MPRA

Trade related business climate and manufacturing export performance in Africa: A firm-level analysis

Lawrence Edwards and Neil Balchin

University of Cape Town

2008

TRADE-RELATED BUSINESS CLIMATE AND MANUFACTURING EXPORT PERFORMANCE IN AFRICA: *A Firm-level Analysis*

2008

NEIL BALCHIN
School of Economics, University of Cape Town
E-mail: neilgbalchin@hotmail.com

and

LAWRENCE EDWARDS
School of Economics, University of Cape Town
Private Bag, Rondebosch 7700
South Africa
E-mail: Lawrence.Edwards@uct.ac.za

ABSTRACT.

Africa continues to be marginalised in world trade of manufactured goods, despite reductions in tariffs and non-tariff barriers. This paper investigates whether high business and trade costs associated with Africa's trade-related infrastructure, trade institutions and the regulatory environment have contributed towards its mediocre trade performance. The paper focuses on eight African countries — Egypt, Kenya, Madagascar, Mauritius, Morocco, South Africa, Tanzania and Zambia — using the World Bank's investment climate surveys. The results of the study suggest that the business climate, as measured using principal components for micro-level supply constraints, macroeconomic conditions and the legal environment, is closely associated with firm-level export propensity. Improvements in domestic policy may therefore have a considerable positive impact on manufacturing export performance in Africa.

TRADE-RELATED BUSINESS CLIMATE AND MANUFACTURING EXPORT PERFORMANCE IN AFRICA:
A Firm-level Analysis

INTRODUCTION

The marginalisation of Africa in world trade has generated a great deal of attention. Early evidence from a World Bank programme of research in the mid-1990s showed that Sub-Saharan Africa's (SSA) share of world trade declined dramatically from more than 3 percent in the 1950s to less than 1 percent in the early 1990s (Ng and Yeats, 1996). Africa's share of manufacturing trade and production has also declined dramatically. Estimates from the UNCTAD Trade and Development Report (2006) show a decline in Africa's share of world manufactured exports from 5.4 percent in 1980 to just 2 percent in 2003. Finally, unlike other developing country regions, especially Asia, Africa has been characterised by an inability to diversify into new high value-added, dynamic products (Lall, 2005). As a consequence, many African countries remain highly dependent on a very narrow range of primary products for export earnings, a reality that leaves them highly susceptible to terms-of-trade shocks.

The sources of Africa's decline in world trade are widely debated. These include a comparative advantage in primary products (Wood and Mayer, 2001), high domestic barriers to international trade (Ng and Yeats, 1996), inadequate income growth and poor geography (Rodrik, 1997) and high transport costs associated with poor infrastructure (Venables and Limão, 2001; Elbadawi, 2001; Djankov, Freund and Pham, 2004). More recently, the focus has shifted towards the relatively weak institutional policy and regulatory environment in Africa (Clarke, 2005; Eifert, Gelb and Ramachandran, 2005). Collier and Gunning (1999), for example, argue that distorted product and credit markets, high risk, inadequate social capital, inadequate infrastructure and poor public services are key factors inhibiting investment responses by African firms to market opportunities.

This paper focuses on the role of the business climate in influencing manufacturing export performance in Africa. The business climate can be broadly defined as aspects of the economic environment such as physical infrastructure, the legal and financial systems, features of the micro and macro policy environment, and social factors that are "not under the control of individual firms but that affect the expense, ease and reliability of doing business in a country" (Carlin and Seabright, 2007: 1).

The relationship between the business climate and participation by firms in the export market is investigated in eight African countries — Egypt, Kenya, Madagascar, Mauritius, Morocco, South Africa, Tanzania and Zambia — using the World Bank's Enterprise Surveys. The results of the study suggest that the business climate has an important direct effect on export participation in Africa. Principal components-based indices representing micro-level supply constraints, macroeconomic conditions and the legal environment are all found to be significant determinants of the probability of exporting. At the individual country level, the quality of the business climate is found to matter most for export participation in Mauritius and Zambia. The paper also finds that individual firm characteristics — such as size, age, ownership, use of information technology and managerial education levels — are important determinants of the decision to enter foreign markets. Improvements in domestic policy may therefore have a considerable positive impact on manufacturing export performance in Africa.

The remainder of the paper is structured as follows. Section 2 presents a brief overview and critical discussion of the existing literature evaluating the relationship between the business climate, productivity and exports. Section 3 presents a comparative analysis of export performance and the business climate in Africa. The empirical analysis then follows in Section 4, which investigates the effect of the business climate on export propensity. Section 5 concludes.

THE BUSINESS CLIMATE, TRADE COSTS, PRODUCTIVITY AND EXPORTS: A BRIEF REVIEW OF THE LITERATURE

The business climate affects aggregate export performance through three broad channels, all of which are influenced by firm export behaviour. First, the quality of the business climate has a direct impact on production costs and profits, and hence the volume of exports produced by existing exporters. Second, the business climate affects aggregate export volumes by influencing the decision by firms to enter or exit the export market. Third, the business climate affects firm-level productivity and thus the optimal quantity of exports produced by exporters as well as the participation of firms in the export market. These channels are briefly explored below.

The first channel, the direct output relationship, can be modelled using a simple Cobb-Douglas production function where the business climate enters directly as an input. This is represented as:

$$X_i = A_i L_i^{\beta} \overline{BC}^{\alpha}$$

where X_i is the volume of output produced by exporter firm i, A_i denotes total factor productivity (TFP), L_i represents the labour input, and BC is an exogenously fixed variable representing the state of the business climate (and can be interpreted as public capital). In this model the business climate is considered a key input in the production process — exporting requires the use of road, rail and port infrastructure and the fulfilment of various administrative requirements related to customs procedures and environmental regulations and standards. Improvements in the business climate therefore raise the profit maximising volume of exports by raising the marginal productivity of the factor inputs, and thereby directly increasing output.

The second channel operates via changes in the participation of firms in the international market. In the firm-level model developed by Melitz (2003), entry into the export market is characterised by fixed and variable trade costs and only the relatively productive firms are able to cover these costs and enter into the export market.[1] Thus, relatively productive firms 'self-select' into exporting. Improvements in the business climate that reduce variable trade costs and/or sunk costs associated with exporting can thus induce entry of firms into the export market. Furthermore, lower trade costs can lead to substantial changes in the firm composition of industries. Low productivity non-exporting firms exit in response to greater competition from foreign varieties, but the improved profits from lower costs cause high productivity non-exporters to increase their sales through exports as they are now able to overcome the sunk costs associated with exporting (Melitz, 2003; Bernard, Jensen and Schott, 2003). The rise in aggregate industry productivity and exports thus reflects the changing composition of firms in the industry.

The third channel through which the business climate influences aggregate exports is via its effect on firm-level productivity. Lower trade costs can improve firm productivity through access to a better and wider variety of imported inputs, increased domestic and international competitive pressures and foreign technology transfers. In the selection models, improvements in productivity may enable existing firms to cover the fixed costs associated with exporting and thus enter into the export market. If there is a learning-by-exporting effect, this may lead to further improvements in productivity and export volumes within these firms. For existing exporters, the improvement in productivity raises the optimal level of exports.

---

[1] Studies such as Roberts and Tybout (1997), Bernard and Jensen (2001), Melitz (2003) and Fukunishi (2004) confirm the existence of significant start-up costs associated with entry into foreign markets.

Turning to the empirical evidence, a positive association between the business climate and aggregate export volumes in Africa is well documented. Factors found to negatively affect export volumes in Africa include poor infrastructure (Limão and Venables, 2001: 41), transport delays (Djankov et al., 2004), high transaction costs (Collier, 2000; Elbadawi, 2001) and weak micro-level institutions covering port administration, the customs environment, the regulatory environment and registration of new businesses (Johnson, Ostry and Subramanian, 2007; Wilson, Mann and Otsuki, 2005; Finger and Wilson 2006). In a striking example, Djankov et al. (2004) estimate that if the Central African Republic reduced its factory-to-ship time from 116 days to 27 days (the median for their sample of countries), exports would nearly double.

