in more established locations (commercial buildings and markets) have a greater positive effect on firm growth.[43] Very significantly, the coefficient is positive and significant for commercial buildings. In the IV model, a negative relationship obtains for firms located on open or leased land. The location of a firm between a rural or urban area has no effect on growth. Fisseha's (1993) 12 year retrospective

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[43] The F statistic for firm location is F=1.89 for the OLS IV model.

dynamic study reveals little difference between rural and urban firm growth rates as well, supporting these results.

As a fifth finding, the gender of the proprietor matters in this representation as well. The coefficient on gender is highly significant, and the negative sign on the coefficient confirms the negative relationship between female proprietors and firm growth. This result finds support in Hotchkiss and Moore (1996), who report on earning differentials in the formal sector in Jamaica. In particular, they report that compensation differentials range between 49% to as little as 2% to that of their male counterparts, depending on the occupation. They further report that these differentials are not the result of different job market characteristics between men and women, but that the market simply treats men and women differently when it comes to compensation.

Sixth, a surprising result thus far is the lack of significance of education or business training on firm growth. Polachek and Kim (1994) explored this phenomena in a different context. For a fixed effect model, these authors suggest that education or training might influence the slope and not the intercept. Specifically, more motivated workers would have steeper earning slopes than their counterparts. What they found, however, was that a fixed effects model with time varying slopes did not do a better job than a model with just shifting intercepts. This leads them believe that motivation impacts the proprietor early in their life in their choice of

education and training, but the education does not impact them continuously through time. This provides a plausible explanation for the lack of significance on these variables.

A final issue not addressed explicitly in any of the models above is the persistence of past growth on current growth. This is a corollary of Gibrat's law, and has been examined in several papers, most notably perhaps by Chescher (1979). The significance of lagged employment as an explanatory variable suggests but does not confirm the persistence of growth. To asses this, an OLS model in first differences was run, which in effect redefines the dependent variable explicitly as growth, and the exogenous variable of lagged employment as lagged growth. Tested in this way, verification of the persistence of growth also tests for presence of serial correlation in the data (Dunne, et al 1994). The OLS first difference model provides the additional advantage of sweeping out measurement error and the effects of firm heterogeneity.

Similar to the fixed effect model, however, the results of this model were very weak (R squared of .03) and the F statistic was not significant. This indicates the hypothesis that the coefficients were equal to zero could not be rejected. No clear indication of the persistence of growth or of serial correlation can be confirmed through this model. The conclusion supported here is that past growth is not a good indicator of future growth.

4.4 Short Term Employment Growth Revisited: A Panel Data Lagged Dependent Variable Approach

4.4.1 Introduction

The last section focused on long run dynamics. Do the relationships identified in the long run, however, pertain in the short run? Do different factors affect the growth pattern? The analysis of this section focuses on short run dynamics, examining firm growth on a quarter to quarter basis over the two year time period between 1993 and 1994 . The treatment here is unique in that roughly the same group of firms included in the long run analysis are considered here in the short run.

The same model specification and estimation techniques used to examine long run growth are adopted here. Section 4.4.2 examines results, followed by conclusions in section 4.4.3.

4.4.2 Quarterly Employment Panel Data Model: Results

The model adopted in this section follows the lagged dependent variable specification of the last chapter; the data definitions are exactly the same as well. OLS is employed to estimate the model in equation 4.3. The Huber correction adjusts for heteroskedasticity. The complete specification follows:

Equation 4.3

$$\ln employment_{i,t} = \alpha + \ln employment_{i,t-1} + \ln firmage_{i,t} + 6seasonals_i + gender_i + ageproprietor_i + preeducation_i + posttraining_i + precredit_i + postcredit_i + location_i + parish_i + ruralurban_i$$

Each of the hypotheses dealt with in the above chapter will be treated in turn. As above, the model excludes firm age interaction terms, but these results are available in Appendix III. Instrumental variable techniques are employed in both models to control for measurement error. Table 4.3 summarizes the results.

Table 4.3
Quarterly ln ln Dynamic Employment Model: Jamaican Microenterprise, 1993-1994

Coefficients	OLS (A) n=650 266 Firms	OLS IV (B) n=650 266 Firms
Dependent Variable	**ln employment**	**ln employment**
Ln lagged employment (t-1)	.7357824 (22.783)	.880222 (27.225)
Ln Firm Age	.0423203 (2.085)	.0210071 (1.161)
Gender of Prop	-.0791643 (-2.957)	-.046219 (-1.933)
Age of Proprietor	*	*
<20		
20-24	.1250795 (1.668)	.0858123 (1.286)
25-29	.0629241 (0.912)	.0533443 (0.867)
30-34	.0787337 (1.158)	.0346441 (0.584)
35-39	.1092747 (1.484)	.07161 (1.111)
40-49	.0163726 (0.234)	.0141279 (0.220)
50-59	.0008491 (0.012)	.0029977 (0.051)
60-69	.0090302 (0.116)	.0239949 (0.341)
70+	-.1307186 (-1.456)	-.0978818 (-1.257)
Level of Education	.0297357 (1.011)	.0239982 (0.919)
Post – Education Business Training	.0055823 (0.125)	-.0200684 (-0.560)
Startup Credit	.037407 (0.781)	.0159523 (0.402)
Post-Startup Credit	.0603361 (1.240)	.0179819 (0.458)

Parish		
Kingston	*	*
St. Andrew	.0354801 (0.450)	-.0195355 (-0.281)
St. Thomas	.0436889 (0.510)	.0400882 (0.562)
Portland	.1123851 (0.660)	.0533679 (0.309)
St. Mary	.1467945 (1.131)	.1192002 (0.907)
St. Ann	-.0335053 (-0.427)	-.0317658 (-0.435)
Trelawny	.1604453 (1.375)	.120242 (1.081)
St. James	-.1586495 (-1.290)	-.1419171 (-1.089)
Hanover	-.1751188 (-1.870)	-.1341456 (-1.449)
Westmoreland	-.1291804 (-1.585)	-.1029261 (-1.416)
St. Elizabeth	-.0856099 (-1.211)	-.0731962 (-1.145)
Manchester	-.0453301 (-0.585)	-.0630914 (-0.934)
Clarendon	-.0024488 (-0.030)	-.0068074 (-0.093)
St.Catherine	-.0159559 (-0.213)	-.0257596 (-0.364)
Location		
Private Home	*	*
Private Yard	.0615752 (1.573)	.0310576 (0.900)
Leased Land	-.1196253 (-1.090)	-.1542618 (0.480)
Open Land	-.0274377 (-0.383)	-.0569805 (-0.914)
Roadside	.0021048 (0.039)	-.0175273 (-0.335)
Commercial Bld	.0593655 (2.011)	.0415204 (1.667)
Market	.1727609 (1.583)	.1505956 (1.815)
School Gate	.0090017 (0.197)	.0128119 (0.381)
Other	.0704684 (1.445)	.0637825 (1.860)
Rural or Urban	-.0210042 (-0.718)	-.0137706 (-0.553)

Seasonals	- - .041549 (0.957) .0542327 (1.291) .0001543 (0.004) .0731273 (1.929)	- - .0338299 (0.737) .0539587 (1.236) -.0044954 (-0.117) .0726132 (1.803)
Constant	-.0276314 (-0.247)	-.0231142 (-0.220)
Instrumental Variable		
Lagged Employment (t-2)	NO	YES
R squared	0.7122	0.6965
F Value	76.18 (0.0000)	129.23 (0.0000)

Source: STATIN Survey Data
All values in parentheses are t values.

The quarterly dynamic model exhibits a good fit, and many of the factors driving long run dynamics appear to affect the short run as well. But first, the R squared varied between .69 and .71, with F values between 76 and 129. The IV variable used here is $y_{i,t-2}$, which satisfies the requirements of an IV (Hall, 1987; Hsiao, 1986). The IV specification improves the fit slightly, and results in slight shifts in all of the coefficients. This suggests that measurement error does play a role in coefficient bias. In other words, for these short run results, correcting for measurement error is an important step in obtaining consistent estimates. In the models from the previous section, the IV specification improved the fit for the OLS model only slightly, and resulted in just minor shifts in some of the coefficients.

The first set of comments will focus on quarterly dynamics, followed by a discussion of the relationship to the long run findings. The first result is regarding the relationship between firm size and growth. The coefficient on lagged employment is less than one, meaning firm size in the previous quarter is inversely related to quarterly employment growth. The magnitude of the coefficient is very much in line with the other results. Indicative of a correction for measurement error, the coefficient for the IV model shifts closer to 1, to .88. The IV variable makes a sizeable adjustment to the parameter estimate on lagged employment, much more so than in the five year model. Assuming the IV estimator is behaving properly, this suggests the presence of more measurement error in the short run data.[44] In summary, the inverse relationship on lagged employment points to the importance of small firms in affecting short term firm growth. The policy implication is clear: the smallest firms deserve attention, if not special attention.

This result suggests that Gibrat's law is invalid, even for the short run, and builds more support for Jovanovic's 1982 theory. Beyond the theoretical explanation of this result provided by Jovanovic, however, sample attrition may contribute to this result (although it cannot be confirmed). As this sample included firms with between 1 – 10 total employees (including sole-proprietorships as well), firms that quickly grew beyond the size of 10 are excluded as well as firms that failed. Since the sample frame dates back to

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[44] Appendix III reviews the full sample model. In these results, the small shifts in the coefficients between models 4a and 4b, and between 4d and 4e,

1990, the possibility exists that the firms left in the sample were the smallest firms that are still growing and the larger microenterprises that have hit their efficient size. As there is no data for firms larger than 10 employees, there is no way to gauge the extent of this potential bias.

