CRIME, SECURITY AND FIRM PERFORMANCE IN SOUTH AFRICA

Busani Moyo*

Abstract

We use cross sectional data from the World Bank enterprise surveys gathered in 2007 in South Africa's four cities (Johannesburg, Cape Town, Durban and Port Elizabeth) to assess the impact of business related crimes on firm performance proxied using firm sales. Using Ordinary Least Squares (OLS) and Tobit model, we find that crime in the form of theft, robbery, arson and vandalism has a negative effect on sales and hence firm performance. However the impact of domestic shipment crime is mixed and varies from city to city depending on the magnitude of losses incurred by firms in each city. Results also show that crime is regressive in nature because crime related losses are relatively higher among small firms than large firms. The prevalence of crime amongst small firms and its negative effect on firm performance suggest the need for government and the business community to come together and develop security systems that are effective and affordable to small businesses. This is because, supporting small businesses is important for growth and employment creation.

Keywords: Crime, Security, Firm Performance

** Senior Lecturer in the Department of Economics at the University of South Africa, Preller Street, Muckleneuk Ridge, Pretoria: P.O. Box 392 UNISA 0003 South Africa*
Tel.: +27 12 429 6191, +27 84 526 9216:
E-mail: moyob@unisa.ac.za, myxbus001@gmail.com

1 Introduction

According to the results of a global survey carried out by PricewaterhouseCoopers in 40 countries between April and July 2007 as well as November 2009, fraud was found to be one of the most problematic issues for business worldwide. The 2007 survey which covered about 103 companies (of which 71% were listed) found that South African companies have been the subject of more crime than most other countries in the world. According to the survey, 72% of these companies uncovered fraud over the last two years, compared to 43% of the businesses surveyed worldwide[6]. The same pattern was also replicated in 2009 with about 52% of South African firms falling victim to economic crime compared to 30% globally.

The most common crimes in South Africa, according to the 2007 and 2009 surveys were asset misappropriation (theft), product piracy and counterfeiting, bribery and corruption as well as financial misrepresentation. The surveys also found that larger companies with more than 1000 employees are most vulnerable to fraud, and that the financial services companies reported more incidence of fraud than any other industry.

These findings were partly confirmed by the World Bank enterprise survey data carried out on 1057 establishments in the manufacturing and services sector of South Africa in 2007. Thus about 38% of firms identified crime, theft and disorder as a major hindrance to doing business compared to a regional average of 28% in the whole of Sub Saharan Africa and 25% worldwide (see table 1 below). The severity of crime in South Africa is also reflected by the number of firms that have invested in systems and controls to detect and deter economic crime. Thus about 76% of firms have spent money on security systems compared to the regional average of 60% in whole of SSA.

Given the above findings the question then that comes to mind is: Why is the level of crime so high in South Africa? Schönteich and Louw (2001) argue that there is no single satisfactory answer to this question but a number of reasons have been given to explain these high crime levels plaguing the country.

[6] The African continent also tops the list in terms of having the highest level of economic crime worldwide at 51%, followed by North America with 41%.

Table 1. South Africa Crime related statistics, 2007

	South Africa	Region (SSA)	World
% of firms paying for security	76.38	60.45	56.76
Losses due to theft, robbery, vandalism and arson against the firm (% of sales)	1.01	1.68	1.03
If there were losses, losses due to theft, robbery, vandalism and arson against the firm (% of sales)	2.39	6.14	4.71
Security costs (% of sales)	1.58	1.81	1.45
Security costs if the establishment pays for security (% of sales)	2.07	3.32	2.82
Products shipped to supply domestic market lost due to theft (%)	0.83	0.93	0.91
% of firms identifying crime theft and disorder as major constraint	38.04	27.68	25.53
% of firms identifying corruption as major constraint	16.87	34.65	36.59
Value lost due to power outages (% of sales)	1.60	5.84	4.90

Source: World Bank enterprise surveys

Table 2. South Africa Crime related statistics by major cities, 2007

	Johannesburg	Cape Town	Port Elizabeth (P.E)	Durban
% of firms paying for security	73.57	90.34	53.03	63.78
Losses due to theft, robbery, vandalism and arson against the firm (% of sales)	3.61	3.77	1.00	3.74
Security costs (% of sales)	3.41	1.55	1.00	1.13
Products shipped to supply domestic market lost due to theft (%)	5.58	2.62	1.02	5.07
% of firms identifying robbery theft and disorder as major constraint	33.66	56.69	28.28	30.30
% of firms identifying corruption as major constraint	25.31	37.80	22.07	34.85
% of firms identifying courts as major problem	1.81	2.36	0.69	0.00
Value lost due to power outages (% of sales)	1.00	1.69	3.89	1.02
Security costs in ZAR (if establishment pays for security)	249 271	136 148	177 544	187 601