At the firm-level, there is a considerable literature on the productivity-export relationship in Africa. Mengistae and Pattillo (2004), for example, show that manufacturing exporters in Ghana, Ethiopia and Kenya have an average total factor productivity premium of 17 percent, which rises to 42 percent for firms that directly export to outside of Africa. This relationship reflects a combination of self-selection of efficient firms into export markets and learning-by-exporting. Bigsten et al. (2004), for example, estimate that exporting is associated with a productivity gain in terms of value added of 20-25 percent in the short-run and up to 50 percent in the long run for a sample of African countries (Cameroon, Ghana, Kenya and Zimbabwe) in the 1990s. This implies that there may be strong productivity gains from Africa orienting its manufacturing sector towards exporting (Bigsten and Söderbom, 2006).

The importance of the business climate in facilitating an increase in export participation by firms in Africa, however, is relatively under-studied. There is evidence that high fixed costs associated with entry into the export market discourage entry into the export market and that once firms enter they are more likely to remain in the export market (Bigsten et al. 2004). Clarke (20005) uses enterprise-level data from eight countries — Ethiopia, Kenya, Mali, Mozambique, Senegal, Tanzania, Uganda and Zambia — and finds that restrictive trade and customs regulations discourage manufacturing firms from exporting. These results are consistent with those of Dollar, Hallward-Driemeier and Mengistae (2006) who find that that low customs clearance times, reliable infrastructure, and good financial services raise the probability that firms export in a range of developing countries (Bangladesh, Brazil, India, China, Honduras, Nicaragua, Pakistan and Peru). The evidence therefore suggests that improvements in trade-related infrastructure that reduce

the costs associated with exporting may have a substantial positive impact on the number of firms that export.[2]

This paper builds on this literature in two ways. Firstly, the paper explores the relationship between different indicators of the business climate and export propensity at the enterprise-level in eight African countries. In doing so, it extends the similar study by Dollar et al. (2006) to the Africa region. Secondly, the effect of the business climate is measured using principal components-based indices representing physical infrastructure, micro-level supply constraints, macroeconomic conditions and the legal environment. To our knowledge this is the first study in this field to follow this approach in relation to Africa. The paper also presents an analysis of the relationship between the investment climate and export propensity using disaggregated indicators of trade-related infrastructure and services.

DATA

The Enterprise Surveys Database

This paper uses manufacturing enterprise-level data from eight African countries — Egypt, Kenya, Madagascar, Mauritius, Morocco, South Africa, Tanzania and Zambia — conducted between 2002 and 2005.[3] The data are drawn from the Enterprise Surveys database maintained by the World Bank. The surveys were conducted in a uniform way across countries using stratified random samples. An important contribution of the surveys is that they quantify firms' costs relating to business climate bottlenecks as well as the availability and quality of infrastructure and services. The data are therefore useful for an investigation of the effects of the business climate on export propensity in manufacturing firms.

The African countries selected for this paper provide a wide regional coverage across the African continent: Morocco and Egypt in the north, Tanzania and Kenya in east Africa, South Africa and Zambia in the south and the island nations of Madagascar and

---

[2] There is also considerable evidence that improvements in the business climate and reductions in trade costs have a positive effect on firm-level productivity (See Dollar, Iarossi and Mengistae, 2002; Dollar, Hallward-Driemeier and Mengistae, 2003; Escribano, Garrido, Peltier and Singh, 2005; Escribano, Guasch and de Orte, 2006; Fernandes, 2005; and Subramanian, Anderson and Lee, 2005). Much of this research, however, has focused on firms in Asia and Latin America, with very few studies on African firms. An exception is Eifert et al. (2005).
[3] Firms in Zambia were surveyed in 2002, Kenya, South Africa and Tanzania were surveyed in 2003, Egypt and Morocco in 2004, and Madagascar and Mauritius in 2005.

Mauritius. These countries were also selected as they contained comparatively few missing observations and had a reasonably high proportion of exporting firms.

Overall, the sample consists of 3 585 manufacturing firms. Egypt (977), Morocco (839) and South Africa (584) collectively contribute 67 percent of the sample. The remaining firms are distributed relatively evenly across Kenya (265), Madagascar (292), Mauritius (184), Tanzania (265) and Zambia (179).

Export Participation in Africa

Table 1 presents the mean characteristics of exporting and non-exporting firms in the sample of African countries. Approximately a third of the manufacturing enterprises are exporters, although there is wide variation across these countries. Over 50 percent of the manufacturing enterprises are exporters in Morocco and Mauritius while the proportion for South Africa and Kenya ranges from 35 to 40 percent. Far lower proportions (15 to 16 percent) of manufacturing firms are exporters in Egypt and Tanzania.

Few African enterprises completely specialise in exporting. Instead, the majority of exporters supply both domestic and foreign markets. The average exporting firm across the eight countries exports 64 percent of its total sales. At the country level, the average share of sales exported ranges from over 87 percent for Madagascan and Moroccan exporters to less than 40 percent for South African and Kenyan exporters. The majority of firms therefore apply a dual strategy of supplying the domestic and the foreign market.

In most cases, the differences between exporters and non-exporting firms are consistent with the 'stylised facts' internationally (see Bernard, Jensen, Redding and Schott, 2007). Across the eight African countries, the median exporter is four times larger than the median firm that operates exclusively in the domestic market. Value-added per worker of the median exporter is also higher than the median non-exporter in the pooled sample and in most countries. Exporting firms are marginally younger, have notably higher shares of foreign ownership (on average more than double the share of foreign ownership for non-exporters), and have marginally higher levels of skill intensity (measured as the ratio of permanent skilled production workers to total employment).

Table 1: Mean characteristics of exporting and non-exporting firms

Export Status	Number of firms	Mean Sales exported	Median Size	Mean Age	Mean Foreign owned	Mean Skill intensity	Median Value added per worker
	(% total in brackets)	(% sales)	(employees)	(years)	(% share)		(US $ '000)
Whole Sample							

Exporter	1133 (32.2)		120	19.8	21.3	0.38	5.0
Non-exporter	2390 (67.8)		30	21.6	9.2	0.35	2.8
Egypt							
Exporter	148 (15.2)	46.1	120	20.6	5.8	0.4	2.4
Non-exporter	826 (84.8)		21	20.7	2.2	0.39	1.0
Kenya							
Exporter	83 (36.7)	39.2	81	27.6	21.9	0.32	6.5
Non-exporter	143 (63.3)		27	26.8	7.8	0.32	4.4
Madagascar							
Exporter	81 (27.9)	87.3	150	11.4	64	0.19	6.6
Non-exporter	209 (72.1)		26	19.7	21.8	0.24	5.2
Mauritius							
Exporter	89 (49.7)	64.9	75	21	13.9	0.52	7.0
Non-exporter	90 (50.3)		30	28.1	0.9	0.46	6.7
Morocco							
Exporter	422 (50.4)	89.1	120	15.3	18	0.45	4.3
Non-exporter	416 (49.6)		32.5	22.6	10.9	0.35	5.7
South Africa							
Exporter	224 (38.6)	31.4	147	27.7	21.4	0.34	12.5
Non-exporter	357 (61.4)		75	24.6	11.5	0.32	8.2
Tanzania							
Exporter	41 (16)	64.1	105.5	17.2	29.8	0.26	3.3
Non-exporter	215 (84)		25.5	18.1	12.7	0.37	1.6
Zambia							
Exporter	45 (25.1)	52.3	171	20.6	32	0.22	1.3
Non-exporter	134 (74.9)		70	19.1	21.8	0.22	1.4

Source: Own calculations using World Bank Enterprise Surveys

The Business Climate in Africa

The Enterprise Surveys provide detailed qualitative and quantitative information on various indicators of the business climate. For a comparative perspective of the business climate in Africa, Table 2 presents data on a selection of business climate indicators for manufacturing enterprises in the sample of African countries used in this study. In the final two columns, these indicators are benchmarked against regional averages for the whole of Sub-Saharan Africa (SSA) and East Asia & Pacific.[4]

In almost all instances, the business climate in SSA is relatively poor in comparison to the East Asia & Pacific region. Roughly 23 percent of all enterprises in SSA found customs and trade regulations to be a major constraint to their operations, compared to a marginally smaller proportion in East Asia & Pacific. Within Africa, customs and trade regulations were particularly problematic for firms in Kenya (40 percent), Madagascar (32.8 percent), and Egypt (29.2 percent).