The second result regards firm age and age of the proprietor. First, the OLS results reveal a positive weakly significant relationship between firm age and growth. Correcting for measurement error, the IV results negate this finding. The age of the proprietor, however, is once again significant, with coefficients gravitating from slightly positive to negative for the oldest proprietors.[45] For microenterprises, this result has intuitive appeal, as the proprietor takes a very visible and controlling role in the firm. This has an important efficiency implication as well. Firm efficiencies are not necessarily passed down from generation to generation or owner to owner, but must be learned new by each proprietor. This supports Cressy (1996), who incorporates the age of the proprietor (not the firm) in his model of firm growth. Different from the five year results, however, the proprietors in the middle of the age distribution grow faster than the youngest and oldest proprietors. One reason for this difference is that proprietors with some experience are able to better manage the short run fluctuations and shocks which apparently heavily effect these micro firms (see Chapter II for details

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indicates that the shifting sample plays little role on the estimation.

[45] The F statistic for joint significance of the age of the proprietor is F=2.30.

A third and final finding comes from a result in Appendix III and regards the firms access to credit. In a full sample OLS model (column 4d) without firm age interaction, the coefficient on post-startup credit is positive and weakly significant (t value = 1.791). This finding suggests that in the short run life cycle, access to operations credit positively influences firm growth, which finds support in Otero and Rhyne (1994), who posit that short run operating needs are the most important for microenterprises. The results here are only weakly significant and do not distinguish between operating loans and capital expenditures. The significance once again points to the potential importance of access to credit for firm growth.

Regarding long and short run dynamics, the environment appears remarkably consistent, particularly good news for policy makers! First of all, the magnitude and sign on the coefficients were generally consistent across the long and short run models. In the short run model, the coefficient on firm size was slightly closer to one; the coefficient on firm age was insignificant; and the other human capital and firm demographic variables were consistent as well. One interesting difference relates to the positive relationship between the age of the proprietor and short run growth; this contrasts with the long run result where the relationship was negative. Although both sets of coefficients trend the same direction, this difference may reflect the different human capital dynamic between the short and long run. This variable in the long run reflects firm learning; in the short run, the variable

may just reflect proprietor energy or enthusiasm. Other than this one exception, the long and short run dynamics reveal remarkably similar patterns overall.

4.5 Attrition Bias

Several forms of estimation bias have been dealt with in the text. These include measurement error, inconsistent and inefficient estimates due to a lagged dependent variable, hetereoskedasticity, and serial correlation. Before discussing conclusions, however, the very important issue of attrition bias and the validity of the sample needs to be considered.

Attrition is a common problem with panel data, and there are many reasons why firms may drop out of the sample. With a panel, unlike a cross sectional study, respondents might grow tired of answering the enumerators question(s) on an ongoing basis, the household or firm might change location, or if large distances need to be traveled to interview the respondent, only one chance might be allowed for the interview.

For the Jamaican sample, several of these issues are salient. In particular, respondent fatigue was an issue, as this particular sample had been originally formed and interviewed for the 1990 microenterprise census. In 1992, the in-depth qualitative National Microenterprise survey was conducted, and then in 1993 the Quarterly Panel Survey began. Despite the

fact that these panelist were on their third survey, however, very few interviews came back as outright refusals. This is consistent with Ashenfelter's (1986) comments that respondent fatigue is seldom an issue in developing countries. Other more significant concerns for this enumeration are missed interviews due to long distances traveled for interviews, bad weather delays, firm closures, and heavy work loads on the part of enumerators, forcing them to sacrifice some of their field visits.

To test whether these sources of attrition bias impacted results, a basic model of employment growth was estimated using OLS and OLS IV. Following Hall's (1987) approach to attrition bias, the employment growth model was run on the subset of firms that were in the sample either 6-7 quarters, 5-7 quarters, 4-7 quarters, and 3-7 quarters respectively. In other words, the sample is allowed to shift based upon which firms met the sample criteria. If the results are consistent across definitions, then the conclusion of little estimation bias due to sample effect obtains. The model is evaluated in levels as well as with a log log transformation. The model is as follows:

Equation 4.4

$$\text{employment} = f(\text{constant, lagged employment})$$

A couple of issues to note on this model: one, why this model? This model specification is consistent with much of the literature on small

business growth (Audretsch, et al (1994), Dunne, et al (1994), and Mata (1994)) In the literature, firm growth, often measured in firm assets, is modeled as a function of firm size, startup size, or as a lagged variable of growth itself. Since the objective here is merely to examine attrition bias, the simplest specification was sought. Secondly, firm age is dropped as it was insignificant in most of the modeled results presented above. Finally, both OLS and OLS IV results are presented to parallel the main analysis above. Tables 4.5 and 4.6 summarize the results.

Table 4.4
Evaluation of Attrition Bias in a Panel Data Model of Employment Growth: in Levels for Jamaican Microenterprises

Variables	Number of Quarters Firm in Sample							
	6-7 Quarters n=408		5-7 Quarters n=558		4-7 Quarters n=656		3-7 Quarters n=697	
	Coeff	**T**	**Coeff**	**T**	**Coeff**	**T**	**Coeff**	**T**
Model 1: OLS								
Intercept	0.35	6.41	0.35	7.87	0.33	8.08	0.086	6.28
EMPLAG	0.79	36.37	0.79	43.12	0.81	50.23	0.81	48.57
Model F	1322.58 (0.0001)		1859.25 (0.0001)		2523.37 (0.0001)		2358.99 (0.0001)	
R-sq	0.71		0.70		0.71		0.68	
Model 2: OLS with Instrumental Variables								
Intercept	.20	1.826	.18	1.950	.14	1.843	.15	1.934
EMPLAG	.86	12.939	.88	15.943	.90	20.380	.90	20.112
Model F	167.41 (0.0000)		254.19 (0.0000)		415.33 (0.0000)		404.49 (0.0000)	
R - sq	0.70		0.70		0.71		0.70	

Source: STATIN Survey Data

Table 4.5
Evaluation of Attrition Bias in a Panel Model of Employment Growth: ln ln form Jamaican Microenterprises

Variables	Number of Quarters Firm in Sample							
	6-7 Quarters		5-7 Quarters		4-7 Quarters		3-7 Quarters	
	Coeff	**T**	**Coeff**	**T**	**Coeff**	**T**	**Coeff**	**T**
Model 1: OLS (ln ln form) dep var: ln of employ								
Intercept	0.07	3.86	0.08	5.39	0.082	5.84	0.096	6.14
LEMPLAG	0.80	34.21	0.81	40.29	0.81	45.64	0.80	41.95
Model F	1170.09 (0.0001)		1623.42 (0.0001)		2082.88 (0.0001)		1759.84 (0.0001)	
R-sq	0.69		0.67		0.68		0.61	
Model 2: OLS with Instrumental Variables								
Intercept	.026	1.254	.025	1.431	.027	1.555	.035	2.045
LEMPLAG	.90	24.129	.91	29.310	.92	34.341	.92	34.227
Model F	582.19		859.07		1179.30		1171.52	
R-sq	0.68		0.68		0.68		0.68	

Source: STATIN Survey Data

These results reveal that firms moving in and out of the sample for all of the reasons discussed above are not appreciably affecting the value on the coefficient. Specifically, the coefficient on the employment lag maintains a consistent value as firms with fewer quarterly representations were added. Further, both the OLS and OLS IV model results in the same conclusion. For example, in Table 4.5, the coefficients on EMPLAG (lagged employment) are .79, .79, .81 and .81 for firms in 6-7 quarters, 5-7 quarters, 4-7 quarters, and

3-7 quarters respectively. In the OLS IV model, the coefficients are .86, .88, .90 and .90. Further the model in ln ln form yields the most consistent results, as one would expect (.80 - .81). If consistency across each model dissolves the specter of attrition bias, then these results appear to bear that out. Interestingly, several articles on small business panel data found little evidence of attrition bias impacting their data (Hall, 1987; Evans, 1987; Dunne and Hughes, 1994; Mata, 1994; and Wagner, 1994). Dunne and Hughes (1994), for example, used a MLE and a probit model to account for firms that died. Attrition bias still did not influence the OLS regression results.

4.6 Conclusions

This chapter extended the analysis of the previous sections by developing a dynamic panel data model of microenterprise firm growth. As such, this chapter represents new and unique perspectives on microenterprise dynamics. The dynamic models of sections 4.3 and 4.4 proved to be stable model specifications with good predictive power. Further, the IV estimation introduced here revealed little evidence of measurement error in the five year results, but contributed to an appreciable adjustment in the short run model. This representation of microenterprise growth

definitely enhanced the simpler cross sectional specification presented earlier.

The five year findings are consistent with the previous results. First, firm size has an inverse relationship with firm growth, meaning the smallest firms have the fastest growth. Firm size, in this context is defined as prior year firm size. Further, female proprietors have a negative relationship with firm growth, and firms in business districts or formal commercial buildings effect firm growth positively. Regarding firm age, the variable is insignificant across all of the OLS models, OLS IV, and the fixed effect model as well. Age of the proprietor, however, is jointly significant, with several individually significant age coefficients and a trend in the coefficient towards a stronger negative relationship with greater age.

The quarterly analysis of firm growth reveals several things: One, long and short term dynamic effects are fairly consistent. This is great news for policy makers. Designing programs to address specific short term issues along the lines discussed above should have a consistent carry through to long term effects. Secondly, the inverse relationship between firm size and quarterly firm growth holds. Third, the age of proprietor is inversely related to firm growth, whereas age of the firm is not. Finally, measurement error plays a more significant role in the short run results than the long run. This may reflect the increased volatility of quarterly data versus the its' counterpart.

CHAPTER V

CONCLUSIONS: IMPLICATIONS FOR POLICY AND FUTURE RESEARC H

To the policy maker and the researcher, microenterprise present a challenge. Both in the developing and in the developed world, the significance of their existence and role in the broader economy has been recognized. However, by definition of who they are and the complex interplay between all the elements, interests, and needs encapsulated in their existence, a comprehensive understanding of them has remained elusive. In recent years, a significant amount of research effort has shed light on some of the stylized facts of these firms, their prolific presence in most LDC economies, and their birth and survival. Further, the sector has received increasing attention from both donor agencies and policy makers. Most recently, a concerted effort has been made to gain an understanding of the mechanisms of growth and change for these firms. This dissertation has sought to contribute to a deeper understanding of these special firm dynamics.