Source: World Bank enterprise surveys

Their explanations consider the impact of the country's ongoing political and socio-economic transition, the impact of the proliferation of firearms, the growth in organized crime, changes in the demographic composition of the country, and the consequences of a poorly performing criminal justice system. They argued that South Africa is a heavily armed society and according to the police Central Firearms Registry, 3.5 million South Africans legally possess about 4.2 million firearms of which slightly more than half are handguns. It is also estimated that a similar number of illegal firearms is circulating in the country. Schönteich and Louw (2001) also went on to argue that high levels of gang activity and availability of firearms is evident in urban areas and is a factor behind violent crimes or robberies committed in these places. They also argued further that, South Africa is the third most urbanized country in Sub Saharan Africa and because of rural urban migration; overcrowding, competition for limited resources, greater stress and increased conflict have also contributed to high crime levels both on business and individuals in the country.

The PricewaterhouseCoopers survey findings however, identified staff reductions because of the recent global recession, poor or ineffective corporate governance structures and weak internal audit and risk management systems as some factors behind business crime in the country. Thus the 2009 survey found that 89% of respondents believed that management's focus on survival strategies under the current harsh economic environment has led firms to resort to staff reductions[7], resulting in fewer resources being deployed on internal controls.

A corporate governance structure with vigorous escalation procedures where employees can

[7] Staff reductions result in reduced segregation which in turn impacts on the organisation's ability to maintain a sound control environment creating gaps in the system.

assertively report their concerns confidentially and in which perpetrators are dealt with seriously by management is a powerful deterrent tool. However, the fact that 71% of South African respondents reported that increased pressure and incentives were the most likely causes for the greater risk of fraud should therefore raise alarm in most organisations[8]. The survey also found that the majority of economic crimes were perpetrated from within (62%) whilst 38% were external perpetrators. This should not be shocking because employees have a greater understanding of the company and the internal controls in place designed to prevent fraud and so weak internal audit and risk management controls make it easy for employees to defraud the company.

The aim of this study therefore is to examine how these high crime levels in South Africa have affected the performance of firms in the manufacturing and services sectors. Our argument here is that crime result in firms redirecting resources away from productive activities to financing security systems thereby compromising firm performance[9]. Thus, instead of simply producing their products, companies feel driven to spend more on preventing theft, fraud and robberies as well as securing their premises and other assets. The other motivation is that there are very few studies that have been done in this area (using firm level data) particularly on Africa.[10] Studies that tended to relate crime with economic variables have been done largely at macro level and these related crime to economic growth, employment, income distribution and even foreign direct investment (FDI) (see Detotto and Otranto, 2010; Josten, 2000; Antoni et al, 2007; Daniele and Marani, 2008; etc). Our argument is that, when studying crime, it is more appropriate to do the analysis at firm and individual or household level because these are the economic agents directly affected by criminal behaviour. This is important for developing theoretical models of crime.

Additionally, macro level studies also assume that crime levels are the same across the country when in actual fact they may be interesting variations depending on the size and level of urbanisation of the each area, effectiveness of the local policing units and even income growth and unemployment levels in each city.

Given that a number of firms in this study spend funds on establishing and strengthening security measures, we also want to find out whether these security expenditures minimise the impact of crime on firm performance. In carrying out our analysis, we will control for other firm specific factors like firm size, age and whether the firm export or not. City and sectoral dummies will be used to capture variation in the prevalence of crime according to where the firm is located and in which sector it operates[11].

This paper is organised as follows: Section one covers introduction whilst section two is on literature review. The empirical methodology and descriptive analysis of data are covered in sections three and four respectively. Section five covers results and conclusions.

2 Literature Review

According to Krkoska and Robeck (2006), the literature on crime is grouped into three strands namely institutions, economics of crime and the unofficial economy[12]. Research on institutions includes enterprise experience with crime as one of several indicators to measure the quality of an institutional set up. Hay and Shleifer (1998) and Frye and Zhuravskaya (2000) studied the impact of weak institutions on the enterprise sector and showed crime as one symptom of general institutional weakness. They argued that crime thrives where the state is unable to exert power over public administration, protect property rights or provide institutions that support the rule of law. Frye and Schleifer (1997) found that enterprises in Russia rely on private protection either through employment of legal protection agencies or through payments to organized crime to substitute weak law enforcement.