---

[4] These values reflect the mean response of all enterprises surveyed in the Sub-Saharan Africa and East Asia & Pacific regions respectively, and include some services-based enterprises.

The surveys also ask firms the average time it takes imports and exports to clear customs after arriving at the point of entry or exit in their country. On average it takes 8.7 days for firms in SSA to clear imports from customs and 5.1 days for these firms to clear exports through customs. This is higher than in East Asia & Pacific (3.7 - 5 days). Within the sample of African countries, customs delays are relatively high in Kenya, South Africa and Tanzania, particularly with respect to imports. Customs delays are lower in Egypt and Morocco (0.9 to 2.6 days).

Differences in infrastructure-related variables are particularly stark. On average, delays in excess of 38 days are experienced when obtaining an electricity connection, a water connection or a mainline telephone connection in SSA countries. These delays represent, on average, more than twice the equivalent delays experienced by firms in East Asia & Pacific. There is enormous variation within the African economies. The average delay for electricity, water or telephone connections exceeded 99 days for manufacturing enterprises in Egypt. Delays were far lower in Morocco (4.5 to 8.7 days), Mauritius (23 days) and South Africa (3.9 to 8.2 days).

The implication is that a high proportion of firms perceive water and electricity infrastructure to be a major barrier to their operation. For example, 46.7 percent of SSA firms find electricity a major obstacle to their operations. This is substantially higher than the equivalent proportion in East Asia & Pacific (24.1 percent).

A further implication is that a relatively high proportion of the value of sales is lost to poor infrastructure. The average SSA enterprise loses close to 6 percent of its sales due to power outages. Within the sample of African firms, this percentage ranges from 0.8 percent in Morocco and 0.9 percent in South Africa to 9.1 percent in Kenya. The proportion for South Africa is expected to have increased given the recent crisis in electricity supply over the past two years. Water availability is also important. Loss of sales in response to insufficient water supply exceeds 4.5 percent for Egypt, Madagascar and Tanzania. Combined, these losses have a disproportionate negative effect on productivity in African countries (Eifert et al., 2005).

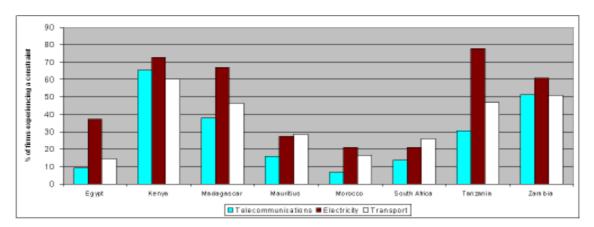Table 2: Comparative data on selected business climate indicators

	Egypt	Kenya	Madagascar	Mauritius	Morocco	South Africa	Tanzania	Zambia	Sub-Saharan Africa	East Asia & Pacific
Permits and Licenses										
Delay in obtaining an operating license (days)	115.6	11.6	-	-	4.9	5.1	18.0	-	15.4	21
Delay in obtaining a construction permit (days)	92.6	97.7	-	103.1	38.1	8.3	-	34.3	54.4	39
Delay in obtaining an import license (days)	38.2	6.1	17.1	8.2	-	7.1	15.2	10.7	14.3	12.8
Infrastructure and Services										
% of firms rating government service	-	11.6	63.7	43.4	47.4	46.7	40.9	19.1	-	-

delivery as efficient										
Lost value due to power outages (% sales)	6.1	9.1	7.9	4.1	0.8	0.9	11.0	4.7	5.9	2.6
Electricity as a major constraint (% firms)	37.5	72.7	67.1	27.3	21.3	21.1	77.6	60.9	46.7	24.1
Lost value due to insufficient water supply (% sales)	4.8	-	5.3	1.4	0.1	0.5	6.9	-	-	-
Days power outages	17.5	80.9	78.3	7.5	7.3	5.9	67.6	40.3	-	-
Days insufficient water supply	8.5	85.0	12.6	22.9	1.8	5.1	107.1	25.8	-	-
Days unavailable mainline telephone service	-	34.6	12.6	2.7	4.2	6.0	49.6	43.2	-	-
Delays in obtaining an electricity connection	99.4	49.6	56.7	23.0	8.4	5.9	54.6	173.7	38.2	21
Delays in obtaining a water connection	99.6	-	-	23.5	8.7	3.9	42.7	26.8	42.2	17.7
Delays in obtaining a mainline telephone connection	136.9	96.0	63.8	23.0	4.5	8.2	22.7	74.0	54.1	16.4
Trade										
Average customs clearance time for imports (days)	2.6	5.3	3.5	4.0	2.6	5.3	9.4	3.9	8.7	5
Average customs clearance time for exports (days)	0.9	1.6	1.0	2.3	1.3	2.9	2.9	0.8	5.1	3.7
Customs & trade regulations as a major constraint (% firms that trade)	29.2	40	32.8	22.7	0.4	16.8	11.6	9.8	22.8	21.6

Source: Own calculations using World Bank Enterprise Survey data.
Note: '-' indicates that no data was available for that country.

Figure 1 shows that physical infrastructure constraints are particularly problematic for firms in Kenya, Madagascar, Tanzania and Zambia; where over 30 percent of firms, and up to more than 70 percent, find issues relating to telecommunications, electricity and transportation as problematic for operating their businesses. Of the three physical infrastructure constraints, electricity represents the dominant problem for most of the economies, although problems relating to transportation represent greater obstacles for firms in Mauritius and South Africa.

Figure 1: Percentage of firms experiencing constraints relating to physical infrastructure
Notes: The results are for all firms that experienced moderate, major or severe obstacle to their operations.

In summary, the difference in mean values for the best-performing and worst-performing African countries for the majority of the business climate indicators is startling. Bottlenecks relating to most aspects of the business climate considered here appear to be lowest in South Africa and Morocco; while, at the opposite end of the spectrum, the business climates in Egypt, Kenya and Tanzania rank particularly poorly along most dimensions.

In the following section we attempt to identify whether these differences in the business climate can explain differences in the export propensity across African firms.

THE BUSINESS CLIMATE AND EXPORT MARKET PARTICIPATION

This section investigates the effect of the business climate on export propensity in Africa. The empirical methodology and framework for the analysis is first outlined. The analysis of the key determinants of export participation then follows.