Jamaica provides an invaluable setting for the study of microenterprise dynamics. First, the micro sector is an important part of Jamaica's national economy. The size of the sector has been documented on two occasions by the Statistical Institute of Jamaica. In 1978, a nation-wide

census estimated a total of 38,000 microenterprises employing roughly 80,000 people. A 1990 census revealed an increase to over 88,000 enterprises employing over 150,000. This amounts to 15% of the Jamaican labor force.[46] Second, the analysis can reveal the dynamics of microenterprise in the context of macroeconomic crisis. The time period of this analysis encompassed an economic downturn, including a currency devaluation, volatility in interest rates, and soaring inflation. Finally, a significant amount of research has been done in Jamaica to understand the role and size of the micro sector. These include the two census surveys mentioned above, several smaller surveys conducted in the late 1970's (Davies, Fisseha, and Kirton, 1979; Fisseha and Davies, 1981; Fisseha, 1982), a small establishment survey in 1983 by STATIN (Small Establishment Survey, 1983), and a national survey of microenterprises in 1992 (Anderson, 1994).

The static characteristics of the microenterprise sector in Jamaica have been defined from this series of studies, and the findings reveal a sector similar to that of other countries. First, they are dominated by own account firms, with roughly seventy three percent falling into this category.[47] Twenty two percent of the firms employed between 1-4 employees, while only five percent employed between 5-9. The average microenterprise employed 1.7 workers. Consistent with the Jamaican phrase "female is to small as male is

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[46] STATIN reports that the labor force in 1990 was 1.06 million.
[47] Microenterprises are defined in this work as firms employing less than 10 persons.

to large,"[48] female headed firms were more likely to be own account than their male headed counterparts, although female headed firms represent almost equal numbers in the microenterprise sector. Jamaican firms are distributed with a slightly higher urban bias than most countries, with roughly fifty-five percent of the Jamaican firms located in urban settings. Based upon the 1992 National Survey, twenty four percent of the firms were less than four years old, another 41 percent were between eleven and four years of age, and the remaining thirty-four percent were older than 11 years. Reflecting the large role of tourism in the local economy, sixty six percent of the firms were engaged in trade and commerce. Although manufacturing is important in Jamaica, the preponderance of trade activity diverges from the experience of most other developing countries, where manufacturing is the dominant industry.

This dissertation builds on a unique set of information collected from a panel of microenterprises in Jamaica.[49] This represents the first national effort to capture detailed information on microenterprises over an extended time period. The enumeration included annual data collection over five years of the same firms, with an additional intensive quarterly collection over a two year period. Even with this extensive data collection, these data are not without limitations. First, firm birth and death data were not collected. Second, the survey instrument proved to be somewhat complex in the method

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[48] Quote found in Anderson, 1994.

used to collect sales and output data. Finally, the attempt to capture annual information on capital accumulation was unsuccessful.

Beyond these shortcomings, these data provide a unique opportunity to shed light on questions surrounding firm dynamics. As the data were non-retrospective, they did not suffer from bias due to loss of memory.[50] Further, tracking the same set of firms over time (panel data set) allowed a careful documentation of firm level changes over the life cycle. As such, this analysis builds on several important research questions relating to firm growth, as well as provides valuable insight to the Jamaican government and donor agencies seeking to better channel assistance to the sector.

Two unique approaches to this data were taken in this dissertation. First, a detailed year-to-year and quarter-to-quarter analysis of secular trends for key measures of growth performance outlined the dynamic ebb and flow of this sector. This depiction of changes in the firms over time revealed important stylized facts of the volatile environment characterizing these firms over the long and short run. Second, a model of firm growth was estimated using a lagged dependent variable and IV (instrumental variable) techniques to control for measurement error. This model extends the traditional cross sectional approach to growth models (presented in Chapter III) by incorporating a true dynamic effect into the model specification.

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[49] Specifically, the data incorporates firms identified in the 1990 census, the 1992 National Survey, and the Quarterly Panel Survey of 1993-1994.
[50] All of the employment information was non-retrospective, with the exception of 1991 employment collected with the 1992 National Survey.

Importantly, this model better characterizes the dynamic process driving the growth of surviving firms. A summary of the major findings follows.

In Chapter II, a descriptive analysis profiled firm performance over a quarterly two-year and annual five-year time frame along several key firm dimensions: employment, sales or output, and wages. This technique generated a unique dynamic picture of how these firms changed, ebbed and flowed over time, and how the patterns of change varied by sector, gender, location and firm size. For the quarterly analysis, firm performance was summarized by examining the quarter to quarter change in firm employment and wages for a set of firms "alive" in two consecutive time periods. The measures were broken down by sector, gender, firm location and size. A similar approach was applied in the five-year analysis, but only for firm employment. Several key insights came out of this analysis.

First, this micro sector is very tenacious. The period between 1990 and 1994 was characterized by several negative macroeconomic shocks, particularly between 1993 and 1994 during the quarterly panel survey. The effects of the shocks manifested themselves in quarter to quarter and year to year fluctuations in firm performance with periods of double digit loss. For example, between quarter I of 1994 and quarter II of 1994, employment fell by almost 10 percent! Although some of this fluctuation is attributable to

seasonal fluctuations, the extreme variation points to the influence of macro effects.[51]

Second, the overall level of employment of the existing microenterprise in Jamaica declined over the 1993-1994 period. Total employment in the panel of firms at the fourth quarter of 1994 was 18.6 percent below the level in the same enterprise in 1993.[52] The five year analysis reflected a similar trend, with the greatest decline in 1993 and 1994.

The overall downward trend in output and employment in the existing microenterprises in the sample is consistent with the picture of an economy in stress. This was indeed a difficult period for the Jamaican economy. Overall, real GDP per capita increased only 0.5 in 1993, and inched up in 1994. One of the main contributions of the panel survey is an indication of the effect of this stress on an important component of the Jamaican economy.

At the sector level, one of the significant findings has been the desultory performance of microenterprise in the trade and commerce sector of Jamaica. By all measures - employment, sales, and wage bill -, it performed the worst over the survey period. Moreover, this sector was subject to more quarter to quarter variation than the others. Finally, microenterprises in the manufacturing sector experienced the smallest quarter to quarter variation in activity.

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[51] Note as well that these fluctuations were even more exacerbated when examining real sales or output.

[52] Real sales fell by 35.7% for this same panel of firms (Gustafson and Liedholm, 1995).

With respect to gender, the most striking finding was the relatively strong performance of female-owned microenterprises in Jamaica. Although employment and the real wage bill declined for female headed firms, the decline in the real wage bill was significantly smaller than that experienced by their male-owned counterparts. It should be noted, however, there was greater quarter to quarter variation in employment of the female-owned microenterprises.

By firm size, it is the largest microenterprises (5-9 employees) that performed the worst during the period. Not only did their employment and real wage bill decline more than the other firms sizes, but by the end of 1994, their level of employment was almost 50 percent lower than at the beginning of 1993. Those firms also experienced the most volatile swings from quarter to quarter. By contrast, the own account firms fluctuated the least, and were the only size category where employment and real wages were higher at the end than at the beginning of the 1993-94 period.[53]

Finally, a characteristic of the data were wide quarter to quarter swings in the level of microenterprise activity in Jamaica. From quarter II to quarter III, 1993, for example, there was a downturn that was picked up by all the indicators. These swings were less evident in the five year long run time frame, and the different sectors moved more in lockstep fashion.

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[53] This result may be partially influenced by the fact that one person firms cannot decline without closing. Mansfield (1962) suggested this as the primary driver for the apparent negative relationship between firm size and growth.

Chapter III extended the above analysis to examine firm growth by means of an OLS cross sectional model. This approach parallels the majority of research on firm growth, permitting a direct comparison to those results. Several of the key issues addressed were the validity of Jovanovic's 1982 theoretical model, Gibrat's law, and the relevance of several dimensions of human and firm capital on firm growth. Different from most other studies, however, the dependent variable was defined alternately in log levels and as firm growth to assess the impact of the different variable specifications on the parameter estimates. Four key findings emerged from this analysis.

First, an examination of the coefficients across the five years reveal subtle changes in firm dynamics. The result for parish, for example, fluctuated across the years, with the signs on the coefficients changing from year to year. One explanation for this result posits that microenterprise are sensitive to macroeconomic and other shocks, and these shocks vary by region. For future research, careful consideration should be given to the timing of efforts to examine microenterprises. Findings grounded in a particular policy or macro environment may not be relevant when change takes place. For policy makers, factors such as interest rates, inflation and exchange rate fluctuations do make a difference in the health of the small firm.

Second, the definition of the dependent variable does make a difference. With the dependent variable defined as the natural log of firm growth, a

negative bias is introduced into the model results. This bias is readily observable for the coefficient on firm size, with an expected slight shift in the magnitude of the coefficient between the models. The result for firm age was more dramatic, however, with a change in sign and a general shift in coefficient significance between the models. Significantly, in the model with the dependent variable defined as the natural log of firm growth, the firm age variable is significant and negative. For Jamaica at least, the negative relationship between firm age and growth is called into question, and more careful scrutiny of this relationship should be exercised in future studies.

Shifting the focus to the model in log levels, a third result confirms the negative relationship between firm size and growth, although the relationship posited for firm age is not supported, either in sign or significance level. This latter result conflicts with a significant amount of other empirical work in several countries. In contrast, the age of proprietor is significant and negative or trending downward. This supports Cressy (1995), who suggests that age of the proprietor is a good indicator for human capital. If this measure can be thought of as a proxy for firm learning, then Jovanovic's model finds support here as well. This result will be reviewed in more detail below.