The main focus of the economics of crime literature is on law enforcement aspects of the fight against criminal activities as well as factors which explain the decision to commit crime. This area is divided into theoretical and empirical literature. Eeconomists in this realm agree that a person commits an offense if the expected utility to him exceeds the utility he will get by using his time and other resources at other activities. Thus people

[8] 71% of South African respondents felt that increased pressure and incentives were the most likely causes for the greater risk of fraud compared to 68% globally. The most significant contributors to increased pressure and incentives were targets that are more difficult to achieve (54%) and the fear that people might lose their jobs (31%).

[9] In addition to leading to greater uncertainty, a high incidence of crime may induce enterprises to exit from the market place or relocate to safer locations (World Bank, 2003 on Jamaica). Crime may also have a detrimental effect on potential entry of firms (local and foreign) and their expansion (Krkoska and Robeck (2006).

[10] Some enterprise notes in this area have been written by Amin M from the World Bank but they are all on Latin America and Eastern Europe and Central Asia whilst Krkoska and Robeck (2006) also carried out a similar study using 34 European and Asian countries.

[11] Descriptive statistics showed that most firms in Cape Town and those in the textile and garment sector complained more about crime than firms in other cities and sectors.

[12] The third strand of crime literature which relate to unofficial economy is defined to include irregular and illegal activities and mainly covers tax evasion.

become criminals not because their basic motivation differs but because their benefits and costs differ.

A prime example of theoretical papers analyzing the economic impact of crime is the seminal paper by Becker (1968). Becker modeled general crime as a type of economic activity that is immoral, but nevertheless, can be analyzed by standard economic tools. He used a model that related crime and punishment to develop optimal public and private policies including the optimal amount of resources and level of punishment to minimize social loss from crime. Assuming that crime is an economic activity carried out by individuals who balance costs and benefits, offenders will refrain from entering the criminal business when the risk or cost of high punishment is too high. He argued that many theories agree that the increase in the probability of conviction or punishment if convicted generally decreases the number of offenses committed and that a change in this probability has a greater effect on the number of offenses than a change in punishment.

Studies that examine the economic impact of crime from an empirical perspective include Glaeser and Sacerdote (1999). They looked at the relationship between crime and economic growth and argued that factors of production tend to avoid places where the risk of expropriation through crime is high and that the location decisions of well educated households are particularly sensitive to local crime rates. They also argue that one potential channel through which growth might affect crime is the labor market. If it is relatively easy to find a job even for less educated people, the relative attractiveness of crime as an economic activity goes down and faster-growing regions should therefore experience less crime. Using a panel data for U.S. Metropolitan Statistical Areas (MSAs) between 1987 and 2006 and using lagged abortions to instrument for crime, they found strong evidence for a growth depressing effect of crime. Their estimates suggest that, reducing the annual crime rate by five crimes per 1,000 people (for the period from 1987 to 2006, this is equivalent to lowering crime in the average MSA by 10 percent) is associated with an increase in per-capita earnings growth by about 0.5 percentage points. Taken together, these results suggest that crime is costly to growth because of its adverse effects on local production.

Gaviria (2002) used survey data gathered by the World Bank and the Inter American Development Bank in 1999 on 29 countries from Latin America and the Organisation of Economic Cooperation and Development (OECD). He looked at effects of corruption and crime on firm performance using ordinary least squares method and found that crime has a noticeable effect on the economic outcomes of firms or reduces firm competitiveness. He also found that the prevalence of corruption and crime differs substantially from one country to another and that both phenomena are closely associated. Another World Bank (2003) study on economic development in Jamaica paid particular attention to the issue of crime. The study found crime to be one of the main reasons for weak economic development in Jamaica due to its substantial costs on business in the country.

Descriptive statistics analysed by Amin (2009a) using World Bank survey data show that a third of the firms in 14 Latin American countries experienced at least one incident of crime during 2005. 72.8% of all firms lost money either due to crime or expenses on security, which together average 2.7% of annual sales for a typical firm. He also found that firms in Latin America are as likely to be victims of crime as much as individuals and households (33% vs. 38% for households are reported in a study by Gaviara and Pages, 2002). Amin (2009a) also found that, large firms are more likely to be victims of crime than small firms (42.4% vs. 31.4%), but however losses due to crime as a percentage of annual sales are much higher for small firms than large firms (1.4% vs. 0.65%). This burden on smaller firms contradict findings by Gavaria and Pages (2002) as well as Glaeser and Sacerdote (1999), who found that relatively better off (larger firms in this case) suffer more from crime than the rest. Finally, Amin (2009a) also found that the incidence of crime is higher in bigger cities compared to smaller ones. He argued that this could be because criminals prefer bigger cities where it is easier for them to remain anonymous and there is more wealth to steal. The enterprise survey data showed that this result holds only across cities within a country not across countries, hence what matters is how big or small a city is relative to other cities in the same country with absolute size of the city being irrelevant. In this case, natural population growth should not call for more resources but a reallocation from the slower to faster growing cities.

