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DO PUBLIC SECTOR CONTRACTS AND POLICY TOWARDS SMALL FIRMS MATTER?: EVIDENCE FROM WOMEN BUSINESS ENTERPRISES

ABSTRACT

This paper provides an empirical investigation of the agency relationship between the public sector and small firms targeted for assistance by examining micro and macro data for a cross section of eligible women business enterprises (WBEs). Using hedonic sales and employment indices we find that 2% of firm sales is lost to negative gender externality. We show that under asymmetric information public sector transfers neither compensate for this loss of sales nor do they increase employment. When we impose transfer restrictions under perfect information, sales is unaffected but firms respond by increasing the amount of part time employees hired and do not increase full time employment. Moreover, we show that WBE presence at the state level depend on prime-contractor-sub-contractor relationships and that if long term contracts are offered then business risks are reduced and firms increase employment levels because of securitized sales. Further, formation of new WBEs are directly proportional to the amount of new small business loans provided in the economy after controlling for size and population effects. The evidence suggests that after President Richard Nixon signed Executive Order 11625 the velocity of new WBE formation is approximately 39% of the difference between policy targets and actual realization. We introduce an entrepreneurial reaction function which shows that firms react to private and public sector funding incentives but not to the level of education attainment and overall business formation in the economy. We find that agency problems provide incentives for firms to engage in strategic misrepresentation. Thus, the incidence of adverse selection in current transfer programs are as high as 60% in some instances; imposes an asymmetric residual loss on the public sector, and contrary to the goals of benevolent policy, transfers are skewed in favor of less needy firms.

Keywords: negative externalities, compensatory financial contracts, hedonic indices, business risk, entrepreneur reaction function

Journal of Economic Literature Classification Number: G3 G38

I. INTRODUCTION

Small firms are one of the fastest growing segments of the business community in the United States. According to statistics extracted from the United States Enterprise and Establishment Microdata (USEEM), in 1982, approximately 94.2 percent of all manufacturing firms had less than 100 employees. Further, they accounted for 16.5 percent of employment and 12.1 percent of sales nationwide (see Acs and Audretsch (1990), pp: 61-63)[1]. However, due to scale effects (Weiss (1976)), and relatively higher cost of capital (Stoll (1984), Andrews and Eismann (1984)) some of these entities are at a competitive disadvantage *vis-a-vis* larger and more established conglomerates. For instance, research has shown that small firms face liquidity constraints and higher debt financing costs that stymie timely completion and implementation of projects and abet sub-optimal capital labor ratios (Evans and Jovanovic (1989) and Fazzari, Hubbard, Peterson (1987)). These disadvantages are not new. During the Post World War II period, many studies investigated the impact of monetary policy on small business access to credit (e.g., McHugh and Ciaccio (1955), Federal Reserve System Report (1958), Stockwell and Byrnes (1961)). By and large, they found that next to self financing, bank credit was the key factor affecting small business investment and development[2] (see Cox, Elliehausen and Wolken (1989)).

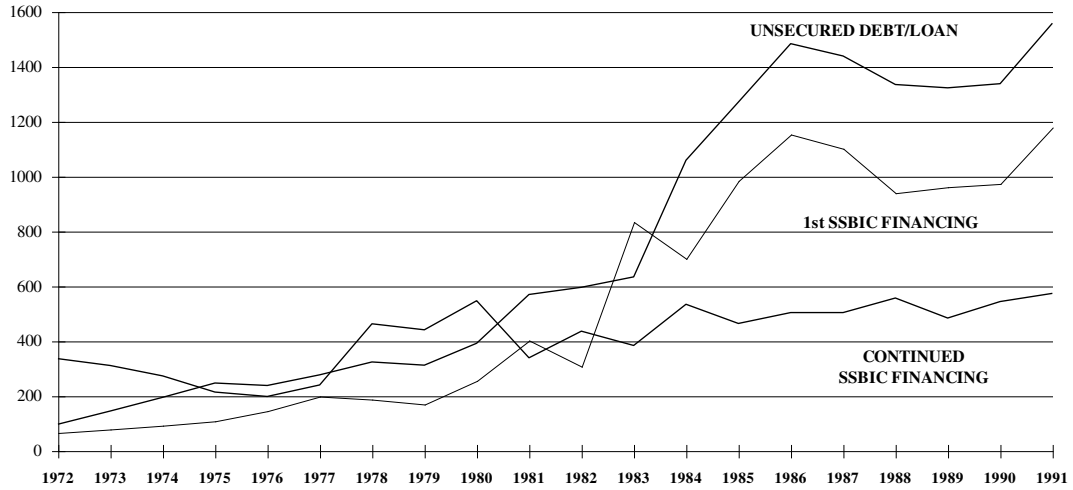
The incipience of current public policy towards small firms occured in 1953 when Congress instituted the United States Small Business Administration (USSBA or SBA as it is more commonly known), as part of the Small Business Act, in order to alleviate some of the disadvantages and provide technical and managerial assistance for small businesses to facilitate procurement of government loans and contracts. A funding component was later added through the Small Business Investment Company Act of 1958 (SBIC). That piece of legislation was designed to foster public-private sector partnerships by permitting the SBA (1) to grant licenses to private

[1] Recent work by Davis, Haltiwanger and Schuh (1993) questions the commonly held beliefs that small firms are largely responsible for job creation in the economy.

[2]Recently, Gertler and Gilchrist (1993) showed that short term credit flows decline for small firms after tight monetary policy but actually increase for large firms. Thereby, lending credence to theories that posit financial propagation mechanisms in business cycle studies.

sector investment companies and (2) to provide SBA guaranteed debt over and above the private capital input of licensed investment companies. SBICs use their pool of private capital and SBA leverage to provide long term financing and equity capital for small firms. According to the Investment Advisory Council (IAC) report to the SBA (1992a), between 1959 and 1991, SBICs disbursed $8.5 billion in long term capital to over 55,600 firms, of which approximately 31% of disbursements were SBA backed debt.

Figure 1(a): *SBIC 301(d) Financing of Small Firms*



Source: Extrapolated from various issues of *SBIC Digest*. The data for 1972-1974 were estimated from backcasting and that for 1990-1991 was estimated from a state space forecast of the three series.

In 1969, Specialized Small Business Investment Companies (SSBICs) were formed to address the special needs of Women Business Enterprises (WBEs), Minority Business Enterprises (MBEs) and otherwise economically disadvantaged firms. According to the IAC Report to the SBA (1992a), as of 1991, about 14,000 such firms received some type of funding from SSBICs. The role of SSBICs was expanded in 1972 when President Richard M. Nixon signed Executive Order 11625 to foster (in part) the development of otherwise "disadvantaged business enterprises". The distribution of SBIC funding over a 20 year span is depicted in Figure 1(a). Due to increased bureaucracy induced by public sector procedures, the Office of Advocacy for the SBA was established in 1976 to reduce the debilitating effect of government red tape on small firms. Moreover, in response to the onslaught of regulation implemented in the early 1970s, the Economic Policy Act of 1980 was

passed to enable Congress to monitor the state of small business via annual reports from the President.

Most empirical studies on small firm finance and entrepreneurship focus on determinants of capital structure and characteristics of business owners (e.g. Constand, Osteryoung and Nast (1991), Bates (1990,1991), Walker (1989), Fairlie and Meyer (1992)). Other studies such as Holtz-Eakin, Joulfain and Rosen (1992, 1994) and Meyer (1990) examine the impact of wealth and or inheritance on entrepreneurial choice. In the literature on firm growth Lucas (1978) and Jovanovic (1982) (among other things) examined entrepreneurial decisions and their impact on heterogenous firm size to explain why smaller firms grow faster than larger firms in the same industry. Recently, Prager (1993) provided a qualitative assessment of an outsourcing agency problem in the public sector by examining the role of scale, scope, organization, competition and management in the selection of contractors to do the job(s). This study differs from earlier studies in many ways. Specifically, it uses a unique dataset of a cross section of women owned firms that qualify for public sector transfers under some of the programs outlined earlier. Secondly, it provides an empirical analysis of an agency problem between the public sector and small firms by analyzing the effects of transfers designed to compensate for negative externalities and increase the growth of targeted firms. Thirdly, it utilizes marco data to assess firm response at the national level to various public sector financial and contracting incentives. Fourthly, it provides an empirical investigation of the impact of asymmetric information on the effectiveness of the transfer mechanisms used to provide assistance for these firms. In particular, we provide an *ex-post* analysis of adverse selection in the transfer program.

To underscore the timeliness and importance of this study we note that women owned enterprises increased from 5% in 1972 to 30% of all firms in 1989 (Nelton (1989)) with an estimated growth rate of 57% between 1982 and 1987 - twice that of men owned firms (Brush (1992)). According to a recent SBA Report (1992b), approximately 12% of SBA loan recipients went to 100% wholly owned WBEs and about 35% went to recipients that had at least one female

part owner. Further, approximately half of all firms in the U.S. will be female owned by the year 2000 (Olson and Currie (1992)). Several factors contribute to the success and explosive growth of WBEs. According to Granger, *et alia* (1993) many of these firms began by "pulling themselves up from the bootstrap" with personal resources, small business loans from commercial banks and government financing from (SBICs). Some analysts believe that so called government setaside contracts and SBA certification status are needed to sustain this growth because women experience gender bias in their quest to procure new business and obtain start-up capital (see Nelton (1993), *NAST Review* (1993), *Venture Capital Journal* (1992)). For instance, Bates (1994) provides evidence that state and local government assistance seems to be skewed toward women business owners and that small firms do benefit from such assistance. Other studies show that women are not discriminated against by bank officials when they apply for small business loans (see Buttner and Rosen (1992) and the references therein). Moreover, some non-profit and research organizations provide counsel for women interested in starting their own businesses and some private venture capitalists specialize in funding WBEs[3].