Beyond this, a fourth key finding relates to the difficulties facing female entrepreneurs in Jamaica. The gender of the proprietor stands out as an area requiring special policy attention. Unequivocally across model

specifications, female headed firms are apparently at a disadvantage to male headed firms as measured by firm growth in employment. This is consistent with the analysis of Chapter II which detailed the poor employment performance of female headed firms. This stylized fact may be further compounded, for example, by firm location, as female proprietors are more likely to work out of their homes rather than a commercial center (Anderson, 1994). Consistently in these data, home based businesses were also at a disadvantage to businesses in commercial centers. The evidence in these data underscores the difficult challenges facing the female proprietor in Jamaica.

Chapter IV introduces an important extension to the analysis of Chapter III. Specifically, a panel data model is developed introducing a true dynamic effect to the specification (a lagged dependent variable) and IV (instrumental variable) estimation is utilized to diminish the bias in the estimated parameters. This model is evaluated for both the five year and two year quarterly employment data and reveals results broadly consistent with the cross sectional analysis.

Three central findings stand out. The first relates to the classic hypotheses between firm size, age and growth. Firm size is negatively related to firm growth, even when firm size is defined as size in the prior year or quarter. This is a strong refutation of Gibrat's law. Firm age, by contrast, is not related to firm growth, although age of the proprietor is. These results

basically confirm the results from the previous sections, and solidify these findings for Jamaica.

Second, access to credit is positively related to firm growth. Although this result did not obtain in the more robust models (the IV specification for example), the specter of its significance has important and exciting implications for donor agencies and public policies focused on credit and lending. The result here is not definitive, but through this dynamic model at least a "weakly significant" effect can be confirmed.

Third and finally, short and long run growth dynamics appear to be driven by very similar processes. Evaluating the signs and magnitudes of the coefficients across the models, the majority obtain very similar results. One striking difference between the long and short run model relates to age of the proprietor. Specifically, age of the proprietor switches from a negative to a positive relationship with firm growth between the long and short run models respectively. This may be because the variable proxies different effects in the long and short run. Overall these results imply that firm dynamics reflect roughly the same process in the long and short run. An interesting and important area for additional research might be how decisions and risks are evaluated by the microentrepreneur in both of these times frames as well.

Before discussing policy implications, some observations on the benefits and pitfalls of panel data are in order.[54] Is panel data the panacea

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[54] See Hsiao (1986) or Raj and Baltagi (1993) for a thorough discourse on the benefits of panel data.

for the researcher in lesser developed countries? There are several very specific benefits and insights that the panel data delivered. First, several elements of firm dynamics were fleshed out, such as the volatility of the sector and the differing patterns of various measures of firm performance over time. These could not have been addressed through a cross sectional dataset. Second, an assessment of short run performance dynamics was possible, and the comparison between the short and long run revealed only subtle differences between the two. Third, the panel data made possible the introduction of a lagged variable into the specification, improving the fit of the model and better representing the dynamic process at work. Finally, the IV (instrumental variable) estimate was introduced to adjust for measurement error, which turned out to be more substantial in the short run model.

Several shortcomings of the data, however, should be noted as well. Panel data take a long time to collect, and in localities with wildly swinging political or economic conditions, such time is not available. In Jamaica, difficult weather and travel conditions, migrant proprietors, and poor data collection infrastructure all complicated data collection efforts. Moreover, several very useful pieces of flow data are difficult to collect, especially from enumerators of governmental agencies. This is a common problem in all data collection exercises, but data with continual random error exacerbate the error in the estimates (Hsiao, 1986). Finally, the difficulty of panel wear out

and attrition is a difficult hurdle, and for Jamaica this was no different. This effect is difficult to quantify. Panel data bring a different perspective to microenterprise growth, however, as it extends beyond static considerations to address dynamic issues. The need on the part of policy makers and donors to understand dynamic processes better may provide the justification for more panel work in the future.

Given the above findings, what are the implications for policy makers and donors? As the broad range of comments below will highlight, there is no single silver bullet that can bolster all the different dimensions of microenterprise growth. The policy mix, in contrast, needs to encompass multiple dimensions and reflect the social and economic tides of the day. Further, Jamaica provides a particularly challenging microenterprise environment, as such a large proportion of activity is focused on trade and tourism. The comments below will first highlight three overarching stylized facts, which provide a lens through which to view several specific recommendations.

First, a very encouraging characteristic of these Jamaican firms revealed in the intertemporal dynamics of the panel is the tenacity of the microenterprises. Amidst economic decline and marcoeconomic shocks these firms forged ahead, reflecting the Jamaican mindset, "You can't get me outta the race."[55] Secondly, the environment facing these firms contained large swings in market demand, reflected in broad swings in employment in

Chapter II.[56] These swings potentially affected the proprietors willingness to take business risks to expand or diversify their offerings. Finally, the fundamental elements governing long and short run dynamics are mostly congruent. Based upon the set of firm dimensions examined in this work, policy directives do not need to discriminate between the two.

Within this context, several key policy recommendations can be suggested. The first relates to firm size. In general, smaller firms grow faster, confirmed by evidence from both the trend analysis of Chapter II and the modeled relationships of Chapters III and IV. Two seeds of caution are necessary regarding this result, however. One, own account firms are incapable of shrinking their employment other than closure. In this case, they would drop out of this sample and not be included in the analysis. This introduces an upward bias into this result. Perhaps reflecting this phenomena in the quarterly analysis of Chapter II, own account firms remained robust to changes in employment while larger firms declined; however, own account firms experienced a more significant percentage decrease in sales than their larger counterparts. In fact, the firm with 2-4 employees achieved the best performance. This suggests that small, but maybe not the smallest, firms should be the target for programs.

Second, younger proprietors can be a useful target of policy or aid programs, given the strongest relationship between growth and age was in

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[55] Comment quoted from Anderson, 1994.

the youngest cohort. The insignificant result for firm age adds an additional dimension to this recommendation as well. It appears from these data and other research (see Fisseha, 1979) that there is little generational continuity in Jamaican microenterprises. Further, few Jamaican firms use family labor, and consequently microenterprises have a high potential for closure with the death or retirement of the proprietor. In other words, firm learning in the Jovanovic paradigm dies with the proprietor. Policy should be formed that recognizes this life cycle aspect of the firm, encouraging for example more continuity between successive generations of firm management.

Third, enterprises located in commercial districts achieve faster growth, although it appears to make no difference whether a firm is located in an urban or rural setting (see Fisseha, 1993 as well). As seen in many other studies, home base enterprises are often slow growers or stagnant. This fact is intuitive due to lower traffic levels at home enterprise and competing interests for the proprietors time. Although home base enterprises reflect lower levels of financial risk (lower overhead), policies could be designed to minimize financial exposure in moving from a home based to a commercial building.

The fourth implication regards the gender of the proprietor. Handa (1996) points out that there is a very high incidence of female headed households in Jamaica, as there are throughout the Caribbean. In Jamaica,

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[56] See Gustafson and Liedholm (1995) for details on how sales and output fluctuated.

this percentage is roughly 42%. This implies two things. One, a large percentage of women in the work force are not only working or running a business, but also raising children and running a household. As Downing (1990) suggests, this takes time and energy away from their business. Secondly, however, Handa points out that Jamaican women are more likely to choose female headship in their own household than women in other LDC's in order to improve their status and influence, for mainly economic reasons. The high incidence of female headed households coupled with the high percentage of microenterprise firms headed by females points to the significance of the policy directives that should focus on female headed microenterprise firms and female headed households. The importance of this area of focus is highlighted in the negative relationship found between firm growth and female proprietors.

Fifth, attention should be paid to credit programs, both for startup and operating capital. Access to credit has been a hot topic in recent years, both in the academic literature as well as for GO or NGO's projects. In the panel data model, both access to startup capital and post-startup capital obtained a weakly significant result with firm growth. A very interesting result obtained in the short run model was the significant positive relationship between post-startup credit and firm growth. This result could be interpreted as a working capital effect. Supporting this find, Rhyne and Otero (1994) point out that access to small amounts of working capital is

perhaps the greatest need of microenterprises. These results support the fact that credit accessed after startup has a positive impact on firm growth in the short run, and roughly the same percentage impact on growth as access to startup capital. Credit programs should pay attention, if not equal attention, to each type of loan scheme.

The result on firm credit is not definitive, however, due both to the weakly significant model results and the issue of endogeneity. Self selection implies only the more successful firms are able to obtain credit. These firms, already growing with a higher probability of growing faster than others, are the ones to be approved for loans. Hence, credit looks like an extremely effective policy program. This tangle cannot be unpacked, and only a tentative case can be made for the positive effect of credit on firm growth.

A sixth recommendation relates to long and short run policy considerations. Good news for the policy maker, long and short run dynamics appear to be very similar, meaning little discrimination needs to be made on policies between the two. One exception discussed directly above would be considerations for short run operating loans. A case could be made for increases in working capital loans to micro firms, which is a short run consideration. These loans may also help smooth out some of the volatility in the business cycle, which the firms seem particularly sensitive to. A second consideration relates to age of the proprietor. In the short run, firm age is positively related to firm growth. This result holds for all age groups,

although the magnitude of the coefficient decreases for older proprietors. In the short run, age may simply be a good proxy for the proprietors energy, willingness to take risks or succeed. Policies designed to motivate could target any age group and result in positive economic results for the micro sector in terms of employment growth. This finding could be particularly noteworthy in an economic downturn, similar to this analysis period, when the policy goal is to stimulate short run employment growth.

Finally, a confusing result relates to technical assistance or business training. This dimension of human capital is difficult to measure, and with all survey data, is always subject to under reporting or other forms of measurement error. There are several technical assistance programs in place in Jamaica, and the intuitive result would suggest these programs to be at least somewhat effective. With one exception, most of the results were not significant. In the 1992 cross sectional analysis, business training was positively related to firm growth. This also happens to be the year of greatest economic distress. One obvious explanation is that proprietors with better training were better prepared to deal with the difficult demand environment, hence the positive relationship with firm growth. This result is singular, however, and does not lead to a strong recommendation for these types of programs.