Empirical Methodology

The econometric methodology used to estimate the determinants of export participation in this paper borrows from the approaches in Dollar et al. (2006) and Escribano et al. (2006). The theoretical model is based on that of Melitz (2003) where entry of a firm into the export market is dependent on firm-level productivity and trade costs associated with exporting. Firms only enter the export market if their productivity levels are high enough to absorb trade costs associated with exporting. This is represented in the following relationship for any producer i:

$$Export_i = 1 \text{ if } \quad \pi_{xi}(\theta_i, \tau, f_x) > 0$$
$$= 0 \qquad \text{otherwise}$$

where $\pi_{xi}(\theta_i, \tau, f_x)$ is profits from exporting, θ_i is productivity, τ are variable trade costs and f_x are sunk costs of entry into the export market. There are therefore two channels through which the business climate can influence export participation (Dollar et al., 2006). Firstly, an improved business climate lowers trade costs and the sunk costs of entry. Secondly, productivity (θ_i) is itself a function of variable trade costs and fixed costs. A positive association between lower trade costs and productivity has consistently been found in Latin American and Asian countries.[5]

To estimate the export relationship we follow Dollar et al. (2006) and assume that the profits from exporting, $\pi_{xi}(\theta_i, \tau, f_x)$, can be approximated by the following linear specification:

$$h(\theta_i, \tau, f_x, \varepsilon_i) = a\theta_i + b\tau + cf_x + \varepsilon_i$$

---

[5] See for instance Escribano et al. (2006) for Chile; Escribano and Guasch (2005) for Guatemala, Honduras and Nicaragua; or Dollar et al. (2003) for Bangladesh, China, Ethiopia and Pakistan.

where ε_i is an independent and identically-distributed standard normal random error term orthogonal to productivity and trade costs. The export relationship can then be expressed as:

$$Pr(Export_i = 1|\theta_i, \tau, f_x) = Pr[\varepsilon_i > -(a\theta_i + b\tau + c f_x)| \theta_i, \tau, f_x]$$

This probability relationship is estimated using a probit model where ε_i is assumed to be distributed normally with mean 0 and variation 1. In the empirical specification, $(a\theta_i + b\tau + c f_x)$ is proxied by various business climate variables and firm-specific characteristics such as size, age, foreign ownership and managerial skills.[6]

An important caveat with regards to the study is that it only exploits the cross-firm variation to identify the export propensity relationship. It is therefore difficult to draw conclusions regarding causality. For example, the business climate variables may not be exogenous. Export firms may self-select into regions characterised by good business climates. Similarly, high demand by exporters for infrastructure services may result in the perception that the availability of infrastructure is a major constraint to exporting. Our study, at best, identifies the association between the business climate and export propensity.

Variables

To facilitate analysis, the various business climate measures are grouped *a priori* into five categories representing common areas of the business climate: a) physical infrastructure, b) micro-level supply constraints, c) macroeconomic conditions, d) legal environment, and e) trade-related infrastructure and services. Within each of these groupings, the business climate data consists of both quantitative and perception-based variables.[7] Full descriptions of these variables are presented in the Appendix.

---

[6] In an alternative specification an estimate of firm-level productivity (calculated as the residual from a Cobb-Douglas production function) is used for θ_i, . However, productivity estimates of this nature suffer from several important limitations. For instance, the productivity shock may itself be correlated with the choice of inputs leading to biased coefficients on capital and labour. Furthermore, the absence of price deflators implies that the estimates of productivity differences based on value data include the effect of differences in prices and mark-ups. Finally, the ordinary least squares (OLS) estimation of the residuals from a Cobb-Douglas production function allows for two-sided errors, and a significant amount of noise, which are likely to influence the productivity estimates. The estimates show a positive correlation between firm-level productivity and export participation across the African sample, which is consistent with other studies on Africa (Rankin et al., 2006). Nevertheless, given the limitations of the productivity measure, it was decided not to include these results in this paper.

[7] In terms of the perception-based indicators, firm managers are asked to rank the extent to which issues relating to the business climate represent a constraint to the operation and growth of their business on a five-point scale ranging from zero (no problem) to four (very severe obstacle). For the purposes of empirical analysis, these business climate constraint indices are recoded into dummy variables taking on a value of one if the particular issue represents a moderate, major or very severe obstacle to the firm's business operations.

The effect of these business climate variables on export participation is evaluated in two ways. Firstly, principal components-based indices are created from the variables within each of the five categories listed above. Secondly, estimates are generated using the individual business climate measures.

The principal components-based variables are constructed using the perception-based indicators of business climate constraints to the firm.[8] Each of the firm responses for each of the individual business climate constraints are normalized by the sample mean, achieved by dividing each firm's response by the mean response for the entire sample for the variable in question.[9] Country-level factors such as gross domestic product (GDP) and population levels are expected to affect the quality of the business climate. To separate out these effects, the normalized indicators are regressed on a range of country dummies, sector dummies and population and GDP variables.[10]

The new normalized and adjusted business climate variables are then taken as the residual from this regression equation; and these variables are used as the underlying variables in the principal components analysis.[11] The correlations between the first principal components and their underlying business climate variables are presented in Table 3.

Table 3: Correlation between business climate variables and first principal components

Physical Infrastructure		Micro-level Supply Constraints	
Underlying Variables	**Correlation**	**Underlying Variables**	**Correlation**
Telecommunications	0.5849	Access to land	0.3350
Electricity	0.5773	Tax rate	0.3667
Transportation	0.5698	Tax administration	0.3832
		Labour regulations	0.2484
		Skills and education of available workers	0.2324
		Business licensing and operating permits	0.3393
		Access to finance	0.4322
		Cost of financing	0.4346
Legal Environment		**Macroeconomic Conditions**	
Underlying Variables	**Correlation**	**Underlying Variables**	**Correlation**
Corruption	0.5475	Economic and regulatory policy uncertainty	0.7071
Crime	0.5062	Macroeconomic instability	0.7071
Anti-competitive or informal practices	0.4582		
Legal system/conflict resolution	0.4838		

Empirical Results

Table 4 presents a simple probit model consisting only of firm-specific characteristics. The direct coefficients, and not the marginal effects, are presented. The first column of results is for the pooled sample of countries where country dummy variables are included to capture country-level factors such as culture, size of markets and the degree of political stability. The remaining columns present results for the individual country estimates. In the subsequent analysis of results, only variables that are significant at the 10 percent level or above are discussed.

Table 4: Firm-specific determinants of export propensity

	Pooled	Individual Country Analysis							
		Egypt	Kenya	Madagascar	Mauritius	Morocco	South Africa	Tanzania	Zambia
Firm-specific Characteristics									
Size (log)	0.334***	0.386***	0.119	0.514***	0.325**	0.601***	0.187***	0.202*	0.422***
Age (log)	-0.186***	-0.122*	0.190	-0.211	-0.420**	-0.428***	-0.146**	0.024	0.037
Foreign ownership (dummy)	0.169**	0.119	-0.0107	0.245	0.861	0.067	0.277*	0.294	0.209
E-mail (dummy)	0.735***	0.645***	0.666*	0.752***	1.063	0.766***	-	-0.094	-
Website (dummy)	0.206***	0.457***	0.552**	-0.0395	0.314	-0.126	0.260*	0.188	0.418
Skill intensity (log)	0.024	0.057	-0.039	-0.237*	0.308*	0.097	-0.010	-0.148	0.052
Manager has tertiary education (dummy)	0.187**	0.033	0.615**	-0.193	0.348	-0.121	0.567***	0.788*	-0.302
Country Dummies									
Kenya	0.247*								
Madagascar	-0.0453								
Mauritius	0.746***								
Morocco	0.610***								
South Africa	0.0245								
Tanzania	-0.470***								
Zambia	-0.534***								
Number of observations	2953	953	170	223	146	565	524	173	122

*** Significant at 1% level   ** Significant at 5% level   * Significant at 10% level
[a] Dependent variable is an indicator variable of whether the firm exports or not
[b] All regressions estimated with industry dummies
[c] Egypt is the omitted country

Firm-specific Characteristics

The results in Table 4 are consistent with the 'stylised' determinants of export performance in developing countries, including Africa. In the pooled estimates, larger and younger firms are more likely to export. The positive size effect is found in almost all countries. The potential for economies of scale, greater capacity for taking risks, superior opportunities to raise capital at lower costs, and more research and development (R&D) resources available to large firms mean that larger firms are relatively more likely to export (Correa, Dayoub and Francisco, 2007). Furthermore, in the presence of fixed costs of entry into the export market (some of which may be sunk costs), a minimum firm size may be requisite in order

to overcome the fixed entry costs and still remain profitable in foreign markets. Larger firms are also more likely to export because of decreasing average costs.