In keeping with the guidelines of the Board of Governors of the Federal Reserve (1980), a small firm in this study refers to one with less than 500 employees. However, most of the firms in the micro data set actually have less than 100 employees so that selection criteria is easily satisfied. The empirical analyses in this paper is based on a spectrum of econometric models implemented as follows. Section II, presents the research methodology and describes the associated hypotheses developed to test the relationship between public sector contract and incentive activity and WBE development. It also provides a brief demonstration of the liquidity constraint argument mentioned earlier. In Section III, a brief description of the data is provided followed by empirical results and

[3] Vizly, the National Education Center for Women in Business located at Seton Hill College in Greensberg Pennsylvania recently received a grant from the federal government to provide research and education for Women Owned Businesses. Similarly, the National Women's Business Council in Washington D.C. is also set up to provide assistance. Among venture capitalists, Capital Missions Company, St. Charles, Illinois and Ark Capital Management, Chicago, Illinois are two entities that specialize in securing funding for Women Owned Businesses. In fact Ark Capital Management introduced a novel fund of funds concept to steer venture capital towards WBEs. Similarly, according to *The Private Equity Analyst* (August 1993) Fairview Capital Partners, L.P., in Farmington, Connecticut, showed that the return to limited partners from a sample of SSBICs averaged 17% after expenses - an attractive return by any standard.

stylized facts about associated business risks. Some policy recommendations are proposed to increase the stability and viability of these firms by reducing business risks. In Section IV the empirical results for the research questions are presented and an hedonic sales and employment indexes are introduced to test for incidence of gender bias across industries. Diagnostics from robust small sample pretest procedures are included in the Appendix. Section V is the summary and conclusion.

II. METHODOLOGY

The first hypothesis investigated provides a weak form test (to be explained later) of the impact of federal contract actions at the state level on the development of WBEs in those states. To conduct this test we regress the number of adult women in the state(s), WBE ownership rates and Federal Contract Actions in those states, on the number of WBEs in the state(s). If federal contract actions at the state level are an integral part of the income of women businesses in those states, then we would expect them to be a significant explanatory variable in the model. Even though the model controls for size effects by including the population of women in the states as an instrument for state size, it may well be that state size is unrelated to federal contract activity. For instance, political clout of Congressional Representatives maybe a better indicator. Moreover, due to shortcomings in the data the model does not account for other characteristics of business owners such as education and personal resources used for start-up capital which also help to explain small business development (see Bates (1990), Farlie and Mayer (1992)). Because these variables were not available, and hence omitted from the model, the test is necessarily weak form.

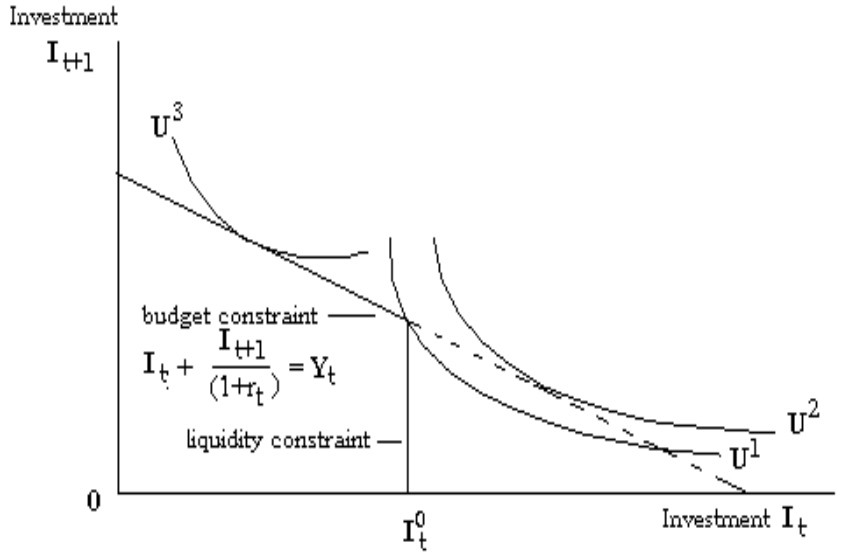
The second hypothesis examines the effect of federal contract actions at the state level on sales and receipts of women owned firms in those states when the regressors are the same as those from the first hypothesis. In this Multiple Indicator model, if federal contract actions are a significant component of sales and receipts then one would expect them to be significant in the model. Here

again, this is a weak form test since there are other factors such as private sector contracts that also determine sales and receipts and other indicators may also qualify as dependent variables[4].

Hypothesis number three takes place at the micro level where we employ a unique dataset of a cross section of women owned firms to identify evidence of negative externality (due to gender bias against these firms) and the impact of public policy in addressing this problem. To assess the impact of public sector contracts and policy at the firm level we introduce the notion of weak and strong benevolent policy by including certain policy interaction terms in the model and imposing restrictions on others. We say that a benevolent policy is weak when there is ineffective public sector transfers that 'throws money' at small firms but fails in its attempt to compensate for negative externalities. Strong benevolent policy occurs when certain restrictions are imposed on the model so that government policy is forced to provide the full compensation needed to eliminate negative externalities. The impact of these policies are examined in the context of hedonic sales and employment indices. The hedonic sales index is constructed with regressor variables comprising firm demographics such as female ownership threshold, firm age and quality measures such as amount of services provided, number of pieces of equipment and square footage of floor space for the home office. If the threshold of female ownership is significant and negatively correlated with sales then firms with higher levels of female ownership will have lower sales and receipts. Therefore this test provides a weak form measure of gender bias because other factors such as industry decline and poor management may also explain lower sales. The model attempts to control for some of those scenarios via an instrument for business experience, namely, firm age or length of stay in business. The model is extended to include strong and weak benevolent policy variables mentioned earlier. The hedonic employment index is similar to the hedonic sales index except that the dependent variable is no longer the log of sales but the log of the number of full and or time and or part time workers employed by the firm, accordingly.

[4] It should be noted that in many cases private sector contracts include Women and or Minority Owned Businesses as sub-contractors either voluntarily or in accordance with government request for proposal (RFP) guidelines. This would be included in the residual and or "unexplained error term" in the model.

Figure 1(b)*: Liquidity Constraint Argument*



Finally, the fourth hypothesis examines the relationship between the rate of new business formation for WBEs and the amount of SBA loans provided in corresponding states and or jurisdictions. A simple stock adjustment model is used to investigate whether the level of new WBE formation depends on the level of SBA loan activity in prior periods. If those variables depicting SBA activity are significantly correlated with WBE formation then one may conclude that SBA policies play a key role in the growth and development of small businesses nationwide. The model is motivated by an intertemporal liquidity constraint argument depicted in Figure 1 (b)[5]. In that set up the firm has an investment utility function $U(.)$ and an endowment of funds Y_t at time t. When there are liquidity constraints the firm would like to be on the U^2 utility curve but is constrained to stay on the U^1 curve regardless of the interest rate for loanable funds (r_t) at time t. In that case $I_t = I_t^0 = Y_t$ and the firm invests all of its time t endowment. At U^3 the firm does not experience liquidity constraints and it can trade-off between current and future investment in its intertemporal budget constraint equation $I_t + I_{t+1}/(1+r_t) = Y_t$. The familiar intertemporal rate of substitution between present and future investment is $U'_{t+1}/U'_t = (1+\rho)/(1+r_t)$, where ρ is the subjective discount rate. Mathematically, the derivatives do not exist at the corner of the budget constraint so

[5] For a more detailed empirical analysis on this issue with respect to small firms see Rhyne (1988).

there is no intertemporal substitution for liquidity constrained firms. Nonetheless, larger firms tend to operate at the U^3 level and smaller firms at the U^1 level. One of the goals of public sector policies in this case is to provide more liquidity for the U^1 firms in the amount of $I_t - I_t^0$ via some transfer scheme[6]. In this paper, the mechanism employed by the public sector consists of certification status after some screening process in order for firms to qualify for procurement of so called setaside contracts and other compensation for negative externality[7].

A corollary to the stock adjustment model was implemented in the form of an entrepreneurial reaction function. That set up was used to check whether lagged values of private and public sector policy variables had predictive powers in explaining the formation of new firms. We also subject this model to a simple instrumental variable (IV) specification test to see whether or not selected instruments are orthogonal to the entrepreneurial information set. If the model is well specified then it should not be sensitive to variables in the time t-1 information set of entrepreneurs.

Finally, we introduce a *de facto* certification scoring model to mimic possible decision rules of public sector implementation of the loan and contract transfer mechanism. For instance, we compare results from a naive decision rule in which firms are given a 50-50 chance of selection in the program. This is compared to an adaptive decision rule in which the historical acceptance rate is used to compare the robustness of the model. We also use the model to provide *ex-post* estimates of adverse selection in the transfer program and to identify the characteristics of those firms actually selected to participate versus the characteristics of other eligible firms that either decided not to participate or which were not chosen to participate. Whereas no explicit hypothesis is tested in this segment of the paper, some stylized facts are gleaned from the data.

III DATA AND BUSINESS RISK

[6] Whether the transfer takes place in the form of a lump sum or some kind of intertemporal distribution scheme depends on the distribution of information among the parties involved. Under perfect information the authorities could simply allocate an appropriate lump sum transfer to needy firms. However, as is more likely the case, the allocation of the transfer takes place under imperfect information so that the authorities are forced to devise some kind of mechanism to acomplish this goal. An analysis of this problem is outside the scope of this paper. The interested reader is referred to Laffont and Tirole (1993) for a taxonomy of such schemes.

[7] In many ways liquidity constraints and negative externality have similar debilitating effect on firms.

Data

Micro data for the analyses were procured from a management consulting firm that specializes in public sector contracting issues. The data is current as of January 1, 1990[8], and it represents a cross section of firms taken from across the U.S. In keeping with the Board of Governors of the Federal Reserve Board System (1980), only nonfinancial and nonfarm industries were considered. Since all the firms were privately owned, the issue of heterogeneous record keeping procedures peculiar to publicly held and or non-profit firms (Cox, Elliehausen and Wolken (1989)) are not relevant here. Macro data was taken from various issues of the Statistical Abstract of the United States published by the U.S. Census Bureau.