Several important research questions stem from this work. First, the findings relating to credit and education (training) in general are counter

intuitive. For Jamaica in particular there are a plethora of microenterprise training efforts, but it appears from these data that these efforts had little effect on microenterprise performance. This result may be due to low impact projects, or it may flag a need for a different design in data collection to address these issues. Further, a construct to better understand the long run effects of credit on a microenterprise need to be designed.

Second, the firm dynamics depicted in this dissertation reflect the activity of surviving firms only. Although there is strong theoretical and empirical justification for this, panel data incorporating birth and death information would greatly enhance the validity of the findings. Most of the research to date on firm survival has been generated in a static environment or through a two period data collection scheme. To incorporate this type of information into a rolling panel would enable a comprehensive analysis of the dynamic process.

Third, firm productivity, efficiency and market demand represent other areas of research related to firm dynamics and not explicitly covered here. Evidence of low efficiency or demand in Jamaica were identified in the rapid adjustment in firm output from period to period without corresponding increases in employment. To assess these effects, better flow information on changes in firm capital and some assessment of local market conditions would be required.

Fourth, this dissertation did not foray into the household side of the enterprise. How central is the income from these firms to the household? How are funds handled between the household and micrenterprise? How does the health of the enterprise affect key measures of human welfare, such as nutrition and education? Questions such as these relate directly to the welfare implications of policy directions, and consequently remain an important venue for future research.

Fifth, this research brought into question the treatment of firm age, both on a empirical as well as a theoretical basis. Is the experience of a firm best encapsulated in the age of the firm or that of the proprietor? Further is this relationship linear or non-linear as Jovanovic's theory suggests? More cross country work needs to be tackled on this issue, with careful attention paid to the regression estimate of the firm age effects.

Finally, this dissertation has sought to confirm or negate some key predictions coming out of the limited theoretical literature on firm growth. Mark Blaug (1993) suggests that this type of research is the appropriate manner in which to confirm or deny the reigning theoretical constructs. Clearly, there are some significant holes in the empirical predictions, both in the predictive capability and in the number of dimension included in the paradigm. More work needs to be done to fill these voids and add more depth to the existing literature.

The plight of microenterprises in Jamaica provides a challenge in as much as the understanding of the dynamics of their growth and change over time is truly a complex interplay between cultural, human capital, governmental and market realities. The assessment of their contribution and the health of the sector hence poses difficult questions indeed. Unequivocal, however, is the role they play in the local economy and the important source of income and livelihood they provide. The peril they face is enhanced or diminished as a direct function of appropriate efforts to fully comprehend and interact with their reality.

APPENDICES

APPENDIX A

Table A.1 Cross Sectional Model: 1990 thru 1994 Firm Age Interactions Included

Variables	Ending Year for Growth Model				
	1990	1991	1992	1993	1994
Dependent Variable	ln Growth				
Ln Startup Size	-.2960843 (-5.329)	-.0422646 (-2.232)	-.0465315 (-2.698)	-.1177187 (-4.292)	-.1201862 (-4.427)
Ln Firm Age	-.206484 (-2.710)	-.0333079 (-1.062)	-.026136 (-.955)	.0000492 (.001)	-.0272202 (-.546)
Ln Firm Age Squared	.0274899 (1.943)	.0023201 (.450)	.0010431 (.815)	-.0030934 (-.409)	.0012247 (.153)
Ln Firm Age * Startup Size	.0967071 (4.693)	.011851 (1.888)	.0120388 (.034)	.0315852 (3.578)	.0322358 (3.782)
Constant	.3727841 (3.804)	.0939525 (2.031)	.0859612 (2.085)	.0459734 (.669)	.086056 (1.132)
R Squared	0.3256	.0656	.04722	.1512	.1727
F Value	15.45 (0.0000)	6.94 (0.0000)	8.09 (0.0000)	14.10 (0.0000)	13.59 (0.0000)

Source: STATIN Survey Data
Values in parentheses are t values.

Table A.2 Complete Cross Sectional Model: 1990 thru 1994
Firm Age Interactions Included

Variables	Ending Year for Growth Model				
	1990	1991	1992	1993	1994
Dependent Variable	ln Growth from Startup				
Ln Startup Size	-0.86495 (-9.057)	-0.20707 (-2.789)	-0.20433 (-2.771)	-0.403 (-3.652)	-0.47617 (-4.109)
Ln Firm Age	-0.58248 (-4.528)	-0.17175 (-1.387)	-0.11359 (-0.863)	-0.03871 (-0.19)	-0.05535 (-0.229)
Ln Firm Age Squared	0.09007 (3.372)	0.027625 (1.161)	0.018269 (0.745)	0.008122 (0.224)	0.00541 (0.128)
Ln Firm Age * Startup Size	0.240099 (6.273)	0.047164 (1.657)	0.036245 (1.315)	0.07839 (1.97)	0.106055 (2.627)
Gender	-0.10589 (-2.861)	-0.06997 (-2.847)	-0.07128 (-3.159)	-0.06074 (-2.126)	-0.08376 (-2.87)
Age of Proprietor	1.051671 (3.297)	(dropped)	-0.03269 (-0.167)	0.484092 (2.105)	0.029211 (0.137)
	1.162984 (3.672)	0.122561 (2.033)	0.049311 (0.253)	0.38564 (1.689)	-0.11871 (-0.558)
	1.226472 (3.872)	0.142688 (2.415)	0.099407 (0.511)	0.473204 (2.078)	-0.02935 (-0.138)
	1.137687 (3.606)	0.129152 (2.249)	0.074253 (0.383)	0.396034 (1.752)	-0.02355 (-0.112)
	1.117079 (3.544)	0.064132 (1.126)	-0.00394 (-0.02)	0.37329 (1.652)	-0.11061 (-0.525)
	1.10047 (3.483)	0.051567 (0.862)	-0.01 (-0.052)	0.33666 (1.484)	-0.12592 (-0.596)
	1.013268 (3.187)	0.059042 (0.927)	-0.02771 (-0.142)	0.324506 (1.422)	-0.13294 (-0.625)
	1.018408 (3.147)	-0.00744 (-0.095)	-0.06417 (-0.322)	0.333099 (1.431)	-0.13973 (-0.645)
Education	0.018046 (0.488)	0.003575 (0.15)	0.002862 (0.128)	-0.02447 (-0.86)	-0.03218 (-1.14)
Business Training	0.00166 (0.03)	0.025605 (0.732)	0.07535 (2.316)	0.048374 (1.072)	0.018114 (0.403)
Startup Credit	0.040271 (0.609)	-0.01577 (-0.379)	-0.01254 (-0.324)	0.05511 (1.084)	0.035611 (0.706)
New Credit	0.040069 (0.707)	0.051824 (1.4)	0.063721 (1.829)	0.0604 (1.445)	0.010575 (0.256)
Parish	0.006991 (0.085)	0.017005 (0.32)	0.061454 (1.242)	0.038192 (0.58)	0.072014 (1.087)
	0.012895 (0.102)	0.056597 (0.684	0.05413 (0.697)	-0.0595 (-0.586)	-0.07716 (-0.782)
	0.035969 (0.233)	0.006109 (0.06)	-0.03631 (-0.382)	0.086675 (0.758)	0.405794 (2.597)

	-0.10479 (-0.964)	-0.01305 (-0.18)	-0.01199 (-0.176)	-0.04888 (-0.582)	-0.05237 (-0.634)
	-0.04387 (-0.503)	0.054459 (0.972)	0.064729 (1.23)	-0.02313 (-0.341)	0.032897 (0.463)
	0.37955 (2.161)	-0.07643 (-0.891)	-0.07815 (-0.973)	-0.28695 (-2.211)	-0.09564 (-0.953)
	0.061147 (0.77)	0.021592 (0.41)	0.01348 (0.276)	0.039068 (0.625)	-0.00034 (-0.005)
	-0.0616 (-0.621)	-0.06242 (-0.975)	-0.04827 (-0.803)	-0.07097 (-0.93)	-0.06329 (-0.781)
	-0.02466 (-0.275)	0.022813 (0.392)	0.014731 (0.267)	-0.08074 (-1.163)	-0.12169 (-1.709)
	-0.14576 (-1.846)	-0.04802 (-0.944)	-0.03833 (-0.804)	-0.09039 (-1.453)	-0.11616 (-1.841)
	0.045069 (0.537)	0.014392 (0.262)	0.034657 (0.676)	-0.01071 (-0.163)	-0.01505 (-0.231)
	-0.00943 (-0.105)	0.028281 (0.485)	0.017086 (0.315)	0.007603 (0.109)	-0.01348 (-0.192)
	-0.04563 (-0.578)	0.044879 (0.89)	0.038951 (0.826)	-0.04572 (-0.715)	-0.0422 (-0.646)
Location	0.065663 (1.198)	0.034956 (0.991)	0.076299 (2.3)	0.104157 (2.539)	0.059135 (1.455)
	0.229264 (2.617)	0.128699 (2.245)	0.153684 (2.911)	0.260896 (3.825)	-0.03225 (-0.491)
	0.027571 (0.173)	0.205986 (2.166)	0.114153 (1.278)	0.153165 (1.166)	0.13919 (1.279)
	0.016664 (0.178)	-0.01539 (-0.242)	0.041765 (0.699)	0.126173 (1.783)	0.030043 (0.437)
	0.091864 (2.054)	0.063874 (2.237)	0.07979 (3.004)	0.114526 (3.354)	0.035735 (1.049)
	0.016482 (0.124)	0.025801 (0.297)	0.045452 (0.558)	0.097451 (1.003)	0.027596 (0.306)
	0.355361 (1.597)	0.127106 (0.868)	0.100526 (0.731)	0.070663 (0.317)	0.015832 (0.077)
	0.158465 (1.767)	0.045477 (0.755)	0.042063 (0.765)	0.109134 (1.427)	0.068933 (0.988)
Rural/Urban	-0.07761 (-1.843)	-0.02583 (-0.959)	-0.03031 (-1.205)	-0.00904 (-0.284)	-0.02163 (-0.688)
Constant	-0.05429 (-0.164)	0.269042 (1.66)	0.23387 (0.967)	-0.24987 (-0.755)	0.363288 (0.978)
R Squared	0.4447	0.1928	0.2641	0.3304	0.3514
F Value	6.26 (0.0000)	1.96 (0.001)	2.94 (0.0000)	3.43 (0.0000)	3.29 (0.0000)