The positive relationship between export propensity and size is consistent with other firm-level research on Africa (Bigsten and Söderbom, 2006; Rankin et al., 2006). One of the reasons for the relatively low export propensity in Africa is that firms tend to be very small and focus primarily on the local market. The focus on the domestic market ensures that, in aggregate, their growth will be limited by the growth of domestic incomes. One of the reasons for the prevalence of small manufacturing firms in Africa is the high cost of transport given the poorly developed infrastructure, which creates localised markets (Bigsten and Söderbom, 2006). Improvements in infrastructure can therefore facilitate the growth of firms and the subsequent entry into the export market.

Another 'stylised' relationship is the positive association between foreign ownership and export propensity (Mengistae and Pattillo, 2004; Bigsten and Söderbom, 2006). For example, Mengistae and Pattillo (2004) find that foreign equity participation, the holding of foreign licences and access to foreign technical assistance are key features distinguishing exporters from non-exporters in Ethiopia, Ghana and Kenya. Foreign ownership is seen as a mechanism through which productivity enhancing technology flows occur. The pooled results of this study give a consistent relationship between foreign ownership and export participation (Table 4). However, the relationship is only found for South Africa in the country-level estimates. Nevertheless, on average it appears that increased foreign ownership may enhance export participation.[12]

The quality of management is also expected to influence firm productivity and export participation. To capture these effects, a dummy variable is included in the regressions identifying if the firm's top management has a tertiary education. The results in Table 4 indicate a higher propensity to export amongst firms whose top manager has some form of tertiary education. For the country estimates, the relationship is only significant for South Africa, Kenya and Tanzania.

Finally, firms that use information technology (e-mail and/or a website) in their interactions with clients and suppliers are more likely to export. The internet presents a powerful and cost-effective means to obtain information on foreign markets (Correa et al., 2007). Internet access also provides firms with greater access to information regarding the latest foreign production techniques, procedures and advancements and can lead to improvements in product quality and product differentiation, thereby influencing the global

---

[12] The positive association may also reflect the purchase by foreign companies of productive domestic firms that export. The lack of panel data implies that this relationship cannot be explored further.

competitiveness of firms (Lal, 2002). The results suggest that these effects may be present. A positive relationship is found in the pooled analysis as well as in all countries except for Zambia. This outcome is consistent with the cross-country gravity model estimates of exports by Wilson et al. (2005), where e-mail use is strongly correlated with export performance.

The Business Climate

This section turns to a more detailed analysis of the key business climate determinants of the decision to export. The results based on the four principal components-based indices are presented first in Table 6. Each of these four variables represents constraints to the firm relating to physical infrastructure, micro-level supply constraints, macroeconomic conditions, and the legal environment. Higher values of the index reflect a more severe constraint to business and a negative coefficient is expected.

The results suggest that perceptions regarding the business climate have an important effect on export participation.[13] Significant and negative coefficients are estimated for the principal components representing micro-level supply constraints, macroeconomic conditions, and the legal environment. The coefficient on the legal environment component is relatively high. In estimates including the individual variables making up the principal component, crime and anti-competitive behaviour are found to be significant. The macroeconomic principal component is a measure of perceptions regarding macroeconomic instability and economic and regulatory policy uncertainty. If the policy environment is uncertain, firms may be unwilling to invest in export capacity, particularly if there are large sunk costs associated with exporting, as has been found in African economies by Bigsten et al. (2004). High risk also makes firms choose conservative product mixes with lower expected profit rates (Bigsten and Söderbom, 2006).

The micro-economic principal component captures a wide range of effects including access to land, tax rates and administration, labour regulations, business licensing and operating permits and the cost of and access to financing. These variables, particularly access to credit, are often found to be key constraints to growth and investment in African firms (Collier and Gunning, 1999; Bigsten and Söderbom, 2006). The result for the micro-economic variable is consistent with these views.

---

[13] Once again endogeneity problems are present. Firms that export may have managed to develop mechanisms to overcome adverse business climate conditions.

Table 6: Determinants of export propensity: principal components-based business climate factors

	(1)	(2)	(3)	(4)	(5)
Firm-specific Characteristics					
Size (log)	0.252***	0.337***	0.333***	0.290***	0.297***
Age (log)	-0.134***	-0.187***	-0.193***	-0.130***	-0.169***
Ownership - some foreign (dummy)	0.273***	0.160**	0.138*	0.265***	0.183**
E-mail (dummy)	0.627***	0.727***	0.783***	0.716***	0.710***
Website (dummy)	0.298***	0.199***	0.222***	0.298***	0.188**
Skill intensity (log)	-0.045	0.027	0.009	0.005	0.005
Manager has tertiary education (dummy)	0.369***	0.180**	0.175**	0.302***	0.264***
Country Dummies					
Kenya		0.215*		0.286**	0.824***
Madagascar	-0.889***	-0.049	-0.090	-0.024	0.480**
Mauritius		0.739***	0.758***	0.660***	1.363***
Morocco		0.601***	0.503***		1.137***
South Africa	-0.767***	0.017	-0.030	-0.071	0.672***
Tanzania	-1.379***	-0.469***	-0.509***	-0.564***	0.128
Zambia	-1.491***	-0.551***	-0.577***	-0.662***	
Principal Components Business Climate Factors					
Physical infrastructure	0.054	0.024			
Micro-level supply constraints	-0.020		-0.043**		
Macroeconomic conditions	-0.072			-0.074**	
Legal environment	-0.106**				-0.132***
Number of Observations	1210	2912	2392	2324	1979

Notes: *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level
[a] Dependent variable is an indicator variable of whether the firm exports or not
[b] Coefficients are reported as marginal effects
[c] All regressions include industry dummy variables
[d] Egypt is the omitted country

Notably, however, the physical infrastructure factor — representing a combination of business climate constraints relating to telecommunications, electricity and transportation — is not a significant determinant of export participation in either specification. This result is similar to that reported in Correa et al. (2007) who find no significant relationship between infrastructure variables and export propensity in Ecuador.[14] Similarly, Clarke (2005) finds only weak evidence that the quality of domestic transportation infrastructure affects export participation in Africa.

The lack of significance may arise from the lack of variation in these variables across firms within each country. However, the quality of infrastructure may still be important, but at a country level. The results give some indication that this is the case. The coefficients on the country dummy variables in Table 4 indicate that export propensity, conditional on all variables included in the regression, varies considerably across countries. Focusing on Column (2) of the results in Table 4, shows that export propensity is large (relative to Egypt) in Mauritius and Morocco. These are also the economies characterised by relatively good infrastructure as reflected in the firm responses presented in Table 2.

---

[14] They construct a similar infrastructure index using principal components.

Similarly, export propensity is relatively low in Tanzania and Zambia where the quality of infrastructure is relatively poor.

More insights into the effect of infrastructure on export propensity are provided in more disaggregated estimates. The following sub-sections present summarised results based on the individual business climate measures relating to physical infrastructure and infrastructure services and trade-related infrastructure and services. The results are presented in Table 7 and Table 8.

Physical infrastructure and infrastructure services. Table 7 shows that, in the pooled analysis, none of the perception-based variables measuring the extent of physical infrastructure constraints faced by firms emerge as important determinants of exporting. Similarly, the results from the individual country analyses suggest that business climate constraints relating to physical infrastructure are generally not important determinants of exporting in the eight countries. However, obstacles relating to telecommunications represent a significant constraint to export participation in Mauritius. Similarly, transportation constraints significantly reduce the probability of exporting for firms in Zambia.