Each firm in the micro dataset provided data on last reported sales (SALES); the number of services offered (SERVICES); the number of pieces of equipment at its disposal (MACHINE); the number of full time (FULLEMPL) and part time employees (PARTEMPL); the amount of floor space occupied by its offices in square feet (FLORSPC); the year the firm was established (YRESTAB); Standard Industry Classification (SICCODE); percent of firm which is owned by members of a minority group (PCTMBE); percent of firm which is women owned (PCTWBE); number of clients (CUSTOMRS); and Small Business Administration, Section 8(a) certification status (SBA8(a)). The number of years in business (e.g. an instrument for business experience) was computed at 1990 as:

$$YRSINBUS=1990 - YRESTAB$$

The amount of equipment and the services offered were transformed[9] as follows:

$$INVSERV = 1/SERVICES \quad INVMACH = 1/MACHINE$$

[8] Actually, some observations ended in 1988 and the final two years were estimated from extrapolation.

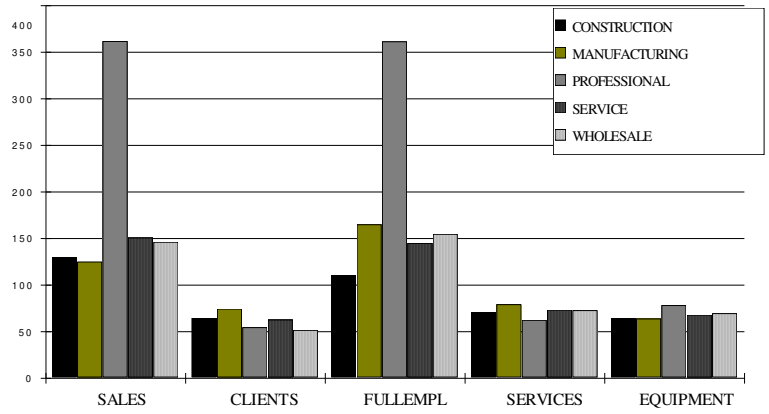
[9] The transformation of service and equipment was done to provide a more intuitive interpretation of the regression results for expository purposes since initial runs with the untransformed variables revealed that some negative coefficients were an artifact of the sample. However, the transformation is fairly innocuous and does not affect interpretation of the models.

Other transformations entailed conversion of SIC codes into dummy variables by using the format 1=in industry group, 0=not in industry group. A more detailed description of the variables is shown in the Data Appendix.

Business risk

A major indicator of the risks associated with small business is the volatility of firm earnings. This is crucial since the cost of equity financing is typically high for these firms and many of them lack the ability to fund projects from internal earnings (see Gertler and Gilchrist (1993)). From a corporate finance perspective, business risks indicate the amount of leverage (e.g.

Figure 2. *Volatility distribution of firm characteristics*

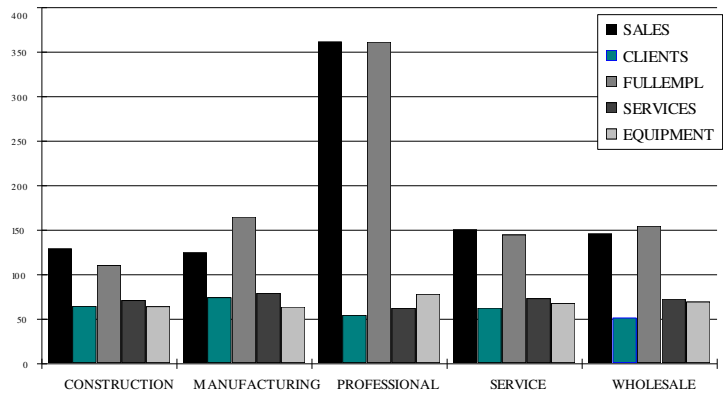


firm debt/firm value) in the capital structure of these firms. For example, Bradley, Jarrell and Kim (1984) found that firm leverage ratios will be negatively correlated with earnings volatility if bankruptcy costs and agency costs of debt matter. So that the extent to which firm characteristics affect sales, is the extent to which they will also affect business risk. Figure 2 displays the volatility of firm characteristics as measured by the coefficient of variation ($CV = (\sigma_x / \overline{X}) \times 100\%$) of firms' sales in the spirit of Ferri and Jones (1979)[10]. The dispersal of clients, services and equipment are relatively stable across industry sectors. However, the numbers indicate relatively high volatility in full time employment and sales. This is not surprising since increased sales tend to lead to increased

[10] Most studies use earnings before interest and taxes (EBIT) to compute business risk (e.g. Bradley, Jarrell and Kim (1984) and Titman and Wessels (1988)) since the cash flow generated by earnings are used to service debt. However, Ferri and Jones (1979) argue that since sales constitute the bulk of income it should be a good proxy variable. In any case, earnings statements were not available for these firms so sales was used as a proxy for EBIT.

employment to meet the increase in demand for firm products. High volatility in sales and employment implies that these variables are unstable. Therefore one can expect most of the firms across industries not to have "deep pocket/long purse" to "ride out" a recessions as well as their larger counterparts. From the principal's perspective (e.g. public policy), this raises the question of whether it may actually be more efficient to allow firms to go bankrupt as a result of industry decline or poor management or to absorb the *de facto* bankruptcy costs of those targeted for assistance because of negative externalities due to gender bias. In the event that policy makers choose to compensate for the externality,

Figure 3. *Volatility distribution of industry sectors*



the relatively high volatility displayed by sales suggests that some stabilizing factor is needed to reduce it. One such factor is direct or indirect facilitation of long term contract procurement or securitization of on going sales. Given the similarity in volatility between sales and employment, such a policy would also have a stabilizing effect on employment. The volatility exhibit for industry sectors (Figure 3) depict heterogeneity and instability in every industry sector because of sales and employment. However, the volatility patterns are strikingly similar if those variables are excluded.

In addition to *intra-industry sector* volatility, the instability displayed by all sectors could also be an artifact of the sample since firm data is self reported. Ideally, concomitant figures on firm costs are needed in order to estimate operating leverage[11] in each industry, so that a more accurate

[11] This is a measure of the relationship between sales and production costs. For example, **operating earnings=sales-(cost of goods sold+administrative expenses+other production costs)**

estimate of business risk can be obtained. For example, operating earnings for small firms are likely to be less volatile than sales over the business cycle. This is highlighted by the simple variance formula:

$$\sigma^2_{SALES} = \sum_{i=1}^{4}\sigma^2_{Z_i} + 2\sum_{\substack{i=1 \\ i<j}}^{4}\sigma_{Z_i Z_j} \Rightarrow \sigma^2_{SALES} \geq \sigma^2_{OP\ EARNINGS}$$

where Z_i represents the i-th component in the computation of sales (e.g. operating earnings, cost of goods sold, etc.). Thus, *an examination of sales volatility alone actually overestimates business risk*. Nonetheless, the presumption here is that increased sales volume leads to increased operating earnings other things equal. So that policy implementation should focus on eliminating those factors that adversely affect the sales revenue and operating earnings of the firms in the data. For instance, whereas factors such as cost of goods sold and other production costs constitute managerial and industry effects which may or may not be affected by public sector regulation, administrative expenses could be affected by reducing bureaucratic red tape. Therefore a policy maker could target sales in each industry for the purpose of affecting sales smoothing to generate regular cash flows for these companies. Similarly, reducing bonding requirements would increase operating earnings by reducing administrative expenses for these firms when they bid for contracts.

IV. EMPIRICAL RESULTS

Before the empirical models in this section were used to test specific research hypotheses, they were subject to pretest estimation for specification error and possible small sample bias. A Box-Cox test upheld the linear specification for the Multiple Indicator models used at the macro level. Since the stock adjustment model and reaction function for new WBE formation at the macro level are estimated over a small sample period (N=20), a jackknife procedure was implemented to check the stability of the estimated parameters. They were found to be stable and other checks for small sample bias did not reveal any anomalies in the model(s). Further details about these procedures are presented in the Appendix.

Macro Evidence

Multiple Indicator Model

This section presents evidence of public sector contracting and policy towards small firms at the macro level by examining a Multiple Indicator (Y_i) model to test the first and second hypothesis from macro data:

$$Y_i = \alpha_0 + \alpha_1 WPOP_i + \alpha_2 WOWNRATE_i + \alpha_3 SBESHARE_i + \alpha_4 BBESHARE_i + \varepsilon_i \qquad \textbf{[1]}$$

$$Y_i = \begin{cases} NUMWBES_i & \text{If } 1st \text{ Hypothesis} \\ WBESALES_i & \text{If } 2nd \text{ Hypothesis} \end{cases}$$

where $\varepsilon_i \sim (0, \sigma^2_{\varepsilon_i})$ and it is assumed that $\sigma^2_{\varepsilon_i} = \sigma^2(STATESIZE_i)$, $i = 1, \ldots, 50$
$NUMWBES_i$ = Number of WBEs in state
$WBESALES_i$ = WBE sales and receipts in state
$WPOP_i$ = Female population in state(000s)
$WOWNRATE_i$ = Proportion of businesses in state owned by women
$SBESHARE_i$ = Small Business Enterprise (SBE) share of Federal Contract action in stat
$BBESHARE_i$ = Big Business Enterprise (BBE) share of Federal Contract Actions in stat

Under this parametrization scheme, WPOP is used as an instrument for STATESIZE in the transformation for heteroskedasticity correction[12]. It should be noted that the "intercept" term is no longer constant. Reparametrization of [1] gives the following equation

$$\frac{Y_i}{\sqrt{WPOP_i}} = \frac{\alpha_0}{\sqrt{WPOP_i}} + \alpha_1 \frac{WPOP_i}{\sqrt{WPOP_i}} + \alpha_2 \frac{WOWNRATE_i}{\sqrt{WPOP_i}} + \alpha_3 \frac{SBESHARE_i}{\sqrt{WPOP_i}} + \alpha_4 \frac{BBESHARE_i}{\sqrt{WPOP_i}} + \frac{\varepsilon_i}{\sqrt{WPOP_i}}$$

which can be rewritten as

$$Y_i^* = \alpha_0^* + \alpha_1 WPOP_i^* + \alpha_2 WOWNRATE_i^* + \alpha_3 SBESHARE_i^* + \alpha_4 BBESHARE_i^* + \varepsilon_i^* \quad [1]'$$

where the asterisks correspond to the transformed variables (see Kmenta (1986)).