Values in parentheses are t values.
Source: STATIN Survey Data

Appendix B

Table B.1 Five Year ln ln Lagged Employment Model: Jamaican Microenterprise Panel Data OLS and OLS IV Results, 1993-1994

Coefficients	OLS Model 1 (a) n=1233 361 firms	OLS Model 2 (b) n=869 338 firms	OLS IV Model 2 (c) n=869 338 firms	OLS Model 3 (d) n=1233 361 firms	OLS Model 4 (e) n=869 338 firms	OLS IV Model 4 (f) n=869 338 firms
Dependent Variable	ln employment	Ln employment	Ln employment	ln employment	ln employment	ln employment
Ln lagged employment (t-1)	.4900743 (5.099)	.8200685 (9.909)	.8248997 (6.148)	.7095244 (28.735)	.787118 (35.638)	.8084351 (27.899)
Ln Firm Age	.0276247 (0.162)	.0845069 (0.532)	.0737456 (0.460)	.0434618 (1.930)	.0245622 (1.145)	.0219542 (1.048)
Ln Firm Age 2	-.0070908 (-0.229)	-.0094317 (-0.342)	-.0086997 (-0.322)	-	-	-
Ln Firm Age * Size	.08417 (2.527)	-.0123489 (-0.409)	-.0060956 (-0.132)	-	-	-
Gender of Prop	-.0933538 (-3.338)	-.0428483 (-1.750)	-.03619 (-1.440)	-.0918854 (-3.290)	-.043786 (-1.830)	-.0369045 (-1.551)

Age of Proprietor	-.0349574 (-0.427) -.0666488 (-0.949) -.0003449 (-0.005) .0093447 (0.131) -.059871 (-0.924) -.1275801 (-1.898) -.1137938 (-1.600) -.138506 (-1.923)	-.4614641 (-6.894) -.6799688 (-8.878) -.5488978 (-7.493) -.5857322 (-8.571) -.6329473 (-10.035) -.6713405 (-9.640) -.6720513 (-9.563) -.6479991 (-8.696)	-.4610513 (-6.726) -.6827188 (-8.355) -.554562 (-7.037) -.5892108 (-7.825) -.6343655 (-9.323) -.6704026 (-9.237) -.6692901 (-9.329) -.6432642 (-8.296)	-.0375196 (-0.465) -.07998 (-1.205) -.0134675 (-0.205) -.0106654 (-0.163) -.0751191 (-1.254) -.1403406 (-2.190) -.1305325 (-1.859) -.1646349 (-2.199)	-.4537308 (-6.963) -.6665265 (-9.542) -.5352847 (-7.946) -.5706178 (-9.308) -.6191627 (-10.737) -.6587063 (-9.687) -.6600146 (-9.723) -.6398738 (-8.384)	-.4556488 (-7.094) -.6732817 (-9.545) -.5449269 (-7.932) -.5787424 (-9.306) -.624691 (-10.883) -.6616356 (-9.869) -.6613702 (-9.920) -.639256 (-8.504)
Level of Education	0197989 (0.731)	-.010838 (-.010838)	-.011525 (-0.469)	.0146524 (0.540)	-.009941 (-0.383)	-.0110496 (-0.435)
Post – Education Business Training	.013131 (0.297)	.0022654 (0.067)	-.0003339 (-0.010)	.0177367 (0.402)	.0004343 (0.013)	-.0015957 (-0.048)
Startup Credit	.0939508 (2.025)	.0480622 (1.257)	.043994 (1.193)	.0868207 (1.847)	.0498556 (1.294)	.0450554 (1.214)
Post-Startup Credit	.0733206 (1.767)	.0464948 (1.356)	.0423006 (1.265)	.0723038 (1.692)	.0471863 (1.378)	.0428418 (1.273)

Parish	.0970203	.0760746	.0727723	.0860817	.0770678	.0728824
	(1.424)	(1.327)	(1.301)	(1.283)	(1.347)	(1.287)
	.0608598	-.0638092	-.0673241	.0516005	-.0621149	-.0666472
	(0.592)	(-0.711)	(-0.784)	(0.483)	(-0.706)	(-0.783)
	.0849888	.075783	.0749016	.0716417	.0755952	.0740498
	(0.653)	(0.634)	(0.631)	(0.549)	(0.625)	(0.616)
	.0082692	-.1014807	-.1067892	.0185846	-.1041558	-.1084765
	(0.104)	(-1.551)	(-1.632)	(0.233)	(-1.605)	(-1.699)
	.0926579	-.0217946	-.024743	.075938	-.0206224	-.0246243
	(1.462)	(-0.362)	(-0.419)	(1.224)	(-0.341)	(-0.411)
	-.1611341	-.2024398	-.1969947	-.1770206	-.2013154	-.196786
	(-1.843)	(-2.379)	(-2.353)	(-2.011)	(-2.406)	(-2.371)
	-.0005538	.0010326	.0023268	-.0149057	.003109	.0033352
	(-0.008)	(0.017)	(0.039)	(-0.231)	(0.051)	(0.056)
	-.0397309	-.061458	-.0577389	-.0537757	-.0588212	-.0564228
	(-0.485)	(-1.025)	(-1.017)	(-0.661)	(-0.971)	(-0.956)
	-.0157138	-.0989485	-.0976545	-.0286904	-.0973743	-.0970599
	(-0.218)	(-1.465)	(-1.489)	(-0.403)	(-1.441)	(-1.463)
	-.0022572	-.0803091	-.0789844	-.0140364	-.079697	-.0792561
	(-0.218)	(-1.559)	(-1.596)	(-0.403)	(-1.547)	(-1.573)
	.0348068	-.0019197	-.0001753	.0206562	-.0006133	.0000972
	(0.509)	(-0.031)	(-0.003)	(0.311)	(-0.010)	(0.002)
	.0353186	-.0000876	.000077	.0174572	.0023012	.0009705
	(0.480)	(-0.001)	(0.001)	(0.243)	(0.037)	(0.016)
	.0624052	-.0450828	-.0485112	.0546452	-.0422042	-.046546
	(0.937)	(-0.802)	(-0.885)	(0.833)	(-0.744)	(-0.830)

Location of Business	.0896395 (2.474)	.0739368 (2.084)	.0701116 (1.995)	.0848853 (2.275)	.0744865 (2.116)	.0702571 (2.009)
	.0513166 (0.612)	.00057 (0.010)	-.010117 (-0.180)	.0599272 (0.713)	-.0008855 (-0.015)	-.0107978 (-0.194)
	.0615132 (0.981)	-.1326705 (-1.030)	-.1380199 (-1.029)	.060202 (0.982)	-.1308237 (-1.018)	-.1365694 (-1.020)
	.056175 (0.473)	.1336337 (2.239)	.1324181 (2.177)	.0640679 (0.832)	.1321281 (2.222)	.131509 (2.243)
	.1166299 (4.000)	.0696375 (2.467)	.0620418 (2.198)	.1173908 (3.963)	.0698569 (2.485)	.0622446 (2.220)
	.1228646 (1.709)	.0633216 (1.427)	.060958 (1.459)	.1078767 (1.332)	.0655286 (1.487)	.062072 (1.489)
	.1615426 (0.908)	.0592416 (1.144)	.0527939 (1.068)	.1449397 (0.922)	.064718 (1.229)	.0570277 (1.160)
	.0465359 (0.675)	.1148278 (1.451)	.1108195 (1.434)	.054379 (0.770)	.1134357 (1.443)	.1099734 (1.426)
Rural or Urban	-.0161102 (-0.573)	.0071509 (0.264)	.0113037 (0.437)	-.0140109 (-0.497)	.0076436 (0.290)	.0118417 (0.469)
Seasonals	-.0079246 (-0.049)	- -	- -	.0257851 (0.204)	- -	- -
	-.0506054 (-0.318)	-.044604 (-0.590)	.0676547 (2.627)	-.0146136 (-0.119)	.1147208 (1.580)	.1059489 (1.443)
	-.1749014 (-1.089)	.0700559 (2.706)	-.0483061 (-1.216)	-.1368486 (-1.095)	-.0007968 (-0.010)	-.0094401 (-0.121)
	-.1368543 (-0.839)	-.0459604 (-1.174)	- -	-.0982667 (-0.773)	.0455494 (0.603)	.0392187 (0.517)
Constant	.2167581 (0.883)	.538158 (2.435)	.5517097 (2.446)	.115366 (0.752)	.5675724 (5.227)	.5764395 (5.304)
Selected IV Variables						
Lagged Employment(t-2)	NA	NA	YES	NO	NO	YES
Firm Age * Lagged Employment(t-2)	NA	NA	YES	NO	NO	NO
R squared	.6294	0.7184	0.7175	0.6271	0.7184	0.7180

F Value	74.31	126.81	75.97	71.58	129.88	215.57
Pr > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Source: STATIN Survey Data
All values in parentheses are t values.