Bourguignon et al (2002) looked at the relationship between income distribution and crime using a simple theoretical model and panel data in seven Colombian cities over a period of 15 years. They were trying to explain the factors that drive individuals to engage in both social and business related economic crimes. They found that would be criminals are common among those people living in households where income per capita was below 80% of the mean. Distributional changes among those people who are above this limit are not likely to have no significant influence on the crime rate. These findings by Bourguignon et al (2002) are similar to what was found by Ehrlich (1973) in what probably was the first empirical paper on the economics of crime. Ehrlich (1973) found using cross sectional data a significant relationship between the crime rate and the share of the population below half the median income across the US states. However Freeman (1996) mentions that no significant effect was found in a cross section of time series for various metropolitan areas in the US after controlling for fixed effects.

Krkoska and Robeck (2006) also used the World Bank enterprise survey data conducted in 34 countries in Europe and Asia to explain business characteristics that make firms vulnerable to crime. They found that high rates of crime are particularly associated with the weak development of micro enterprises in the services sector, operating in large countries with high unemployment. Their paper also highlighted the deterrent effect of crime on FDI inflows and job creation especially in less advanced transition countries.

3 Empirical Methodology

The methodology that we are going to use to examine the nature of the relationship between crime and firm performance in South Africa borrows largely from the work of Gaviria (2002). The estimated equation which also takes into account other firm characteristics is presented as follows:

$$X_{ij} = \beta_0 + \beta_1 \, Crime_{ij} + \beta_3 \, Z_{ij} + \varepsilon_{ij} \qquad (1)$$

where X_{ij} stands for sales of firm i in city/ region j and Z_{ij} is a vector of firm characteristics like firm size, firm age, location and sector, whether the firm exports or not. ε_{ij} is a random error term. The crime variable used in this study would be measured using a dummy taking the value of one if the firm has experienced losses as a result of theft, robbery, vandalism and disorder and zero otherwise. A negative value of β_1 indicates that crime negatively affects firm performance. Several mechanisms can explain the adverse effect of crime on firm sales. First, crime raises operational costs (through extra security measures), lowering competitiveness and ultimately lowering sales and in extreme cases may result in firms shutting down operations (Gaviria, 2002). Secondly, crime (through misappropriated resources, vandalism etc) prevents companies from enhancing productivity and this affect sales growth. Finally crime may cause firms to lose valuable human capital (through crime related deaths or emigration to safer places) and this also affects productivity and hence competitiveness. We will also use an interaction variable (crime dummy times security costs) to analyse the impact of crime on sales given that the firm has invested on security. We do this to ascertain whether investing on security helps firms minimise or deter economic crime and hence improve firm competitiveness.

3.1 Data

The World Bank's Investment Climate Surveys (ICS) on manufacturing and services sectors from South Africa is the primary source of data used in this study. The survey was done in 2007 and the total number of establishments covered is 1057[13]. These firms were also drawn from 14 International Standards Industrial Classification (ISIC) industries in four cities namely Johannesburg, Durban, Port Elizabeth and Cape Town. The sectors covered in this study include textile and garments, chemical and non metallic products, construction and transport, machinery and electronics, metals, rubber and plastics, as well as food. The survey data on crime used in this study is based on the following questions asked in the 2007 survey.

(i) In 2006 what percentage of the value of your domestic shipments was lost while in transit due to theft

(ii) In 2006, did the establishment pay for security? If yes how much was spent as a percentage of annual sales.

(iii) In 2006, did the establishment experience losses as a result of theft, robbery, vandalism or arson. If yes how much was lost as a percentage of annual sales.