Estimation of [1]' as shown in Table 1, indicate switching significance between SBESHARE and BBESHARE in the multiple indicator model when the dependent variable switches from WBESALES to NUMWBE, respectively. This seeming paradox can be explained by the fact that many federal contracts require prime contractors to team-up with women and or minority sub-contractors as a pre-requisite for responding to request for proposals (RFPs). Therefore, in cases where the number of WBEs in a state are highly correlated with "big" business share of Federal

[12] The parametrization scheme may actually resemble a multiple indicator multiple cause (MIMIC) model since the observed dependent variables are actually instruments for each other and the regressors constitute the causal relationship between the true and or unobserved dependent variables. Because of the limited number of regressors this line of inquiry was not pursued. The interested reader is referred to Joreskog and Goldberger (1975) for more on this issue.

Contract Actions they reflect the prime-contractor-sub-contractor relationship mandated by most government jurisdictions. This result is borne out in the case where sales and receipts of WBEs are significantly correlated with small business share of Federal Contract Actions after controlling for state size and the rate of business formation in the state. Further, we find that the size of the female population in a state is positively and significantly correlated with the number of women owned

Table 1. *Results for Federal Contract Activity and WBEs in state and WBE sales and receipts*

	Dependent variable is NUMBER OF WBEs IN STATE		Dependent variable is SALES AND RECEIPTS OF WBEs IN STATE		
VARIABLE	Est. Coefficient	*t*-statistic	Est. Coefficient	*t*-statistic	Labels
$\hat{\alpha}_0^*$	-64113**	-5.789	-871.88	-0.426	Weighted Intercept
	(11074.85)		(2048.45)		
WPOP *	38.16**	23.213	3.37**	11.092	Amount of women in population
	(1.64)		(0.30)		
WOWNRATE *	1258.83**	5.612	15.51	0.374	WBE ownership rate
	(224.32)		(41.49)		
*SBESHARE**	2.78	0.425	-2.13***	-1.758	Small Business Enterprises share
	(6.54)		(1.21)		of Fed contract actions
*BBESHARE**	5.04**	4.998	0.18	0.983	Big Business Enterprise share
	(1.01)		(0.19)		of Fed contract actions
N=50 (48 states and U.S. territories)	$R^2 = 0.9897$		$R^2 = 0.9191$		

Numbers in parentheses are standard deviations

* variable corrected for heteroskedasticity with weight $(1/\sqrt{WPOP_t})$

** Significant at p=0.01

*** Significant at p=0.10

business in that state. So that one would expect greater patronage of women owned business from women in those states. The counter intuitive sign of the intercept term suggests that there may be omitted variables that help to explain business formation such as initial start-up capital and owner education (see Bates (1990, 1991), Farlie and Mayer (1992) for more on education and start-up capital relationships).

Executive Order 11625 and SBA Loans

Stock Adjustment Model

Under the null hypothesis that the number of new WBEs formed after the signing of Executive Order 11625 depends on the current level of SBA loan activity, we have

$$NEWBES_t^* = \alpha_0 + \sum_{j=1}^{n} \alpha_j SBA_{j,t-1} + u_t \text{ , } t=1,...,20;\ j=1,...,n;\ u_t \sim (0, \sigma_u^2) \qquad \textbf{[2]}$$

where $NEWBES_t^*$ is the number of new WBEs "desired" by public policy and $SBA_{j,t-1}$ is the j-th SBA "control" variable at time $t-1$. The lag specification implies that firms formed at time t received their SBA loans (or observed other SBA "controls") at t-1[13]. Due to political and or economic changes in the economy, the actual realization of new firms ($NEWBES_t$) may not coincide with the level desired by public policy. So that the (partial) adjustment process for new firm formation is given by

$$NEWBES_t = NEWBES_{t-1} + \theta(\, NEWBES_t^* - NEWBES_{t-1}\,),\ 0 < \theta < 1. \qquad \textbf{[3]}$$

After substitution, the model is written as

$$NEWBES_t = \theta\alpha_0 + (1-\theta)NEWBES_{t-1} + \sum_{j=1}^{n} \theta\alpha_j SBA_{j,t-1} + \theta u_t \qquad \textbf{[4]}$$

The estimated model in [4] is

$$NEWBES_t = \underset{(7.1326)}{-2.6812} + \underset{(0.1716)}{0.6125}^{*}\, NEWBES_{t-1} + \underset{(0.7997)}{1.8453}^{**}\, NUMSBALOANS_{t-1} - \underset{(0.0256)}{0.0556}^{**}\, NEWSBALOANS_{t-1} \qquad \textbf{[5]}$$

where the numbers in brackets correspond to standard errors, n=2, * implies parameter significant at 0.01 and ** implies parameter significant at 0.05. In this set up $\hat{\theta} \approx 1 - 0.6125 = 0.3875$, so that approximately 39% of the discrepancy between the policy target and actual number of new firms

[13] Actual lags may be greater than one, however, due to the small sample size (N=20) longer lags were not included in order to minimize loss of degrees of freedom in estimating the model.

should be adjusted (added) to the number of new firms in the prior period in order to get an estimate of the number of new firms in the current period. According to significance tests in [5], the number of new WBE firms started after the signing of Executive Order 11625 are inexorably linked to the number and dollar value of SBA loans allocated during the sample period. The negative sign for the intercept term suggests that there may be omitted variables in the model. However, since it is statistically insignificant these variables would have negligible effect on the model. Further, the negative sign for *NEWSBALOANS* suggests that as the dollar value of new SBA loans increase the number of new firms decrease. This is an artifact of the data (see Appendix) which shows that over time larger loans are given to fewer firms. The results from estimating **[2]** are shown in **[5]**. Here new women owned businesses in a given state are significantly correlated ($p<0.10$) with new SBA loans in that state after controlling for all SBA loans and new business formation in the nation. The negative sign is an artifact of the fact that on average fewer firms get larger loans and more firms get smaller loans (see Figure 5 in Appendix). Hence the SBA effectively adopts a less magnanimous policy by granting less loans even though each loan is nominally higher on average. The net result is that less get more! Therein lies the uncertainty introduced by these policies.

Table 2. *Entrepreneurial Reaction Function for 20 year period after Executive Order 11625*

Dependent Variable is
number of new WBE firms

Variable	Estimated parameters	Estimated Parameters w/IVs	Label
Intercept	-2.6812	-0.3893	Constant intercept
	(7.1326)	(27.3243)	
$NEWBES_{t-1}$	0.6125**	0.4292**	New WBEs formed last period
	(0.1716)	(0.1869)	
$NUMLOAN_{t-1}$	1.8453**	2.2784**	Number of SBA loans allocated last period
	(0.7997)	(0.9557)	
$NEWSBA_{t-1}$	-0.0556**	-0.0730**	Dollar amount of new SBA loans allocated last period
	(0.0256)	(0.0308)	
$WBEDEGR_{t-1}$	–	0.0455	College degrees earned by women in U.S. last period
		(0.0260)	
$NLBUSIDX_t$	–	-0.2498	National index of business formation
		(0.2040)	
$SSBICFIN_{t-1}$	–	-0.0132*	Number of firms receiving SSBIC financing last period
		(0.0069)	
	$R^2 = 0.7285$	$R^2 = 0.8044$	

N=19
** Significant at 5% level
* Significant at 10% level
Numbers in parenthesis are standard deviations

Entrepreneurial Reaction Function

A corrollary to the model in [4] was estimated to constitute an entrepreneurial function as follows:

$$NEWBES_t = f[\{PUBLIC\ SECTOR\ POLICIES\}_{t-k}, \{PRIVATE\ SECTOR\ INITIATIVES\ \}_{t-k}] + \varepsilon_t \qquad \textbf{[6]}$$

In this set up, we assume that the decision to start a business is a function $f[.]$ of a set of public sector policies toward small firms and a set of private initiatives taken *k* periods prior to the actual realization of the firm. The presumption is that a k-period incubation period is needed to actually procure funding, physical construction and the establishment of the firm as an ongoing concern. Private sector initiatives constitute personal characteristics of business owners such as education and commercial lending policies toward small firms undertaken by SSBICs. Table 2. shows the estimated parameters for the model including a lagged dependent variable. The results indicate that the amount of new women owned firms at time t are dependent of the number in the prior period and the number and amount of SBA loans granted in the prior period. An IV specification test due to Hausman (1978) was implemented by including the following instruments. A national index of business formation as an instrument to control for the growth of all firms in the economy; the number of college degrees granted to females as an instrument for education attainment of entrepreneurs and an instruments for private sector initiatives in the form of first time SSBIC financing. With the exception of first time SSBIC financing (significant at p=0.10), all the other instruments were rejected. Hence the reaction function is sensitive to private sector funding but not to educational attainment. Also, the growth of new WBEs seems to be independent of the growth of firms in the nation as a whole. Therefore entrepreneurs react to private and public sector funding initiatives but not to education and national business initiatives.

Hedonic Sales Index.

The hedonic sales index was constructed to estimate the impact of WBE characteristics and public sector contracting policies on firm revenue. A semi-log parametrization was selected so that

sales could be appropriately scaled and negative forecast values avoided (Berndt (1990)). The model is stated below and OLS parameter estimates are shown later in Table 3.

$$LNSALES_i = \beta_0 + \sum_{j=1}^{4} \delta_j D_{ij} + \beta_1 CUSTOMRS_i + \beta_2 INVSERV_i + \beta_3 INVMACH_i + \beta_4 FULLEMPL_i$$
$$+\beta_5 FLOORSPC_i + \beta_6 PARTEMPL_i + \beta_7 YRSINBUS_i + \beta_8 PCTMBE_i + \beta_9 PCTWBE_i + \beta_{10} PUBINTV_i + \varepsilon_i \quad \textbf{[7]}$$

$$\text{where } D_{ij} = \begin{cases} 1 & \text{if } i\text{-th firm in } j\text{-th industry}, \quad i = 1,2,...,N;\ j = 1,2,3,4 \\ 0 & \text{otherwise} \end{cases}$$

$\varepsilon_i \sim iid\ (0, \sigma_i^2)$ and the β's and δ's are the corresponding coefficients as shown

Even though heteroskedasticity in this model is not specified, experience has shown that firm size and industry affiliation are the chief culprits of this phenomenon in models of this type (see Kmenta (1986) for more on related phenomenon). A Feasible Generalized Least Squares (FGLS) procedure due to White (1980) was implemented to correct for heteroskedasticity in the residual error (see Appendix for details).