Appendix C

Table C.1 Quarterly Employment Model: OLS and OLS IV Results, 1993-1994

Coefficients	OLS Model 1 (a) n=1080 355 Firms	OLS Model 2 (b) n=650 266 Firms	OLS IV Model 2 (c) n=650 266 Firms	OLS Model 3 (d) n=1080 355 Firms	OLS Model 4 (e) n=650 266 Firms	OLS IV Model 4 (f) n=650 266 Firms
Dependent Variable	**ln employment**	**Ln Employment**	**Ln employment**	**Ln employment**	**ln employment**	**ln employment**
Ln lagged employment (t-1)	.8132357 (11.710)	.780000 (9.285)	.9246238 (11.765)	.7589007 (31.411)	.7357824 (22.783)	.880222 (27.225)
Ln Firm Age	-.0217568 (-0.261)	.0060 (0.059)	-.0717225 (-0.839)	.0246149 (1.444)	.0423203 (2.085)	.0210071 (1.161)
Ln Firm Age 2	.0118212 (0.744)	.0089528 (0.456)	.0199839 (1.224)	-	-	-
Ln Firm Age * Size	-.022718 (-0.781)	-.0184923 (-0.542)	-.0178553 (-0.538)	-	-	-
Gender of Prop	-.075173 (-3.313)	-.0793128 (-2.953)	-.0466065 (-1.949)	-.0750481 (-3.312)	-.0791643 (-2.957)	-.046219 (-1.933)

Age of Proprietor	.0799412 (1.142) .0240369 (0.366) .0438828 (0.678) .0670441 (1.006) -.0452041 (-0.713) -.049483 (-0.770) -.0419795 (-0.640) -.1447442 (-1.910)	.1328209 (1.467) .074355 (0.840) .0920713 (1.019) .1221808 (1.266) .0282279 (0.314) .0131094 (0.149) .0183395 (0.198) -.1315008 (-1.317)	.1210993 (1.491) .0956236 (1.214) .0804231 (1.028) .1183806 (1.378) .0582964 (0.704) .0460318 (0.592) .062794 (0.728) -.0771603 (-0.843)	.0684252 (1.084) .0069612 (0.128) .024656 (0.468) .0486111 (0.902) -.0616592 (-1.223) -.0654771 (-1.214) -.0555198 (-0.956) -.1435376 (-1.959)	.1250795 (1.668) .0629241 (0.912) .0787337 (1.158) .1092747 (1.484) .0163726 (0.234) .0008491 (0.012) .0090302 (0.116) -.1307186 (-1.456)	.0858123 (1.286) .0533443 (0.867) .0346441 (0.584) .07161 (1.111) .0141279 (0.220) .0029977 (0.051) .0239949 (0.341) -.0978818 (-1.257)
Level of Education	.0097073 (0.397)	.028354 (0.968)	.0225281 (0.859)	.0114301 (0.460)	.0297357 (1.011)	.0239982 (0.919)
Post – Education Business Training	-.0173987 (-0.440)	.0062326 (0.140)	-.0206271 (-0.573)	-.0169885 (-0.426)	.0055823 (0.125)	-.0200684 (-0.560)
Startup Credit	.0425864 (1.009)	.0328409 (0.685)	.0100202 (0.246)	.0465865 (1.089)	.037407 (0.781)	.0159523 (0.402)
Post-Startup Credit	.0753696 (1.009)	.0595014 (1.223)	.0161363 (0.412)	.0751104 (1.791)	.0603361 (1.240)	.0179819 (0.458)

Parish	.0739183	.0300003	-.0296158	.0797852	.0354801	-.0195355
	(1.213)	(0.382)	(-0.427)	(1.299)	(0.450)	(-0.281)
	.0155701	.0444869	.038447	.0160156	.0436889	.0400882
	(0.144)	(0.512)	(0.526)	(0.148)	(0.510)	(0.562)
	-.0509527	.0940345	.0230878	-.0307777	.1123851	.0533679
	(-0.431)	(0.536)	(0.130)	(-0.257)	(0.660)	(0.309)
	.0719838	.1446716	.1117746	.0747937	.1467945	.1192002
	(0.985)	(1.119)	(0.852)	(1.018)	(1.131)	(0.907)
	-.0605354	-.0415956	-.0441727	-.0503562	-.0335053	-.0317658
	(-0.969)	(-0.533)	(-0.601)	(-0.792)	(-0.427)	(-0.435)
	.0207889	.1568907	.1075669	.021792	.1604453	.120242
	(0.201)	(1.301)	(0.934)	(0.214)	(1.375)	(1.081)
	-.0579783	-.1631056	-.147612	-.0493386	-.1586495	-.1419171
	(-0.801)	(-1.327)	(-1.138)	(-0.682)	(-1.290)	(-1.089)
	-.0848938	-.180849	-.1413733	-.0794464	-.1751188	-.1341456
	(-1.136)	(-1.929)	(-1.521)	(-1.060)	(-1.870)	(-1.449)
	-.0962008	-.1357709	-.1129421	-.0889292	-.1291804	-.1029261
	(-1.510)	(-1.652)	(-1.536)	(-1.384)	(-1.585)	(-1.416)
	-.0657788	-.0924155	-.0848129	-.0577449	-.0856099	-.0731962
	(-1.159)	(-1.294)	(-1.309)	(-1.020)	(-1.211)	(-1.145)
	-.0256884	-.0532797	-.0755052	-.0163757	-.0453301	-.0630914
	(-0.400)	(-1.294)	(-1.084)	(-0.253)	(-0.585)	(-0.934)
	-.0070718	-.0083647	-.0166315	-.0003072	-.0024488	-.0068074
	(-0.111)	(-0.102)	(-0.227)	(-0.005)	(-0.030)	(-0.093)
	.0149185	-.0184095	-.0293401	.0175478	-.0159559	-.0257596
	(0.251)	(-0.245)	(-0.415)	(0.292)	(-0.213)	(-0.364)

Location of Business	.0689183 (2.163) -.0445327 (-0.589) .0119679 (0.218) .0576851 (1.201) .0427147 (1.649) .1386976 (1.706 -.0787403 (-0.936 .0892323 (1.569)	.0616511 (1.566) -.112972 (-1.002) -.0230274 (-0.318) .0015956 (0.029) .0601313 (1.979) .175898 (1.570) .0128281 (0.277) .0718944 (1.412)	.030869 (0.893) -.1457887 (-1.365) -.0494668 (-0.781) -.0197931 (-0.374) .0411095 (1.602) .1547532 (1.839) .0222765 (0.657) .0629646 (1.737)	.0691499 (2.179) -.0496031 (-0.667) .0077402 (0.142) .0562732 (1.169) .04184 (1.648) .1378846 (1.738) -.0822247 (-1.042) .0879393 (1.582)	.0615752 (1.573) -.1196253 (-1.090) -.0274377 (-0.383) .0021048 (0.039) .0593655 (2.011) .1727609 (1.583) .0090017 (0.197) .0704684 (1.445)	.0310576 (0.900) -.1542618 (0.480) -.0569805 (-0.914) -.0175273 (-0.335) .0415204 (1.667) .1505956 (1.815) .0128119 (0.381) .0637825 (1.860)
Rural or Urban	.0056823 (0.227)	-.0185908 (-0.614)	-.0090276 (-0.346)	.0032227 (0.132)	-.0210042 (-0.718)	-.0137706 (-0.553)
Seasonals	.0417418 (1.342) .0555654 (1.465) .0596361 (1.714) .015246 (0.518) .0593306 (1.755	- - .0404613 (0.929) .0547467 (1.302) -.0002591 (-0.007) .0731041 (1.927)	- - .0314486 (0.681) .0543103 (1.246) -.0051808 (-0.134) .0722365 (1.793)	.0437064 (1.416) .0562891 (1.487) .0592188 (1.703) .0155816 (0.531) .0595766 (1.765)	- - .041549 (0.957) .0542327 (1.291) .0001543 (0.004) .0731273 (1.929)	- - .0338299 (0.737) .0539587 (1.236) -.0044954 (-0.117) .0726132 (1.803)
Constant	.0598094 (0.577)	-.0027561 (-0.022)	.0398205 (0.343)	.0322779 (0.403)	-.0276314 (-0.247)	-.0231142 (-0.220)
Selected IV Variable						
Lagged Employment(t-2)	NA	NA	YES	NO	NO	YES
Firm Age * Lagged Employment (t-2)	NA	NA	YES	NO	NO	NO
R squared	0.6945	0.7124	0.6965	0.6942	0.7122	0.6965

F Value	61.25	73.80	130.35	76.40	76.18	129.23
Pr > F	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Source: STATIN Survey Data

All values in parentheses are t values.

APPENDIX D

THE SURVEY INSTRUMENT

These comments relate to the survey instrument used for the Quarterly Panel Survey (QPS) only. This instrument was specifically designed for this project with the intent of capturing data for the STATIN National Accounts publications. In 1993, STATIN only reported national account data for firms over 10 persons. The design of the instrument, which will not be detailed here, covered employment, sales, output, and fixed investment for microenterprises. The following comments relate how various aspects of the instrument delivered their intended results.

Overall, the instrument was effective in capturing the intended information. Information on employment was the most complete and accurate. The data on wages, sales, output, and fixed assets were not as robust, although for all but fixed assets the information was mostly credible. The most serious difficulty encountered was logistical. The sampling was random and nationwide in scope. Consequently, the enumerators had a very difficult time visiting all of the firms within the specified data collection period each quarter. As most of the enumerators relied on public transportation, visits to remote rural areas was time consuming and often would not be repeated if the proprietor was not available. The success rate of visits could have been improved with a different sampling scheme (cluster sampling, for example).

Most micro-entrepreneurs do not keep records, so the instrument itself was detailed and designed to operate as a worksheet. This had benefits and pitfalls. On the pro side, some very good basic data on employment, wages, sales, and output was obtained. Beyond non-response, the information obtained particularly on sales and output appeared credible and matched that of other enterprises of the same size.