4 Descriptive Analysis Of Data

Using World Bank survey data and relating crime to other firm characteristics like firm size, firm age and ethnicity, we found that crime appear to be regressive in nature in that losses due to theft and robbery are relatively lower in large sized firms compared to smaller ones (see table 5 appendix). It is about 1.3% amongst large firms compared to 4.3% in small firms. Firms complaining about crime are also relatively more amongst smaller firms (34%) than larger firms (32%). Probably this could be a result of the fact that most large firms invest in security systems compared to smaller firms. Thus statistics show that about 91% of large firms pay for security compared to only 68% of smaller firms. Whilst the highest losses from crime expressed as a percentage of sales were about 10% amongst large firms, they are about 30% amongst smaller firms[14]. The seriousness of business related crime also extends to domestic shipments that are lost due to theft. Thus about 2.7% is lost by large firms compared to 4.3% in smaller firms. However, the percentage of sales spent on security is higher

[13] The data are collected through firm surveys that include a common set of questions for all countries surveyed. The sample is selected by a simple random or stratified random sampling method controlling for size sub sector, geographic distribution based on company registration records or manufacturing census information available from government. The sample size varies ranging from about 100 for small African economies like Lesotho to more than 1000 for big countries like India, China etc.

[14] We use maximum and minimum values for this.

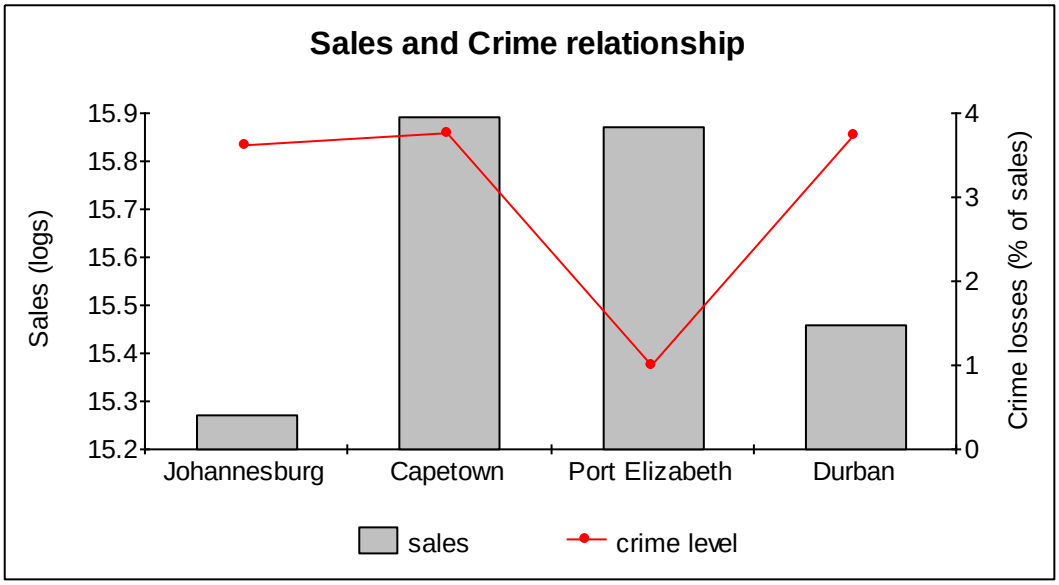
amongst small firms than larger firms. But the fact that large firms' sales are higher in absolute terms than smaller firms means that they still spend more on security systems and hence are able to minimize criminal incidences.

By relating crime to ethnicity, statistics show that there is no big difference between losses experienced by most ethnic groups in the country even though the Indian owned firms appear to have incurred relatively huge losses compared to European owned firms. Thus statistics also show that the maximum loss that was experienced by an Indian owned firm is about 40% compared to 10% amongst African and other Asian owned firms. The same situation is replicated again even when looking at domestic shipments lost due to theft. They are also relatively higher among Indian owned firms compared to other ethnic groups. Probably this could be a result of weak or inadequate security systems put in place by Indian firms. This is because even though there are many Indian firms paying for security, the amount spent by these firms as a percentage of sales (2.66) is lower than what are other big ethnic groups (Africans, Europeans and Other) spend (3.14). Indian firms are also far much smaller than in size compared to Europeans and Other ethnic groups and therefore affected by the regressivity of crime (see table 5 for more). If there is a positive relationship between the size of firms, amount of money spent on security systems and the effectiveness of these systems, this could then explain why Indians have experienced more crime losses than other groups.

We also examined whether being old translate into being more experienced in dealing with criminal activities or not. Statistics show that a larger proportion of older firms (more than 18 years, to differentiate between old and young firms, we used the mean age which we calculated to be 18 years) pay for security and that these older firms experience lesser losses than younger firms (less than 18 years). This pattern is similar to that shown by the firm size variable probably implying that smaller firms are also relatively younger in age. Statistics on table 5 support that small firms are relatively far much younger than large firms.

To ascertain whether crime has any effect on firm performance in the form of sales, we related sales to losses incurred as a result of theft, robbery and vandalism. The nature of the relationship is shown by Fig 1 below. Thus it appears that there is a prima facie negative relationship between these two variables. However, this relationship holds only when looking at all the other sample cities except Cape Town. However, using a correlation matrix (table 7 appendix), the sales variable appears negatively related to crime even though the relationship is not significant.