A limited number of the quantitative indicators of the state of physical infrastructure and infrastructure services in the pooled regressions are found to be significant determinants of the decision to export. For instance, access to a generator increases the probability of exporting across the African sample. The possession of a generator is likely to serve as an effective proxy for the reliability of access to electricity from the public power system, with the ownership of generators expected to be more widespread in areas suffering frequent power outages. Consequently, the result that owning a generator is particularly important for exporting in the African sample suggests that the reliability of power provision is a problem in the African context.

Still focusing on access to electricity, increases in the duration of power outages or surges from the public grid reduce the probability of exporting across the African sample. This result is similar to those found in Dollar et al. (2006) for firms in Bangladesh, Brazil, China, Honduras, India, Nicaragua, Pakistan and Peru; and Escribano et al. (2005) in several countries in South and Central America. In terms of the individual African countries, the reliability of the public power supply appears to be particularly problematic for firms in Mauritius. Similarly, the average duration of power outages has a negative effect on export participation in the Zambian regressions.

In terms of transportation infrastructure, transport failures — reflected in losses in sales value due to transport service interruptions — have a negative impact on participation in foreign markets in the pooled regressions.[15] Small sample sizes may have contributed to the weak results for the importance of the indicators of the extent of transport failures in the individual country regressions. These results show that an increase in the average duration of transport service interruptions is associated with a reduction in the probability of exporting in South Africa; but transport failures are not significant determinants of export participation in the remaining seven countries.

Finally, the possession of an International Organization for Standardization (ISO) certificate or membership in a business association or chamber of commerce both significantly raise the probability of exporting across firms in the pooled African sample. The latter finding is similar to that in Escribano et al. (2006) who show that belonging to a trade association increases the probability of exporting in several Latin American countries.

These two results are, however, largely country specific. While the possession of an ISO certification raises the probability of exporting in Egypt, Morocco, South Africa and Zambia, no significant relationship is found in the other four countries. Similarly, firms that belong to a business association or chamber of commerce are more likely to export in Tanzania; but this result does not extend to any of the other countries.

Furthermore, it is important to note that the direction of causality between ISO certification and participation in export markets is unclear. For instance, it may be that the possession of an ISO certification is an important requirement for firms wishing to enter the export market, in which case ISO certification would be a consequence of exporting and not necessarily a cause. Nevertheless, the result is consistent with evidence in Ecuador, where Correa et al. (2007) find that firms that possess a quality certification are more likely to export.

Table 7: Business climate (physical infrastructure) determinants of export propensity

| | | Individual Country Analysis | | | | | | | |
	Pooled	Egypt	Kenya	Madagascar	Mauritius	Morocco	South Africa	Tanzania	Zambia
Firm Constraints	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)	(1)
Telecommunications	0.077	0.299	0.297	0.259	-1.207*	-0.129	-0.147	0.451	1.241**
Electricity	0.019	0.014	1.012**	-0.342	0.688*	-0.002	0.069	-0.225	0.116
Transportation	-0.047	-0.058	0.389	-0.109	-0.274	-0.128	-0.071	0.755*	-0.933*
'Hard-data' Measures	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)	(2)
Generator (dummy)	0.178**	0.222	0.181	0.634*	0.228	0.304	0.052	0.537	1.162***
Days power outages	-0.0001	0.002	0.00003	-0.001	-0.011	0.0005	0.009	-0.001	0.0001
Average duration of power outages	-0.004*	0.006	-0.0003	0.022	-0.020*	-0.005	-0.0006	-0.003	-0.088*

---

[15] However, the negative coefficient on the lost value due to transport failures variable must be interpreted with caution given the small number of observations that enter the probit regression.

Lost value due to power outages	-0.003	-0.002	0.008	-0.017	-0.022*	-0.127	-0.041	0.007	-0.028
Delay in obtaining an electrical connection	0.001	0.001	-0.002	-0.120	-0.027	-0.009	-0.017	-0.0008	0.074
Days insufficient water supply	-0.001	-0.001	-0.0009	-0.002	-0.005*	0.248	0.058	0.002	-0.0004
Average duration of insufficient water supply	-0.001	-0.019	-0.0003	0.122*	-0.001	-1.458	-0.029	0.013	-0.065
Lost value due to insufficient water supply	-0.003	-0.012	-	0.008	-0.018	-	-0.061	0.590	-
Delay in obtaining a water connection	-0.0003	-0.001	-	-	-0.099	0.003	0.087*	0.057	-
Days unavailable mainline telephone service	0.001	-	0.0005	-0.003	0.010	0.015	-0.007	0.006	0.0008
Average duration of unavailable mainline telephone service	0.001	-	0.001	0.002	0.012	-0.066	-0.032	1.669	-0.028
Lost value due to unavailable mainline telephone service	-0.007	-	-	-	-	23.53	-0.049	-	-
Delay in obtaining a mainline telephone connection	-0.0004	0.00005	-0.002	-0.002	0.009	-0.014	0.012	-0.150*	-0.037
Days transport failures	-0.003	-	-	-	-	-0.074	0.014	0.071	-0.0009
Average duration of transport failures	-0.022	-	-	-	-	0.184	-0.052*	-	-0.094
Lost value due to transport failures	-0.273**	-	-	-	-	4.885	-0.054	-	-
Cargo lost while in transit	0.006	-0.0005	0.040*	0.029	0.132**	-	-	0.069**	0.008
ISO certified (dummy)	0.305***	0.744***	-	-0.186	0.076	0.021	0.336**	-0.064	1.580**
Business association (dummy)	0.138*	-	0.606	-0.318	0.095	0.181	0.104	0.736*	0.206

Notes: *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level
[a] Dependent variable is an indicator variable of whether the firm exports or not
[b] In specification (1), coefficients estimated together with all business climate constraints in a single regression
In specification (2), coefficients for each 'hard-data' physical infrastructure and infrastructure services measure estimated in individual regressions
[c] All specifications estimated with industry dummies and firm-specific controls; pooled specifications estimated with country dummies
[d] '-' indicates that no data available for the variable or that there were too few observations for the variable to be included in the probit regression

Trade-related infrastructure and services. Customs and trade regulations, including delays, are shown to have a strong negative effect on aggregate trade flows (Wilson et al., 2005; Djankov et al., 2004) and firm-level export performance in Africa (Clarke, 2005). We find weak evidence in support of these findings. Firm constraints relating to customs and trade regulations do not significantly affect export market participation in the pooled sample (Table 8). At the country level, a significant negative coefficient is only found for Zambia.

The importance of trade-related infrastructure and services for export market participation is somewhat clearer from the results in Table 8 for the 'hard-data' measures. In the pooled regressions, an increase in the share of material inputs and supplies imported directly raises the probability of exporting. This result is consistent with evidence in Correa et al. (2007), who find that Ecuadorian firms that import intermediate inputs are more likely to enter foreign markets. In addition, lengthier customs clearance times for imported goods reduce the probability of exporting. At the country level, the significant relationships between access to imported intermediate inputs and/or customs efficiency for importing and export market participation are confined to Mauritius, Morocco and Tanzania.

The implication is that transport and trade barriers to the importation of intermediate goods severely constrain manufacturing export performance. Elbadawi, Mengistae and Zeufack (2006: 1) find that average exports per establishment tend to be low in Africa, in

part because of the region's lower 'supply access': "African firms face steeper input prices, partly because of their physical distance from cheaper foreign suppliers, and partly because domestic substitutes for importable inputs are more expensive." Weak trade-related institutions effectively raise the distance of these firms from output markets and input markets and hence adversely affect export performance.