Three things in particular did not work, however. First, the more complex portions of the worksheet were typically not filled out. When asking for "fractions of output" related to the reference week, for example, little reasonable information if any was conveyed. Secondly, the reference week was the only period of time that respondents could reliably provide information on. Data for the month or quarter was either not reported or was simply a multiple of the weekly data. Finally, very little information on firm assets or raw materials was collected. Proprietors could not recall purchase prices or dates.

For a context similar to Jamaica (national survey, census bureau data collection), an improved instrument would incorporate the following. One, a worksheet design, which worked fairly well in this project, but simplified to peel away complex and confusing thinking (don't ask for fractions of weeks, for example). Two, collect information only on the reasonable basics, such as employment and sales. Information on fixed assets or raw material use are hard to come by. Third, sample in a way to minimize logistic bottlenecks to

information flow. Finally, if the intent is to conduct a national survey, careful thought should be put against which sectors should contain bolstered sample for drill down analysis. Panel data is expensive to collect and challenging to manage. Even a small sample of 350 results in a massive amount of data to manage, but little drill down ability within sub-sectors like manufacturing due to small sample size.

STATISTICAL INSTITUTE OF JAMAICA

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(CAP. 368)

FORM II pg1

Jamaican Quarterly Panel Survey of MicroEnterprise
(Trade/Commerce/Service: First Week of Each Month)

SECTION I: Firm Identification for Trade/Commerce/Service

I.1 Interview for the Quarter Ending (Circle One): March, June, September, December 199____.

I.2 Identification:

Establishment Type (be specific)	
Establishment Number	
Parish	
Constituency	
ED Number	
Proprietor's Name* & Nickname	
Enterprise Address	

* Or Contact Person

Name of Interviewer		
Name of Supervisor		
Date of Interview	Started	Completed

SECTION IIA.1. QPS OF JAMAICAN MSEs: IIA.1 LABOR EXPENSES AND PARTICIPATION RATES (SAME FORM FOR MANUFACTURING AND FOR TRADE/SERVICE:

Page: ___ of ___

Description of Individual Worker				How Often is Worker Payment	Is info obtained from Records?	During Reference WEEK			During Ref. MONTH		During Reference QUARTER		
Full Name of Worker	Worker Type	Payment Method	Sex: M/F			J$ Paid Out	Worked Days, #	Total # of Hours	Total J$ Paid for Ms.	# of Days Worked	# of Weeks	J$ Paid Out for Qrt	Commission/ Bonus Paid
(1)	(2)	(3)	(4)	(5)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1. Proprietor													
2.													
3.													
4.													
5.													
6.													
7.													
8.													
9.													
10. Group 1													
11. Group 2													
T O T A L S	Ttl labor		T# Male	////////// ////////// //////////	Records	Total J$	T. Days	Ttl Hrs	Total J$	Ttl Days	T Weeks	Total J$	Total J$

MSE Worker Type: Proprietor -> 1; Family member -> 2; Regular Worker -> 3; Trainee -> 4; Casual -> 5.
Method of Payment: Not paid -> 0; Withdrawal from MSE -> 1; Salaried -> 2; Wage earner -> 3; Casual/piece rate -> 4.
Period of Payment: Daily -> 1; Weekly -> 2; Bi-weekly -> 3; Monthly -> 4; Per Job -> 5.

NOTE: Col. 1: **Everybody who works in the enterprise** (full-time or part-time) must be listed individually (or in a **rare case** grouped);
Col. 4: This is about how the worker or the proprietor is paid by the business (it does not mean how others pay the proprietor);
Col. 6-13: **REFERENCE PERIOD** is the period about which data is collected and does not refer to the period of the visit;
Col. 10 & 11: Workers of **same type, method of payment, gender, and period of payment** could be grouped together.

IIA.2. During the last three months, how many **days** per week was your business usually open? _____

IIA.3. During the last three months, how many **hours** per day was your business usually open? _____

IIA.4. And how many **weeks** for the whole Quarter was your business open? _____

11.5 **Non-Labor Expenditures**

Items of Expenditure During Reference Period (1)	Info from Records (2)	For Reference Week	For Reference Month	For Reference Quarter		Pay Rate	
		Total JS (3)	Total JS (4)	Total JS (5)	Overlapping Mth. (6)	Total JS (7)	Per (8)
Raw Materials or Other Inputs: 1.							
2.							
3.							
4. **ALL OTHER** Raw Materials/Inputs							
Transport Expense: 5.Bus/Taxi, etc:							
6.Transport of Goods:							
7.**OTHER** Transport Costs:							
Repair/Maintenance Expense: 8. Machines/Tools					During Ref QTR	Pay Rate	
9. **OTHER** Repairs/Maintenance Exp.					Overlapping MTH (6)	Total JS (7)	Per (8)
Utilities: 10. Electric							
11. Water							
12. Telephone							
13. Other Utilities							
Rent/Lease: 14. Buildings							
15. Land/Open Space							
16. Equipment							
17. **ALL OTHER Expenses**							
TOTALS							

SECTION IIIC.1. QPS OF JAMAICAN MSEs: Purchase of Merchandise Stock by Trade MSEs

FORM IS USED for MSE Firms in Trade or Service when they buy their stock of materials for retail;

Page: ___ of ___

Merchandise or Stock Purchased for Retail or Sale	Is Infor. from Records?	Unit of Meas.	Total Purch. for Reference Week			Ttl For Ref. Month		Total For Ref. Quarter	
			Qt.	Price	J$ Value	Qt.	Total $	Qt.	Total J$
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10. Miscellaneous Items Grouped		XX	XX	XX		XX		XX	
T O T A L		XX	XX	XX		XX		XX	

====> IIIC.2. Considering the volume of purchases done, would you describer each reference period as (1) Normal, (2) Low, or (3) High:

The Week: _____ ; The Month: _____ ; The Quarter: _____ ;

SECTION IIID.1. REVENUE FROM RETAIL OF MERCHANDISE (FOR TRADE MSEs) OR SALE OF SERVICES FOR SERVICE MSEs

Page: ____ of ____

Merchandise and Services Sold During Ref. DAY	Is Infor. from Records?	Unit of Meas.	Total Values for Reference DAY				Name the Day of Visit	Compare with Busiest day of Ref. Week	Total for Reference WEEK			
			Qt.	Price/1	Ttl $ Value	Level			Qt.	Ttl J$	#, Days	Level
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)	(13)
1.												
2.												
3.												
4.												
5.												
6.												
Miscellaneous		XX	XX									
TOTAL		XX	XX									

NOTE: Columns 2, 3, 4, and 10 have the same meaning as they are used in the previous pages or forms.

ELSE: Col. 1: Major items sold during the reference day go here; other minor sales could be grouped together after the major ones are listed.
Col. 4: Put the total number of the major item sold for the ref. day;
Col. 5: "Price/1" means the price per one or the unit price of the items whose number is indicated in Col. 5;
Col. 6: Put here the **TOTAL** values of the items sold for each Row; (Col. 6) is equal to (Col. 4) Times (Col.5));
Col. 7 & 13:
Col. 8: Put the **day of the visit** (e.g. Monday, Tuesday, Wednesday, ..., etc.)
Col. 9: Here compare the total sales for the Ref. DAY with the busiest day of the week in which the Ref. DAY falls;
Col. 10 & 11: The information sought here is the total for the **WHOLE WEEK**;
Col. 12: Put here the **TOTAL NUMBER OF DAYS** on which the MSEs was open for business during the Ref. Week;

====> IIID.2. Considering the volume of sales, would you describe each reference period as (1) Normal, (2) Low, or (3) High:

The Week: _____ ; The Month: _____ ; The Quarter: _____ ;

=====> **ACCOUNTING FOR REVENUES FROM NON-TRADE (OR NON-SERVICE) ACTIVITY:**
(NOTE: If Trade MSE, then find Revenue from Mfg. and Services, etc)

What is the Total J$ Value of any Product it produced (manufactured) and sold OR Repairs (for Trade MSE) it performed? J$ _____

SECTION IB. QPS OF JAMAICAN MSEs: INVENTORY OF a) OUTPUTS & INPUTS FOR MANUFACT. MSEs; OR b) MERCHANDISE & SUPPLIES FOR TRADE/SERV.)

Page: ___ of ___

Entry No.	OUTPUT FOR MANUFACTURING AND MERCHANDISE FOR TRADE	Quantity		Value
		Unit	Number	J$
(1)	(2)	(3)	(4)	(5)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14	REMAINING Items Grouped			
TOTAL		////////	/////////	

Entry No.	Raw Material for MFG. And Inputs Consumed In House for Trade\Serv.	Quantity		Value
		Unit	Number	J$
(6)	(7)	(8)	(9)	(10)
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
11				
12				
13				
14	REMAINING Items Grouped			
TOTAL		////////	/////////	

Col. 2: a) For a **MANUFACTURING MSE**, list the stock (inventory) of goods or output produced by it & available for sale;
b) For a **TRADE/SERVICE MSE**, list the stock (inventory) of merchandize it has available for sale;

Col. 7: a) For a **MANUFACTURING MSE**, list the raw materials available to be used for production of outputs/goods;
b) For a **TRADE/SERVICE MSE**, list the stock (inventory) of consumable supplies to be used up in running the MSE.

Col. 3 & 8: The Unit of measure could be pound (lb.), Kg., or liter; if an item is just counted (that is, it is not measured), then enter count for unit (e.g., chairs produced by an MSE, or bread and fruits, for sales by the MSE). Please note that things such as baskets, bundle, sacks, etc. could be used as units of measure. Thus, 4 sacks of charcoal, 5 baskets of fruits, etc. If in doubt, to find the unit of measure, you must ask how the item is sold (e.g., for manufactured goods and merchendize) or bought (e.g., for supplies).

Row. 14: This Row is for grouping of items that are too many or too small to enter individually. The J$ value for these grouped items is the sum of all of them (and not the price of a single one).

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