Negative Externality Test. To test for the presence of negative externalities due to gender effects we specify a one tailed test

$$H_0: \beta_9 \geq 0 \ vs.\ H_A: H_0 \text{ is not true.}$$

If the null is true then it implies that at worse there are no gender effects associated with women owned firms. At best there would be positive externalities arising from gender effects. However, if the null is rejected then the estimated coefficient for gender effects must be negative and this implies that there is significant negative externality. The results of this test are shown in Table 3 and depicted in Figure 4.

Weak Benevolence Test under Asymmetric Information. For public policy towards small firms to be effective public sector intervention proxied by the gender interaction term (PUBINTV) must be positive and significant. However, even if this is upheld, as long as $\beta_9 < 0$ and $\beta_9 + \beta_{10} < 0$ the policy will not provide full compensation for the negative externality so it will be weakly benevolent. Therefore the hypothesis test for benevolence in this case is

$$H_0: \beta_9 + \beta_{10} \geq 0 \ vs.\ H_0: \beta_9 + \beta_{10} < 0.$$

Note that under the null we allow for the possibility that rents could accrue to some firms if transfers over compensate for the externality. That scenario may be indicative of the fact that the public sector must infer firm type from some screening process. We correct for the possibility of this type of inefficiency below by imposing a strong restriction that presupposes *de facto* perfect information.

Strong Benevolence Test under Perfect Information. In order for transfers to fully compensate for the gender externality without rents accruing to needy firms we must have $\beta_9 + \beta_{10} = 0$. This would occur if the authorities had perfect information about each firm so that each firm is exactly compensated. To implement this policy we impose it as a strong restriction on the model since it is highly unlikely that this scenario exists otherwise. If the restriction is significant, then we conclude that under perfect information transfers are efficient and they fully compensate for the externality - a result predicted by agency theory. However, if the restriction turns out to be insignificant even though negative externality is significant, then we can conclude that the specific transfer mechanism used in this case (i.e. a linear transfer scheme) is misspecified.

The effective sample size is N=120 which is large enough for estimates to be fairly stable and consistent. Although statistical inference cannot be drawn from the consistent estimates in Table 3, the sign of the estimated parameters reveal stylized relationships between WBE firm demographics and sales whereby positive traits contribute to sales and negative characteristics detract from sales. For instance, industry dummies for manufacturing, professional services, and services all have negative signs. Thus indicating that firms in those industries tend to have lower sales than those in the construction industry where the associated dummy variable has a positive sign. As expected, number of clients have positive impact on sales - more clients implies more sales. It was noted earlier that the INVMACH and INVSERV variables were inverted so that the coefficient of the index would be positive. This procedure was used for expository purposes only. In fact, the result of the regression should be interpreted to mean that when the amount of services offered increases

Table 3. *Estimates for Hedonic Sales Index with SIC dummies*

Dependent variable is LNSALES

VARIABLE	Consistent Est. Coeff.	Efficient Est. Coeff.	Weak Benevolence	Strong Benevolence	Labels
Intercept#	12.8518	12.3572***	11.6648***	10.9187***	Constant
	(0.8092)	(1.2560)	(0.1.1893)	(1.1282)	
D1	0.0256	0.88965	0.6046	1.0794	SIC Construction dummy
	(0.5441)	(0.7156)	(0.7558)	(0.7169)	
D2	-0.9908	0.8000	-0.4006	0.4969	SIC Manufacturing dummy
	(0.7214)	(0.9108)	(1.0236)	(1.0332)	
D3	-0.9964	-0.5247	-1.0531	-0.8708	SIC Professional dummy
	(0.4617)	(0.6647)	(0.6801)	(0.6799)	
D4	-0.6048	-0.2722	-1.5483**	-1.4339**	SIC Service dummy
	(0.3918)	(0.6325)	(0.6720)	(0.6763)	
CUSTOMRS	0.0496	0.1340*	0.2077**	0.1772**	Number of clients
	(0.0389)	(0.0796)	(0.0806)	(0.0797)	
INVSERV	0.4158	0.0836	0.7749	0.8548	Index of firm services offered
	(0.4684)	(0.7942)	(0.8823)	(0.8907)	
INVMACH	0.2316	1.1825*	1.5896**	1.4563**	Index of firm equipment
	(0.4992)	(0.6581)	(0.6560)	(0.6590)	
FULLEMPL	0.0400	0.0166	0.0264	0.0175	No. of full time employees
	(0.0096)	(0.0169)	(0.0162)	(0.0156)	
FLORSPC	0.00002	0.00004	0.00004	0.00005	Amount of floor space
	(0.00002)	(0.00003)	(0.00004)	(0.00004)	
PARTEMPL	0.0044	0.0349*	0.0456**	0.0525**	No. part time employees
	(0.0117)	(0.0194)	(0.0213)	(0.0212)	
YRSINBUS	0.0354	0.0554*	0.0635**	0.0685**	Years in business
	(0.0177)	(0.0287)	(0.0304)	(0.0306)	
PCTMBE	-0.00004	-0.0013	-0.0025	-0.0052	Percent minority owned
	(0.00353)	(0.0053)	(0.0056)	(0.0054)	
PCTWBE	-0.0184	-0.0314**	-0.0280***	-0.0172*	Percent women owned
	(0.0070)	(0.0102)	(0.0105)	(0.0087)	
PUBINTV1	_	_	-0.0012	_	Weak Benevolence[a]
			(0.0132)		
PUBINTV2	_	_	_	0.0172*	Strong Benevolence
				(0.0087)	
	$R^2 = 0.4049$	$R^2 = 0.3774$	$R^2 = 0.3832$	$R^2 = 0.3639$	

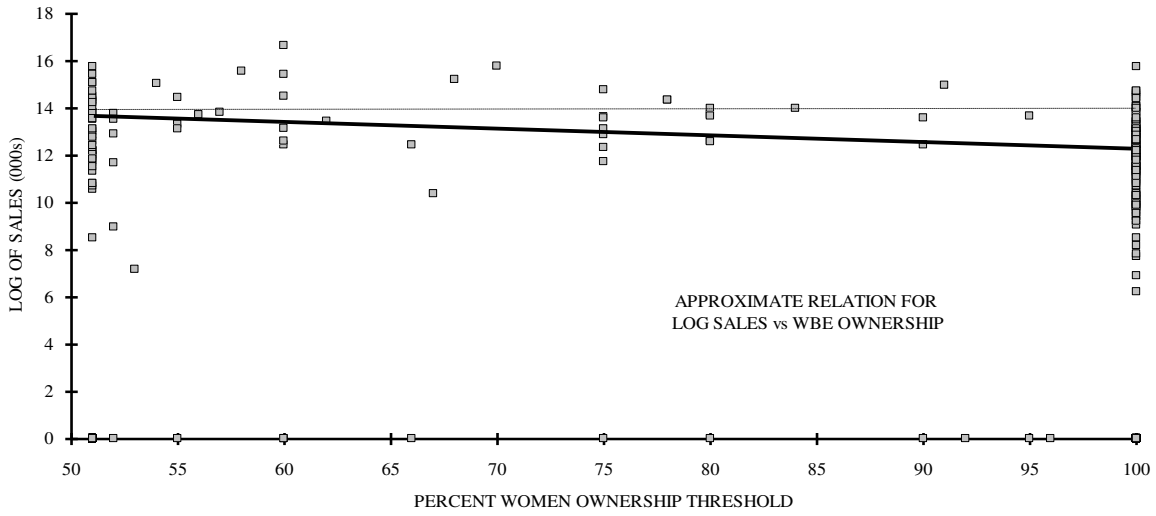
Effective sample size N=120; Numbers in parenthesis are standard errors

* significant at p=0.10 ; ** significant at p=0.05; *** significant at p=0.01

[a] We implemented a supplementary model (not shown) that included a nonlinear transfer scheme and found that weak benevolence still failed.

Intercept term exists for consistent estimators but not for transformed model for efficient estimates (see Kmenta (1986))

Figure 4. *Negative Externality Trend*



Dotted line indcates sales distribution without negative gender externality

firm sales decreases. Similarly, as the amount of equipment increase firm sales decrease. This is an artifact of the type of industries considered in the pooled data. Firms with more equipment tend to be in the service industry which is characterized by low sales, whereas, firms in the construction industry have high sales and low equipment ownership (i.e. many of these firms lease or rent heavy construction equipment so they do not own them outright).

The coefficient for business experience (years in business variable) shows that a unit increase in business experience overcomes the negative externality (but does not eliminate it) due to a unit increase in ownership threshold. In fact each additional year of experience accounts for as much as $354 of every $10,000 increase in sales, according to the index in Table 4, whereas each 1% increase in female ownership results in a loss in sales. So that on net, female owned firms only garner $170 of every $354 gained from business experience. Hence approximately 52% of the increase in incremental revenue is lost to gender effects. Therein lies the negative externality due to gender. On the other hand, if we assume for simplicity that there are no imputed costs associated with experience and reputation, then firms derive net benefits simply by remaining in business for a long time (even though such benefits are reduced in this case). Presumably, some kind of goodwill and market niche is carved out.

Table 3 provides the estimated coefficients for the hedonic sales model with heteroskedasticity correction[14]. The gain in efficiency resulted in minimal loss of explanatory power as seen by the trade off in R^2 from 0.4049 in the OLS model to 0.3656 in the FGLS model. It should be noted that the percent women owned variable is highly significant at $p \leq 0.01$. However, the significance of the INVMACH variable has an interesting interpretation. Firms in the higher sales sectors tend to have less equipment than firms in the lower sales sectors. Thus reinforcing the observation that industries with low equipment ownership thresholds, such as construction, where much of the equipment is leased or rented, tend to have higher sales. Not surprisingly, the number of clients (CUSTOMRS) and the firms' experience (YRSINBUS) have significant impact on sales. An interesting result is the significance of part time employment. This raises the question of whether such a variable is a leading or lag indicator of sales; or whether it is an artifact of the number of small firms in the data. One explanation might be that a significant number of the firms in the sample are involved in seasonal industries such as construction. However, it may also signal entrepreneurial anticipation of firm growth since these firms (presumably) cannot afford labor hoarding.