Figure 1. Sales and Crime Relationship



Source: World Bank Investment Climate data

5 Results and Conclusions

After identifying a prima facie negative relationship between firm sales and crime losses, the next step was to see whether this can be confirmed by regression results. We estimated using ordinary least squares, country, city and sectoral level regressions.

Results at country level (see table 3 below) show that variables like exporting, firm size and firm age are consistent and robust determinants of firm performance proxied using firm sales. These variables are positive and significant with or without city and sectoral dummies and even when using a Tobit specification. Thus being large in size probably

through economies of scale improves firm performance and this is also true for older firms. The positive correlation between firm size and age suggest that most large firms are older and therefore many years of experience in producing a particular good enables a firm to grow in size, generate economies of scale as well as productivity effects that promote better firm performance. Exporting (represented by a dummy =1 if a firm exports and 0 otherwise) also has a robust positive effect on performance suggesting that more external markets are good for firm sales growth.

The variables that are central to this study like crime dummy and domestic shipments dummy are also consistent in terms of their impact on firm performance. The crime dummy is also consistently negative and significant and robust to changes in model and variable specification. Thus crimes committed against firms in the form of theft, vandalism arson etc have a negative effect on sales or firm performance. The variable that captures domestic shipments crime (proxied by domestic shipments dummy) is negative but insignificant suggesting a weak effect on firm performance. This is supported by statistics on table 1 in that at country level, these losses are an insignificant percentage of sales (0.83) compared to other crime losses (2.39).

Table 3. Country level regressions

variables	(1) OLS	(2) OLS	(3) OLS	Tobit
Dependent variable	Sales	Sales	Sales	Sales
City dummies	No	Yes	Yes	Yes
Sect oral dummies	No	Yes	Yes	Yes
Export dummy	0.6755	0.5461	0.6577	0.4989
	(0.1189)***	(0.1001)***	(0.1099)***	(0.1054)***
Crime dummy	-0.0465	-0.0326	-0.1876	-0.2952
	(0.0231)**	(0.0121)*	(0.0227)***	(0.0211)***
Domestic shipments crime dummy	-0.0116	-0.0156	-0.0611	-0.0337
	(0.0121)	(0.0168)	(0.0899)	(0.0897)
Firms size	1.9365	1.3209	1.8765	1.9851
	(0.03541)***	(0.046)***	(0.0469)***	(0.0443)***
Firm age	0.1324	0.1898	0.1983	0.1889
	(0.0320)***	(0.0657)***	(0.0597)***	(0.0330)***
Crime dummy * security costs			0.1778	0.1769
			(0.0321)***	(0.0226)***
Domestic shipment dummy* security costs			-0.0434	0.0415
Constant			(0.0896)	(0.0876)
	11.1086	10.2007	11.6003	13.5342
No of observations	(0.1296)***	(0.3718)***	(0.348)***	(0.2132)
	680	**680**	**680**	**680**

***significant at 1%; ** significant at 5%; * significant at 10%: Standard errors in parenthesis

The use of the Tobit model here was to check for robustness taking into account that sales values are a censored variable (censored from below in that sales values cannot be less than zero) and that ignoring this may bias our estimates (Elbadawi et al 2007). The pattern of significance of our variables appears not to have been affected by this change in model specification. The crime dummies are still negative and domestic shipments dummy is still insignificant. We also decided to include interaction variables that capture the impact of crime on sales conditional on the firm investing in security. Our aim is to find out whether investing in security has an ameliorating effect on sales by limiting criminal incidences against firms. Results show that the variable has a positive and significant effect on firm sales. This supports the belief that security measures are very important in minimizing the negative effects of crime on firm performance and firms should therefore implement and strengthen them. The situation is however different when looking at domestic shipment crime interaction dummy. When using OLS the sign is negative but positive under the Tobit approach. This suggests that security measures used to combat domestic shipment crime have a weak effect on firm sales. Since these types of losses are very small, very little security resources are probably channeled by firms towards these crimes resulting in them having insignificant effect (These results might also be affected by endogeneity as a result of the simultaneity problem. It is possible that firms that are performing well (high sales) invest more in security in as much as investing more in security positively effect firm sales or performance. However, coming up with instruments to minimize this problem is difficult in a cross sectional model like ours).