Table 8: Business climate (trade-related infrastructure and services) determinants of export propensity

| | Pooled | Individual Country Analysis | | | | | | | |
		Egypt	Kenya	Madagascar	Mauritius	Morocco	South Africa	Tanzania	Zambia
Firm Constraints									
Customs and trade regulations	0.051	0.330**	0.312	0.063	-0.388	-0.044	0.098	0.224	-0.536*
'Hard-data' Measures									
Imported inputs	0.003***	0.002	-	0.0009	0.011***	0.008***	0.000	-0.008*	-0.002
Average days to clear customs for imports	-0.007	-0.002	0.022	-52.31	-0.049*	-0.013	-0.009	-0.008	0.005
Longest time to clear customs for imports	-0.005**	-0.004	0.004	-0.020	-0.018	-0.016*	-0.003	-0.016*	0.011
Delay in obtaining an import license	0.001	0.002	-0.005	-	-	-	0.013	0.201	0.015
Average days to clear customs for exports	0.007	0.038	0.071	6.366	-0.077	-0.027	0.018	-0.016	-0.106
Longest time to clear customs for exports	0.005	0.027	0.015	3.063	-0.020	-0.005	0.015	-0.007	-0.044

Notes: *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level
[a] Dependent variable is an indicator variable of whether the firm exports or not
[b] Coefficients for each 'hard-data' trade-related infrastructure and services measure estimated in individual regressions
[c] All specifications estimated with industry dummies and firm-specific controls; pooled regressions include country dummies
[d] Samples restricted to firms that trade
[e] '-' indicates that no data available for the variable or that there were too few observations for the variable to be included in the probit regression

Testing the Robustness of the Results: Addressing the potential endogeneity of the business climate measures

Many of the current estimates have used perception data of the firm to identify the relationship between the business climate and export propensity. An important limitation is that the business climate variables may themselves be endogenous to the decision to export. Efficient firms may find the business environment to be less of a constraint to its operation as they have developed mechanisms to overcome these constraints. That same efficiency may make the firm more likely to export (Dollar et al., 2006).

A potential solution to this endogeneity problem is to replace the individual firm business climate variables with the average business climate measures across firms in a particular location and industry. This is the approach followed by Dollar et al. (2006). It is worth noting, however, that these region-industry averages will only be exogenous to the firm's exporting decisions if its choice of firm location is also exogenous to those decisions. Consequently, using the region-industry average business climate measures does

not solve the endogeneity problem in cases where export-oriented firms self-select into locations characterised by more favourable business climates.

The estimates using principal components are presented in Table 9. The results are broadly consistent with those presented in Table 6. Macro-economic conditions and the legal environment remain significant determinants of export propensity. Micro-level constraints, however, are no longer a significant determinant. Interestingly, the physical infrastructure variable has a significant positive coefficient (10 percent level) which is contrary to expectations.

Table 9: Determinants of export propensity: principal components-based business climate factors based on region by industry averages

	(1)	(2)	(3)	(4)	(5)
Firm-specific Characteristics					
Size (log)	0.280***	0.329***	0.328***	0.287***	0.323***
Age (log)	-0.119***	-0.172***	-0.172***	-0.115***	-0.178***
Ownership - some foreign (dummy)	0.275***	0.194***	0.187**	0.280***	0.193**
E-mail (dummy)	0.719***	0.726***	0.738***	0.676***	0.741***
Website (dummy)	0.274***	0.202***	0.211***	0.292***	0.176**
Skill intensity (log)	-0.008	0.0259	0.0207	-0.009	0.0303
Manager has tertiary education (dummy)	0.311***	0.188**	0.177**	0.288***	0.185**
Country Dummies					
Kenya		0.131	0.125	0.203	
Madagascar	-0.232	-0.0520	-0.0560	-0.0331	-0.244
Mauritius	0.560***	0.742***	0.750***	0.671***	0.659***
Morocco		0.617***	0.611***		0.360***
South Africa	-0.168	0.0230	0.0196	-0.0354	-0.0784
Tanzania	-0.714***	-0.486***	-0.476***	-0.546***	-0.605***
Zambia	-0.811***	-0.553***	-0.554***	-0.639***	-0.675***
Principal Components Business Climate Factors					
Physical infrastructure	-0.0390	0.0435*			
Micro-level supply constraints	0.0308		-0.0269		
Macroeconomic conditions	-0.0700*			-0.0441*	
Legal environment	-0.0533				-0.0574**
Number of observations	1543	2961	2961	2395	2109

Notes: *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level
[a] Dependent variable is an indicator variable of whether the firm exports or not
[b] All regressions include industry dummy variables.
[c] Egypt is the omitted country

The results based on the individual region-industry average business climate measures are summarised in Table A.2 and Table A.3 in the Appendix. There are some important differences from the earlier results. The results using perception indicators (Table A.2) indicate a lower export propensity in firms that find tax rates, macroeconomic instability, anti-competitive behaviour and the legal system a constraint to their business. On the quantitative variables (Table A.3), customs delays to clear imports, value lost to transport failure, days to obtain a water connection and days of insufficient water supply are found to be significant determinants of export participation. ISO certification, membership of a business association or chamber of commerce, and the average duration of

power outages are no longer significant in the semi-aggregated region-industry analysis. Overall, however, the results are broadly consistent with those presented earlier.

CONCLUSION

This paper investigates the relationship between the business climate and manufacturing export performance in eight African countries — Egypt, Kenya, Madagascar, Mauritius, Morocco, South Africa, Tanzania and Zambia — using the World Bank's investment climate surveys. The results of the study suggest that the business climate has an important direct effect on export participation in Africa. Principal components-based indices representing micro-level supply constraints, macroeconomic conditions and the legal environment are all found to be significant determinants of the probability of exporting. At the individual country level, the quality of the business climate is found to matter most for export participation in Mauritius and Zambia. The paper also finds that individual firm characteristics — such as size, age, ownership, use of information technology and managerial education levels — are important determinants of the decision to enter foreign markets. Improvements in domestic policy may therefore have a considerable positive impact on manufacturing export performance in Africa.

References

Bastos, F. and Nasir, J. (2004) Productivity and the Investment Climate: What Matters Most? World Bank Policy Research Paper Working Paper 3335, June 2004.

Bernard, A.B. and Jensen, J.B. (2001) Why Some Firms Export. NBER Working Paper 8349, National Bureau of Economic Research.

Bernard, A.B., Jensen, J.B., Redding, S. and Schott, P. (2007) Firms in International Trade. NBER Working Paper 13054, National Bureau of Economic Research.

Bernard, A.B., Jensen, J.B. and Schott, P.K. (2003) Falling Trade Costs, Heterogeneous Firms, and Industry Dynamics. NBER Working Papers 9639, National Bureau of Economic Research.

Bigsten, A., Collier, P., Dercon, S., Fafchamps, M., Gauthier, B., Gunning, J.W., Oduro, A., Oostedorp, R., Pattillo, C., Söderbom, M., Teal, F. and Zeufeck, A. (2004) Do African manufacturing firms learn from exporting. *Journal of Development Studies*, 4(3): 115-141.

Bigsten, A. and Söderbom, M. (2006) What have we learned from a decade of manufacturing enterprise surveys in Africa? World Bank Research Observer, August: 1-25.

Carlin, W. and Seabright, P. (2007) Bring Me Sunshine: Which parts of the business climate should public policy try to fix? Paper presented at the Annual Bank Conference on Development Economics, Bled Slovenia, 2007.

Clarke, G. (2005) Beyond Tariffs and Quotas: Why Don't African Manufacturers Export More? World Bank Policy Research Working Paper No. 3617.

Clarke, G., Eifert, B., Habyarimana, J., Kapery, W., Kaplan, D., Schwarz, M. and Ramachandran, V. (2006) South Africa: An Assessment of the Investment Climate.

Collier, P. (2000) Africa's Comparative Advantage. In H. Jalilian, M. Tribe, and J. Weiss (eds), *Industrial Development and Policy in Africa*. Cheltenham, UK: Edward Elgar.

Collier, P. and Gunning, J.W. (1999) Explaining African economic performance, *Journal of Economic Literature* XXXVII (March): 64-111.