Hedonic Employment Index

As mentioned earlier, the inclusion of employment variables as regressors in the hedonic sales model raises the question of causality. That is, does high employment cause high sales or does high sales cause high employment? If we assume that firms plan ahead and staff in anticipation of economic booms then it may be plausible to believe that high employment causes high sales. Most importantly, part time employment may be indicative of entrepreneurial anticipation of future firm growth in those industries where seasonal employment is not the norm. Because of the cross sectional nature of the data set the direction of causality could not be determined from lead and lag relationships between sales and employment. Thus, we use a reverse regression approach by using employment variables as the dependent variable and sales as a regressor. Therefore the model is the same as [7] with the roles of sales and employment reversed.

[14]It should be noted that results of the White Test for heteroskedasticity was not rejected for Table 1 results. However, a look at the residual plots indicated that some heteroskedasticity exist. Thus, a correction procedure was implemented. Kennedy(1992), pp: 131 suggests that this can occur when the heteroskedasticity is in a variable orthogonal to the regressors.

Table 4. *Estimates for Hedonic Employment Index with SIC dummies*

	Dependent variable is log PARTEMPL			**Dependent variable is log FULLEMPL**			
VARIABLE	No Benevolence	Weak Benevolence	Strong benevolence	No Benevolence	Weak Benevolence	Strong Benevolence	Labels
Intercept#	1.7759** (0.8030)	1.7983** (0.8121)	1.0116 (0.7330)	0.8221 (0.7384)	0.8721 (0.7399)	1.1958* (0.6923)	Constant
D1	1.0207*** (0.3762)	0.9942** (0.3901)	1.2957*** (0.3698)	0.2219 (0.3293)	0.2896 (0.3358)	0.1732 (0.3227)	SIC Construction dummy
D2	0.5897 (1.6249)	0.5261 (1.6510)	1.0100 (1.6712)	-0.2257 (0.4573)	-0.2920 (0.4617)	-0.3100 (0.4625)	SIC Manufacturing dummy
D3	0.0869 (0.3594)	0.0570 (0.37707)	0.3498 (0.3571)	-0.3662 (0.3083)	-0.3237 (0.3110)	-0.3921 (0.3066)	SIC Professional dummy
D4	0.7132** (0.3564)	0.6860* (0.3715)	0.9722*** (0.3523)	-0.2749 (0.3097)	-0.2467 (0.3108)	-0.2969 (0.3088)	SIC Service dummy
CUSTOMRS	-0.0130 (0.0445)	-0.0124 (0.0448)	-0.0384 (0.0440)	-0.0501 (0.0378)	-0.0496 (0.0377)	-0.0387 (0.0367)	Number of clients
INVSERV	-0.7140 (0.4578)	-0.7121 (0.4608)	-0.7144 (0.4712)	-1.1032*** (0.3965)	-1.0916*** (0.3966)	-1.1291*** (0.3963)	Index of firm services offered
INVMACH	0.7923** (0.3191)	0.7922** (0.3212)	0.7243* (0.3267)	-1.1870*** (0.2926)	-1.1746*** (0.2928)	-1.1509*** (0.2929)	Index of firm equipment
EMPLOYMENT	-0.0051 (0.0091)	-0.0054 (0.0101)	-0.0050 (0.0103)	-0.0009 (0.0098)	-0.0008 (0.0098)	-0.0027 (0.0097)	No. of employees[c]
FLORSPC	-1.601×10^{-9} (1.658x10-8)	-1.414×10^{-9} (1.67x10-8)	1.244×10^{-9} (1.708x10-8)	7.390×10^{-9} (1.585x10-8)	7.011×10^{-9} (1.585x10-8	6.924×10^{-9} (1.588x10-8	Amount of floor space
LNSALES	0.0345 (0.04597)	0.0337 (0.0463)	0.0560 (0.0460)	0.1296*** (0.0435)	0.1277*** (0.0435)	0.1207*** (0.0432)	Log of reported sales
YRSINBUS	-0.0068 (0.0199)	-0.0058 (0.0203)	-0.0137 (0.0204)	0.0463*** (0.0127)	0.0454*** (0.01277)	0.0469*** (0.0127)	Years in business
PCTMBE	-0.0007 (0.0028)	-0.0063 (0.0028)	-0.0013 (0.0028)	0.0014 (0.0024)	0.0078 (0.0025)	0.0017 (0.0024)	Percent minority owned
PCTWBE	-0.0164*** (0.0053)	-0.0164*** (0.0054)	-0.0097** (0.0044)	0.0033 (0.0048)	0.0026 (0.0048)	-0.0008 (0.0039)	Percent women owned
PUBINTV1[a]	–	-0.0020 (0.0071)	–	–	0.0058 (0.0057)	–	Weak Benevolence
PUBINTV2[b]	–	–	0.0097** (0.0044)	–	–	0.0008 (0.0039)	Strong Benevolence
	$R^2 = 0.4879$	$R^2 = 0.4885$	$R^2 = 0.4575$	$R^2 = 0.4630$	$R^2 = 0.4684$	$R^2 = 0.4608$	

[a] corresponds to $H_0: \beta_9 = 0$ vs H_A: H_0 not true

[b] corresponds to $H_0: \beta_9 + \beta_{10} = 0$ vs H_A: H_0 not true

Effective sample size N=120; Numbers in parenthesis are standard errors; c = number of employees is full time when dependent is part time and vice versa

* significant at p=0.10 ; ** significant at p=0.05; *** significant at p=0.01

Intercept term exists for consistent estimators but not for transformed model for efficient estimates (see Kmenta (1986))

The model provide insights into how firms make decisions at the margin in response to public sector benevolence[15]. For instance, the results in Table 4 show that public sector benevolence has no impact on full employment at the margin. At best we experience an increase in the "intercept" term which is not a constant due to heteroskedasticity correction. However, that may be an indication of significance for ommitted variables.

The interesting results are exhibited by the responsiveness of part time employment to benevolent policy. For instance, the introduction of weak benevolent policy has no effect on negative externality arising from gender bias. However, with the imposition of strong benevolence (i.e. strict enforcement of transfer schemes) the coefficient on gender declines by approximately 41% from -0.0164 to -0.0097. Furthermore, this intervention has a highly significant impact on part time employment, particularly in the service and construction industries where part time employment tend to be prevalent. We also see a decrease in the significance of equipment. What this means is that firms respond to strong benevolence by increased staffing of part time employment but do not invest in capital equipment because they are uncertain about the long term intervention policy. It should be noted that after controlling for fulltime employees, sales and firm age is no longer significant in explaining the incidence of part time employment. As an adendum, the results in this section are consistent with the proposals outlined in Section II for reducing business risk.

Significant Demographics

Data shows that floor space is a very poor proxy for firm size in the data. OLS estimate of the parameter for this variable is essentially zero. Similarly, the estimated coefficient for minority ownership is low. This substantiates the fact that over 70% of the firms in the database were non-minority owned.

Estimated coefficients for percent female ownership, and to a lesser extent minority ownership, show that these characteristics have negative impact on firm sales. So that minority and women owned firms experience a negative externality due to race and gender. That is, women and minority business owners pay a premium or incur a penalty over and above the normal costs associated with doing business because of race and gender effects. According to the results in Table 3, this amounts to an estimated 2% of firm sales

[15] This is also a shortcoming of the data because we do not have time series observations to see how firms adjust and or anticipate the benevolent policies.

with a slightly higher increment for minority women as shown. Many factors may account for these phenomena. One of the most frequently sighted reason is that these groups are systematically discriminated against (i.e. excluded from the "old boys network") so that their opportunities for procuring new business is atrophied. Another explanation is that they are relatively new and small businesses deficient in the managerial acumen necessary to be competitive with their more successful non-female-non-minority counterparts.

Characteristics of SBA Certified Frms

Here we identify significant characteristics of firms that obtain government loans and or preferential contracts through SBA certification[16]. The relationship between firm characteristics and SBA 8(a) status helps to identify indicators of the allocation scheme currently employed by the authorities. Even though the actual dollar amount of procured loans and the cost structure of these firms are unobservable, the characteristic vector serves as a noisy signal of firm type. We assume that the principal (SBA) employs a logit model[17] to compute parameter estimates for the binary choice problem (i.e. certify or not certify) since firm type is embedded in the characteristic vector. Estimates are derived from the logistic transformation process

$$P_i = F(\mathbf{x}_i^T \boldsymbol{\beta}) = 1/[1 + exp(-\mathbf{x}_i^T \boldsymbol{\beta})] \qquad \textbf{[8]}$$

where P_i is the probability of finding a firm with the characteristic vector, $\mathbf{x}_i$ and p_i is the corresponding sample proportion. We use the Zellner-Lee (1965) procedure to write:

$$\ln\left(\frac{p_i}{1 - p_i}\right) \cong \mathbf{x}_i^T + u_i \text{ where } u_i \sim iid(0, \sigma_{u_i}^2) \qquad \textbf{[9]}$$

so that [9] models the noisy signal. Intuitively, we assume that the characteristic vectors form a random sample drawn from [8]. Since $\boldsymbol{\beta}$ is unknown we assume that the principal has *ex ante* beliefs (i.e. subjective probability) represented by $\delta(\boldsymbol{\beta})$. However, beliefs (posterior probability) are updated by Bayes rule so that sample observations give an *ex post* probability depicted by

[16] Technically, SBA certification provides the firm with additional opportunities to procure government contracts.