We also decided to assess whether the location of the firm in terms of the city and sector in which it operates from has any influence on firm performance (see table 4 below). This is partly in response to what

we found under descriptive statistics that more firms in Cape Town and Johannesburg and those in the textile and garment sector identified crime as a major problem in addition to having lost a relatively larger amount to criminal activities (We also chose these cities and sectors based on sample sizes. These are the top two cities and sectors in terms of the number of observations or with large sample size.). The pattern of results is not significantly different from the one on table 4 above except that crime related variables are not significant in the metals sectors. Thus the impact of crime on firm performance does not appear to discriminate firms on the basis of location as found under descriptive statistics above. The other noticeable thing is that the domestic shipment interaction variable is now consistently positive and insignificant whilst the shipment dummy is only negatively significant in Johannesburg. This could be because losses made by firms in Johannesburg as a result of domestic shipments crime are relatively higher (see table 2 above). However sectoral level results show that crime does not appear to have a significant effect on firm performance. This is partly corroborated by descriptive statistics in table 6, appendix in that according to rankings, the metals sectors is the 6th sector that experienced high losses due to theft, robbery and vandalism.

However, a negative relationship between crime and firm performance exist in the metal sector even though it appears weak.

Table 4. City and Sectoral level results using OLS

Variables	Johannesburg	Cape Town	Textile and Garment sector	Metal sector
Dependent variable	sales	Sales	Sales	Sales
City dummies	No	No	No	No
Sectoral dummies	Yes	Yes	No	No
Export dummy	0.4336	0.4447	0.3775	0.4689
	(0.1235)***	(0.2003)*	(0.2339)	(0.2335)
Crime dummy	-0.2442	-0.3879	-0.3997	-0.0398
	(0.0356)***	(0.0897)***	(0.0886)***	(0.0587)
Domestic shipments crime dummy	-0.8914	-0.1467	0.1144	-0.0247
	(0.0567)**	(0.1760)	(0.1231)	(0.3127)
Firms size	1.7965	1.4675	1.6189	1.8867
	(0.0853)***	(0.1769)***	(0.1315)***	(0.1455)***
Firm age	0.1359	0.4489	0.3874	0.3568
	(0.0567)*	(0.1254)***	(0.1452)**	(0.1443)**
Crime dummy * security paid	0.2897	0.2987	0.2723	-0.0657
	(0.0352)***	(0.0861)***	(0.0339)***	(0.0782)
Domestic shipment dummy * security paid	0.0987	2.8643	0.0789	0.1443
	(0.0756)	(4.8906)	(0.1123)	(0.1228)
Constant	11.4003	13.6437	12.0779	11.8524
	(0.1165)***	(0.5712)***	(0.3349)***	(0.3765)***
No of observations	**428**	**115**	**110**	**111**

***significant at 1%; ** significant at 5%; * significant at 10%: Standard errors in parenthesis

5.1 Conclusions

The results in this study have shown that crime (theft, robbery, vandalism, arson etc) has negative effects on firm performance and this is a finding that does not appear to discriminate in accordance to firms' geographical location but however varies according to sector. Results also suggest that investing in security is important and can ameliorate the negative effect that crime has on sales. Therefore firms should strengthen their security measures and deterrent punishment should be imposed on convicted criminals by the courts or the affected firms so as to minimize their negative effects on firm performance and general economic growth in the country. However domestic shipment crime though not significant at country level appears to matter most to firms in Johannesburg. Results suggest that the significance of this variable depends on the size of shipment losses incurred by firms in each region or city. Additionally, measures should also be taken to help small sized firms in containing crime since they appear to be the ones mostly affected. Government or the business community should encourage the development of affordable and effective security systems to help the growth of small businesses.

APPENDIX

Table 5. Crime and other firm characteristics

	FIRM SIZE			ETHNICITY					FIRM AGE	
	Small	Medium	Large	African	Indian	Asian	European	Other	< 18yrs	>18yrs
% of firms paying for security	68.3	83.3	91.3	61.6	64.9	61.1	82.1	76.9	66.4	80.3
Losses due to theft, robbery etc against the firm (% of sales)	4.29	3.65	1.39	3.90	5.69	3.75	2.21	4.35	4.00	3.17
Minimum	0.10	0.10	0.10	0.10	0.10	1.00	0.10	0.10	0.10	0.10
Maximum	30.0	20.0	10.0	10.0	40.0	10.0	20.0	20.0	40.0	20.0
Security costs (% of sales)	2.89	3.19	2.49	3.25	2.66	1.58	2.70	3.46	3.63	2.36
Min	0.10	0.10	0.10	0.10	0.10	0.40	0.10	0.10	0.10	0.10
Max	15.0	15.0	20.0	25.0	10.0	5.00	20.0	15.0	25.0	20.0
Domestic shipments lost due to theft (%)	4.26	4.21	2.74	5.49	6.87	4.79	4.49	5.79	7.14	3.69
Min	0.10	0.10	0.10	1.00	0.10	0.50	1.00	0.10	0.10	0.10
Max	20.0	20.0	21.0	15.0	70.0	10.0	50.0	40.0	70.0	50.0
Age of firms	10.1	19.2	32.2	16.3	16.1	11.2	20.5	19.2	5.50	31.9
Firm size	10.1	41.9	426.5	42.1	63.9	61.7	131.4	163.1	53.9	195.9
Firms complaining about crime as major obstacle	34.4	41.8	32.1	32.3	57.7	50.0	30.9	38.6	35.1	35.8
Firms complaining about corruption as major problem	26.6	29.8	27.0	22.8	35.1	27.8	23.2	40.4	26.3	27.6