[17] This may not be the actual model used by the SBA. Nonetheless, Lo (1986) used a Hausman-type specification test which showed that a logit model yields comparable results to an alternative discriminant analysis model and that it was more robust to the distribution of the error term.

$$\delta(\beta \mid \boldsymbol{x}_1,\ldots,\boldsymbol{x}_N) \propto \left(\prod_{i=1}^{N} [F(\boldsymbol{x}_i^T\beta)]^{y_i} [1 - F(\boldsymbol{x}_i^T\beta)]^{1-y_i} \right) \delta(\beta) \qquad \textbf{[10]}$$

The principal wants to maximize the posterior probability in [10]. Without loss of generality assume that she specifies a non informative or Jeffrey's prior for $\delta(\boldsymbol{\beta})$ so that the problem becomes one of maximizing the likelihood function (in brackets) in [10]. Then parameter estimates are derived from an iterative numerical MLE procedure[18] (see appendix) applied to:

$$\boldsymbol{L}(\boldsymbol{\beta} \mid \mathbf{x}_i) = \prod_{i=1}^{N} F(\mathbf{x}_i^T\boldsymbol{\beta})^{y_i} \, [1 - F(\mathbf{x}_i^T\boldsymbol{\beta})]^{1-y_i} \qquad \textbf{[11]}$$

y_i is the discrete binary choice variable that describes the SBA certification status of these firms (i.e. y_i=1 $\Rightarrow$ certified, y_i=0 $\Rightarrow$ not certified). Parameter estimates from [9] is shown in Table 3. The odds ratio for certification is computed from the formula[19]:

$$\text{odds ratio}(\textit{variable}) = \exp(\textit{est. beta coeff}) \qquad \textbf{[12]}$$

For example, in Table 5, odds ratio(EQUIPMENT) = $e^{-0.2904}$ = 0.748. Thus firms that have an additional piece of equipment are less likely to be SBA 8(a) certified. However, as outlined before, the amount of equipment is a proxy for industry affiliation. So that firms in the service industry which has the lowest average sales among all industries in the sample, are less likely to attain SBA certification. This is contrary to the stated objective of a benevolent policy designed to assist the neediest firms. Similarly, *odds ratio*(CUSTOMRS) = $e^{0.0135}$=1.014, implies that firms with additional clients are approximately 14% more likely to be SBA certified. It should be noted that these observations may be an artifact of causality. Firms that become SBA certified have more sub-contracting opportunities and hence more clients. However, the sample was roughly evenly divided between certified (N=65) and uncertified (N=48) firms so that there was no strong bias in favor of certified firms[20]. It should be noted that only

[18] See Amemiya (1985), Chapter 9, for a mathematical treatment of this procedure and Maddala(1983) for further details on logit analysis and a taxonomy of other discrete choice models.

[19] See Neter, Wasserman and Kutner (1989), pp: 588-589

[20] See Greene (1993), pp. 652-653 for an exposition of this phenomenon.

Table 5. *Parameter estimates for SBA Certification Model*

Dependent variable is $LOGIT(p_i)$ **where the binary choice variable is SBASTATU = (1 certified.; 0 not certified.)**

Variable	Est. Coeff.	χ^2-stat	p-value	odds ratio	Labels
INTERCEPT	1.0013 (1.3705)	0.5338	0.4650	2.722	Constant
CUSTOMRS	0.0135* (0.0788)	0.0294	0.08638	1.014	Number of clients
SERVICES	-0.1555* (0.0868)	3.2076	0.0733	0.856	Amount of firm services offered[a]
EQUIPMENT	-0.2904** (0.1051)	7.6315	0.0057	0.748	Pieces of firm equipment[a]
SALES	$1.393x10^{-8}$ (5.684x10-8)	1.4966	0.2212	1.0000	Last reported gross sales
FULLEMPL	-0.0849 (0.0919)	0.8540	0.3554	0.919	Number of full time employees
PARTEMPL	-0.0011 (0.0053)	0.0461	0.8300	0.999	Number of part time employees
YRSINBUS	-0.0007 (0.0207)	0.0010	0.9747	0.999	Years in business
FLORSPC	-0.00006 (0.00005)	0.1.4966	0.2212	1.000	Floor space in square feet
PCTWBE	0.00756 (0.0130)	0.3388	0.5605	1.008	Percent women owned

Effective sample size N=113
-2 log L=20.510 (df=9, p=0.0150); Score stat=15.874 (df=9, p=0.0696)
Numbers in parenthesis are standard errors
* Significant at 0.10; ** Significant at p=0.01

Table 6. *Classification of firm type*

	Predicted		
Observed	Not Certified	Certified	TOTAL
Not Certified	31 (21)	17 (27)	48 (48)
Certified	52 (45)	13 (20)	65 (65)
TOTAL	83 (66)	30 (47)	113 (113)

Numbers in parentheses are for Decision Rule I. All others are for Decision Rule II

sales increases to the order of $10 million has any real impact on increasing the odds of the firm being SBA 8(a) certified. The odds ratio in Table 4 (beyond 3 decimal places) suggests that current government policy as signaled by SBA 8(a) certification status, seems to favor the higher earnings firms in the sample.

Strategic misrepresentation

The material that follows assumes that the SBA adopts a simple decision rule (i.e. transfer mechanism)

$$\delta_n : X_1 \times \ldots \times X_n \rightarrow \{0,1\}$$

which reflects its acceptance ($\delta_n(\boldsymbol{x}) = 1$) and rejection ($\delta_n(\boldsymbol{x}) = 0$) rate for certification. In this set up $\boldsymbol{x}$ is the vector of firm characteristics and $\delta_n(\,)$ is implemented according to the estimated probabilities from the logit analysis so that:

$$\delta_n(\boldsymbol{x}) = \begin{cases} 1 & \text{if } \hat{P}_i \geq \hat{p}^* \\ 0 & \text{if } \hat{P}_i < \hat{p}^* \end{cases}$$

where $\hat{p}^*$ is the critical value selected by the SBA. Let Rule I be a naive decision to select $\hat{p}^* = 0.5$; let Rule II state that the critical value must be based on the past history of acceptance and rejection so that $\hat{p}^* = 65/113$ is the reported number in the sample. The results from these procedures are displayed in Table 6.

In accordance with Decision Rule I the authorities would assign a subjective probability[21] of $\underline{\lambda} = 0.42\,(47/113) and\ \overline{\lambda} = 0.58(66/113)$ for low risk (certified) and high risk (not certified) firms, respectively. This rule is correct about 36.3% of the time (i.e. 41/113). The false positive rate of 57.4% (i.e. 27/47) reflects the proportion of high risk firms who were actually misclassified as low

[21] It should be noted that the logit model used here implies a flat or non-informative prior distribution over the regressors. A richer set of results could be obtained if we assume that the government has specified priors over the set of firm characteristics.

risk firms. Per contra, the proportion of low risk firms misclassified as high risk firms is 68.2% (45/66).

Decision Rule II suggests that the subjective probabilities $\underline{\lambda} = 0.27\,(30/113)$ and $\overline{\lambda} = 0.73\,(83/113)$ for low risk and high risk firms respectively. This rule is correct about 39% of the time. This is a slight improvement over Decision Rule I. Under this scheme, 57% (17/30) of high risk firms are classified as low risk firms and 63% (53/83) of low risk firms are classified as high risks.

The decision rules outlined above have error rates in excess of 60%. They also show that high risk firms could palm themselves off as low risk firms about 57% of the time, whereas low risk firms could palm themselves off as high risk firms over 35% of the time. This margin for strategic misrepresentation imposes an asymmetric residual loss by the SBA. For instance if policy is geared toward assisting high risk firms then greater monitoring will have to be placed on low risk firms since they would crowd out target firms by palming themselves off as high risk firms in order to get subsidies. However, the authorities misclassification of high risk firms is more costly from at least a social welfare stand point. If high risk firms are classified as low risks then they would not be given the subsidy and their chances of bankruptcy will increase. By contrast, high risk firms would want to palm themselves off as low risk firms if SBA policy favors low risk firms. So that the problem reduces to one in which the agency problem of eliminating adverse selection is compounded by moral hazard on the part of firms vying for subsidies.

V. SUMMARY AND CONCLUSION

In this paper, the impact of public sector contracts and policy towards small firms was measured by a variety of models at the macro and micro level. In virtually every case, public sector contracting and policy was found to be inexorably linked to the development of small firms. At the national level we find that women owned firms have some reliance on sub-contracting opportunities with big business and that sales and receipts are tied to Federal Contract Activity at the state level. Further, new WBE formation is linked to public sector policies in the post Executive Order 11625 period as depicted by an entrepreneurial reaction function. At the micro level, we show that the

negative effect of gender bias on firm sales accounts for a 52% loss of any incremental gains arising from a unit increase in business experience. Moreover, a business risk analysis shows that the procurement of long term contracts would help to stabilize sales volatility and increase the level of employment. So that indications are that the role of the public sector is crucial in sustaining the growth of small businesses and facilitating employment. However, the ex-post evidence from a simple decision rule attributed to the SBA, shows that the incidence of adverse selection is quite high in these programs. Moreover, even a successful reduction of adverse selection is complicated by the prospect of moral hazard exhibited by selected firms. The evidence in this paper suggests that further research is needed in order to provide a more detailed examination of the agency relationship between these firms and financial intermediaries - especially Small Business Investment Companies (SBICs). Recent work by Petersen and Rajan (1994) have begun in this direction. Further, a richer dataset with time series observations may yield further insights into firm response to public policies.

APPENDIX

I. Heteroskedasticity correction in Micro data cross sectional models

Consistent estimators of the standard errors were obtained by adapting a method due to Halbert White (1980). These standard errors were then used as weights in the Feasible Generalized Least Squares (FGLS) procedure[22]. The FGLS was implemented as follows. Let $e_i = Y_i - \hat{Y}_i$ where Y_i is the dependent variable LNSALES. Regress $\ln(e_i^2)$ on the regressor variables[23] (i.e. firm characteristics and industry dummies) so that

$$\ln(e_i^2) = \pi_0 + \sum_{k=1}^{N} \pi_k X_{ik} + \sum_{k=1}^{N} \psi_k X_{ik}^2 + \sum_{\substack{j,k \\ j<k}}^{N} \theta_{jk} X_{ij} X_{ik} + \nu_i$$

where $X_{ik}^{'s}$ do not include the industry dummies for terms including powers and cross products. Then use the *antilog of the predicted values* from this process to get $\hat{e}_i^2 = e^{\ln(e_i^2) + (1/2)\sigma_v^2}$. These values are the weights in the FGLS estimates

$$\tilde{\beta} = \left(X'\hat{W}^{-1}X\right)^{-1}\left(X'\hat{W}^{-1}X\right) \text{ where } \hat{W} = \begin{pmatrix} \hat{e}_1^2 & & \\ & \ddots & \\ & & \hat{e}_N^2 \end{pmatrix}$$

According to theory, these estimates are consistent and asymptotically efficient so statistical inference can be made. The interested reader is referenced to White (1984) for a rigorous theoretical proof of these results.