Source: Author's own calculations based on World Bank Investment Climate data

Table 6. Sectoral distribution of losses in the four cities

	Textile Garment	Chemical Non metallic	Construction Transport	Machinery Electronics	Metals	Rubber Plastics	Other	Food
% of firms paying for security	73.8	84.6	66.7	85.7	70.5	81.8	78.3	81.2
Losses due to theft, robbery etc against the firm (% of sales)	5.02	1.33	1.60	4.61	2.23	3.27	3.18	3.09
Minimum value	0.60	0.20	0.20	0.10	0.10	0.20	0.10	0.10
Maximum value	30.0	4.00	3.00	20.0	10.0	10.0	20.0	15.0
Security costs (% of sales)	2.15	2.66	0.30	3.35	3.61	3.38	3.63	3.91
Domestic shipments lost due to theft (%)	3.88	3.38	----	1.72	3.35	6.50	4.76	4.97
LOSSES DUE TO THEFT								
Johannesburg	5.36	0.80	1.60	2.41	2.71	2.38	2.72	3.55
Cape Town	5.00	-	---	20.0	1.00	-	8.50	0.80
Port Elizabeth	1.00	-	---	-	1.00	-	-	1.00
Durban	-	4.00	---	-	1.05	5.50	3.70	0.10
% OF FIRMS PAYING FOR SECURITY								
Johannesburg	69.4	88.7	70.0	90.0	78.1	92.9	79.3	79.1
Cape Town	95.2	90.5	100	71.4	92.3	100.	91.4	93.8
Port Elizabeth	60.0	66.7	-	100.	40.0	0.00	53.9	63.6
Durban	75.0	62.5	25.0	66.7	38.1	66.7	66.7	100.
DOMESTIC SHIPMENT LOST DUE TO THEFT								
Johannesburg	4.39	3.93	-	1.83	3.19	8.33	4.97	5.24
Cape Town	4.53	1.10	-	1.50	1.77	-	4.00	1.94
Port Elizabeth	1.00	--	-	-	1.05	-	-	1.00
Durban	2.20	2.00	-	1.00	15.0	1.00	3.00	9.50

Source: Author's own calculations based on World Bank Investment Climate data

Table 7. Correlation matrix

	Sales	Crime	Security	Crime2	Ethnicity	Age	Size	Location
Sales	1.0000							
Crime	-0.0095	1.0000						
	(0.7575)							
Security	0.1545*	0.2366*	1.0000					
	(0.0000)	(0.0000)						
Crime2	-0.0176	0.0892*	0.0477	1.0000				
	(0.5676)	(0.0037)	(0.1210)					
Ethnicity	0.4448*	-0.0194	0.0312	-0.0294	1.0000			
	(0.0000)	(0.5288)	(0.3115)	(0.3388)				
Age	0.0977*	-0.0157	-0.0179	-0.0297	0.0397	1.0000		
	(0.0015)	(0.6096)	(0.5605)	(0.3345)	(0.1976)			
Size	0.7734*	-0.0128	0.0313	-0.0003	0.2702*	0.4447*	1.0000	
	(0.0000)	(0.6950)	(0.3386)	(0.9934)	(0.0000)	(0.0000)		
Location	0.0581	-0.0756*	-0.2011*	0.1209*	0.0686*	0.0040	0.0153	1.0000
	(0.0592)	(0.0140)	(0.0000)	(0.0001)	(0.0258)	(0.8966)	(0.6400)	

*****significant at 5%; p- values in parenthesis.

Crime represents the proportion of sales lost due to theft, arson and vandalism;

Crime2 is a dummy representing those firms identifying crime to be a major problem.

Security is percentage of sales paid for firm security.

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