[22] A more robust procedure proposed by Oberhofer and Kmenta (1974) and Kmenta(1986), pp: 290-291 was also implemented but it did not work as well as White's (1980) procedure.

[23] A detailed procedure suggested by White(1980) with quadratic and pairwise combination of regressor terms was used.

II. Diagnostics of Robust Small Sample Pretest Estimation Procedures

Table II:*(i)*: *Jackknife Estimation for Stock Adjustment Model*

Variable	Parameter estimate	*t*-statistic	Label
	Dependent Variable is New WBE formation at time t ($NEWBES_t$)		
Intercept	-2.6812 (7.1326)	-0.3759	Intercept
$NEWBES_{t-1}$	0.6125 (0.1716)	3.569**	New WBE firms formed last period
$NUMLOAN_{t-1}$	1.8453 (0.7997)	2.3074**	Number of SBA loans granted last period
$NEWSBA_{t-1}$	-0.0556 (0.0256)	-2.1701**	Value of New SBA loans granted last period in 1991 dollars

** Significant at p=0.05 N=19

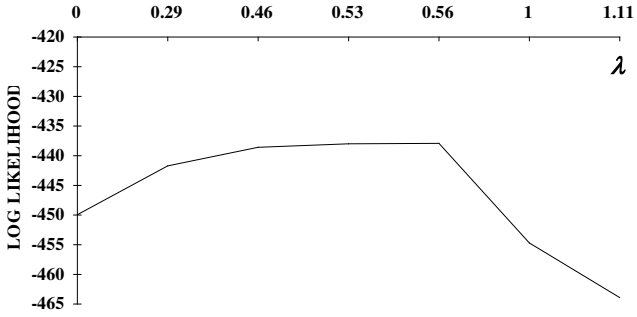
Box-Cox Test Results

The functional form of the Multiple Indicator model was obtained from:

$$\frac{y_t^{\lambda}-1}{\lambda}=\mathbf{x}_t^T\boldsymbol{\delta}+u_t$$

where $\mathbf{x}_t$ is a vector of time t regressor variables at the macro level and $\boldsymbol{\delta}$ is a vector of parameters. Since $\lim_{\lambda\to 0}\frac{y_t^{\lambda}-1}{\lambda}=\ln y_t$, then for λ near zero we use a semilog parametrization or a linear specification otherwise. The plot of λ against the log likelihood function shows that $\lambda=0.560$ is the best parameter value. Hence a linear parametrization was chosen

Figure II:*(ii) Plot of Box-Cox λ versus log likelihood function*

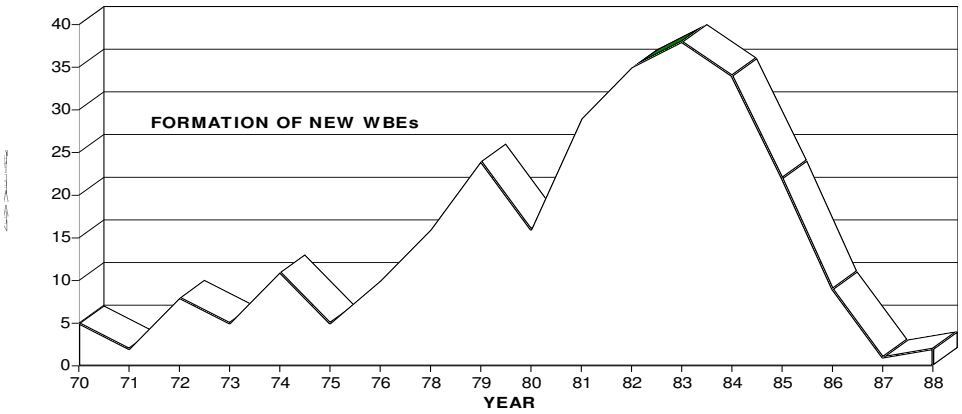


DESCRIPTIVE STATISTICS FOR DEMOGRAPHIC VARIABLES[24]

- Average number of clients per firm is 6 with a standard deviation of 4.
- Average annual sales is $703,628.60 with standard deviation of $1,497,562.
- Median sales is $247,600.00, modal value is $500,000.00, inter-quartile range is $616,500.00
- Average number of full time employees is ten (10); standard deviation is nineteen (19).
- Average number of part time employees is four (4) with standard deviation of 10.
- Average floor space is 1,833 square feet with standard deviation of 6,559 square feet.
- Average business experience is 13 years; standard deviation is 12 years.
- Average amount of equipment is 5 pieces with standard deviation of 4.
- Average amount of services offered is 4 with a standard deviation of 3.
- 71.7% of the firms indicate 0% minority ownership; 24% indicate 100% minority ownership; 2.2% of firms indicate 51% minority ownership; 2.1% indicate other degree of ownership.

[24] More detailed descriptive statistics is available from the author on request.

Figure 5. *New WBE formation*



Descriptive Results.

Business formation. Most of the firms (53%) were established in the decade of the 80's. However, there are businesses which were established as early as 1881 and as late as 1988 - the cut off year for observations in the data set. Figure 1 below demonstrates the proliferation of new WBEs established in the decade of the 1980's. It suggests a favorable business climate during this period that encouraged the development of new businesses. However, this phenomenon could be misleading since those businesses established during the early 1980's may actually have their incipience in the latter part of the 1970's. That is, there is a gestation lag between when an entrepreneur decides to start a business and when the actual establishment of that business takes place. So it may well be that favorable expectations about the business climate germinated in the late 1970's - a few years after Executive Order 11625[25] was in effect - and thus resulted in the fruition of newly established businesses in the early 1980's.

[25] This order was signed by President Richard Nixon to create the SBA and other branches of the Department of Commerce to facilitate the development of "disadvantaged business enterprises".

Figure 6. *Trends in SBA Loans to WBEs 1972-1991*

Data Source: *Statistical Abstract of the Unites States, 1972-1991*

Figure 3 shows that the number of SBA loans declined in 1982 and remained at the same level thereafter even though the nominal value of the average SBA loan increased. Ostensibly, the SBA adopted a principle of granting fewer but larger loans to small businesses.

Macro Data

STATE	NUMBER OF WBEs	WOMEN POP. (000s)	WBE OWNER SHIP RATE	FED CONTRAC ACTIONS	SMALL BUSINESS SHARE	SALES AND RECEIPTS ($M
Alaska	13,976	165	84.7	751	329	829
Colorado	89,411	1,226	72.9	3,710	416	4261
Vermont	13,802	211	65.4	139	79	766
Wyoming	10,796	166	65.0	139	96	524
Montana	17,747	296	60.0	176	138	930
Kansas	53,505	945	56.6	1,489	191	2661
Oregon	58,941	1,046	56.3	547	228	4279
Utah	29,810	536	55.6	1,608	256	1392
New Hampshire	22,713	409	55.5	495	93	1858
Hawaii	21,696	391	55.5	527	271	857
Minnesota	88,137	1,619	54.4	2,634	179	4991
Idaho	18,973	351	54.1	566	81	813
California	559,821	10,380	53.9	30,651	3,668	31027
Nebraska	32,285	608	53.1	383	170	1649
Washington	90,285	1,706	52.9	4,534	519	4689
North Dakota	12,689	243	52.2	228	160	572
Maine	23,922	462	51.8	920	83	1635
Oklahoma	63,690	1,236	51.5	757	360	2948
South Dakota	13,374	262	51.0	147	70	726
Nevada	18,831	373	50.5	948	131	1414
Texas	298,138	6,067	49.2	10,367	1,480	13385
Iowa	53,592	1,099	48.8	768	79	2905
Arizona	60,657	1,268	47.9	3,750	387	2911
Connecticut	60,924	1,291	47.2	5,431	426	5320
New Mexico	25,397	539	47.1	3,026	322	1166
Massachusetts	111,376	2,407	46.3	9,309	790	11140
Maryland	81,891	1,781	46.0	6,839	1,279	5509
Florida	221,361	4,918	45.0	6,977	1,271	16828
Missouri	87,658	2,010	43.6	6,941	446	5349
Indiana	89,949	2,127	42.3	2,321	248	8913
District of Columbia	10,987	263	41.8	2,509	799	774
Virginia	94,416	2,295	41.1	9,509	2,299	5952
Illinois	177,057	4,479	39.5	2,917	756	13884
New York	284,912	7,212	39.5	10,986	1,253	29970
Arkansas	35,469	919	38.6	839	267	2008
Delaware	9,727	254	38.3	223	43	753
Michigan	133,958	3,517	38.1	2,135	559	7889
New Jersey	117,373	3,096	37.9	3,887	790	13554

Wisconsin	69,185	1,833	37.8	1,257	313	4667
Kentucky	53,454	1,424	37.5	949	429	3265
North Carolina	93,532	2,505	37.3	1,599	572	6813
Georgia	88,050	2,364	37.2	3,838	487	5874
Ohio	154,084	4,204	36.7	5,716	805	8872
Rhode Island	14,517	403	36.0	535	179	1340
Tennessee	67,448	1,903	35.4	3,616	920	4226
Pennsylvania	167,362	4,828	34.7	4,998	918	13339
Louisiana	55,852	1,643	34.0	2,319	550	2962
South Carolina	42,604	1,299	32.8	1,844	365	2950
Alabama	48,018	1,574	30.5	2,498	721	3624
West Virginia	22,549	740	30.5	268	106	1114
Mississippi	28,976	973	29.8	1,749	3	2062

Source: Statistical Abstract of the United States, 1992, U.S. Census Bureau

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