Correa, P., Dayoub, M. and Francisco, M. (2007) Identifying Supply-Side Constraints to Export Performance in Ecuador: An Exercise with Investment Climate Survey Data. World Bank Policy Research Working Paper 4179, March 2007.

Dollar, D., Hallward-Driemeier, M. and Mengistae, T. (2003) Investment Climate and Firm Performance in Developing Economies. Development Research Group, World Bank.

Dollar, D., Hallward-Driemeier, M. and Mengistae, T. (2006) Investment Climate and International Integration, *World Development*, 34 (9): 1498-1516.

Dollar, D., Iarossi, G. and Mengistae, T. (2002) Investment Climate and Economic Performance: Some Firm Level Evidence from India. Centre for Research on Economic Development and Policy Reform, Working Paper No. 143.

Djankov, S., Freund, C. and Pham, C. (2006) Trading on Time. World Bank Policy Research Working Paper 3909. World Bank, Washington DC.

Eifert, B., Gelb, A. and Ramachandran, V. (2005) Business Environment and Comparative Advantage in Africa: Evidence from the Investment Climate Data. Centre for Global Development Working Paper Number 56, February 2005.

Elbadawi, I.A. (2001) Can Africa export manufactures? The role of endowment, exchange rates, and transaction costs. In Augustin Nsouli, Kwasi Fosu, and Aristomene Varoudakis (eds), *Policies to Promote Competitiveness in Manufacturing in Sub-Saharan Africa*. Paris: OECD.

Elbadawi, I., Mengistae, T. and Zeufack, A. (2006) Market access, supplier access, and Africa's manufactured exports: an analysis of the role of geography and institutions. World Bank Policy Research Working Paper 3942, The World Bank.

Edwards, L. and Alves, P. (2006) South Africa's Export Performance: Determinants of Export Supply, *South African Journal of Economics*, 74 (3): 473-500.

Escribano, A., Garrido, L., Peltier, N. and Singh, H. (2005) The Impact of Infrastructure on Competitiveness: A Firm Level Analysis Based on ICA Surveys. Presented at the Joint Conference of the Interamerican Development Bank (IADB) and the World Bank, June 6-7, 2005.

Escribano, A. and Guasch, J.L. (2005) Assessing the Impact of the Investment Climate on Productivity Using Firm-Level Data: Methodology and the Cases of Guatemala, Honduras, and Nicaragua. World Bank Policy Research Working Paper 3621, June 2005.

Escribano, A., Guasch, J.L. and de Orte, M. (2006) CHILE Investment Climate Assessment (ICA) on Productivity and on Allocative Efficiency: Effects on Exports, Foreign Direct Investment, Wages and Employment.

Fernandes, A.M. (2005) Firm-Level Productivity in Bangladesh Manufacturing Industries. Presentation for Bangladesh: A Strategy for Growth and Employment Workshop, Dhaka, December 12-13, 2005.

Finger, J.M. and Wilson, J.S. (2006). Implementing a WTO Agreement on Trade Facilitation: What Makes Sense? World Bank Policy Research Working Paper 3971.

Francois, J. and Manchin, M. (2006) Institutional Quality, Infrastructure, and the Propensity to Export.

Francois, J. and Manchin, M. (2007) Institutions, Infrastructure, and Trade. World Bank Policy Research Paper 4152.

Fukunishi, T. (2004) International Competitiveness of Manufacturing Firms in sub-Saharan Africa. Institute of Developing Economies, Discussion Paper No. 2.

Johnson, S., Ostry, J. and Subramanian, A. (2007) The prospects for sustained growth in Africa: Benchmarking the constraints. International Monetary Fund Working paper WP/07/52. IMF.

Lal, K. (2002) E-business and Export Behaviour: Evidence from Indian firms. World Institute for Development Economics Research (WIDER) Discussion Paper No. 2002/68, July 2002.

Lall, S. (2005) Is African industry competing? Queen Elizabeth House Working Paper Series no. 122. Oxford University.

Limão, N. and Venables, A.J. (2001) Infrastructure, geographical disadvantage, transport costs, and trade, *World Bank Economic Review* 15 (3): 451-479.

Melitz, M.J. (2003) The Impact Of Trade On Intra-Industry Reallocations And Aggregate Industry Productivity, *Econometrica*, 71 (6): 1695-1725.

Mengistae, T. and Pattillo, C. (2004) Export orientation and productivity in Sub-Saharan Africa, *IMF Staff papers*, 51 (2): 327 – 353.

Ng, F. and Yeats, A. (1996) Open economies work better: Did Africa's protectionist policies cause its marginalisation in world trade? World Bank Policy Research Working paper No. 1636. World Bank, Washington DC.

Rankin, N., Söderbom, M. and Teal, F. (2006) Exporting from Manufacturing Firms in Sub-Saharan Africa, *Journal of African Economies*, 15(4): 671 – 687.

Roberts, M. J. and Tybout, J.R. (1997) What Makes Exports Boom? Directions in Development, World Bank.

Rodrik, D. (1997) Trade policy and economic performance in Sub-Saharan Africa. National Bureau of Economic Research Working paper no. 6562. Cambridge, M.A.

Söderbom, M. and Teal, F. (2000) Skills, investment and exports from manufacturing firms in Africa. Centre for the Study of African Economies Working Paper WPS/2000-8.

Subramanian, U., Anderson, W.P. and Lee, K. (2005) Measuring the Impact of the Investment Climate on Total Factor Productivity: The Cases of China and Brazil. World Bank Policy Research Paper 3792.

United Nations Conference on Trade and Development (UNCTAD) Trade and Development Report, 2006.

Wilson, J.S., Mann, C.L. and Otsuki, T. (2004) Assessing the Potential Benefit of Trade Facilitation: A Global Perspective. World Bank Policy Research Working Paper 3224.

Wilson, J.S., Mann C. and Otsuki, T. (2005) Assessing the Benefits of Trade Facilitation: A Global Perspective, *The World Economy*, 28(6): 841-871.

Appendix

Table A.1: Variable definitions — firm-specific characteristics and business climate measures

Dependent Variable	Exporter	Dummy variable that takes a value of 1 if firm is an exporter		
Firm-specific Characteristics	Age (log)	Log of years since the firm began operations in the country		
	Size (log)	Log of total number of permanent and temporary employees		
	Ownership – some foreign	Dummy variable that takes a value of 1 if the firm has some share of private sector foreign ownership		
	Manager has tertiary education	Dummy variable that takes a value of 1 if the firm's top manager has a tertiary education		
	Skill intensity (log)	Ratio of permanent skilled production workers to total number of permanent and temporary workers		
	E-mail	Dummy variable that takes a value of 1 if firm regularly uses e-mail in its interactions with clients and suppliers		
	Website	Dummy variable that takes a value of 1 if firm regularly uses a website in its interactions with clients and suppliers		
Perception-based Business Climate Constraints	All 18 perception-based business climate dummy variables	Dummy variable that takes a value of 1 if the firm identifies that particular aspect of the business climate as a moderate, major or very severe obstacle to the operation and growth of the business		
'Hard-data' Business Climate Measures	**Physical Infrastructure and Infrastructure Services**			
	Business association	Dummy variable that takes a value of 1 if the firm is a member of a business association or chamber of commerce		
	Cargo lost while in transit	Percentage of the value of the firm's average cargo consignment that it lost while in transit due to breakage, theft, or spoilage		
	Delays in obtaining: (i) electricity connection (ii) water connection (iii) mainline telephone connection	Actual delay experienced in obtaining the relevant infrastructure connection [(i) – (iii)] (from the day the firm applied to the day it received the connection)		
	Generator	Dummy variable that takes a value of 1 if the firm owns or shares a generator		
	ISO certified	Dummy variable that takes a value of 1 if the firm has received any kind of ISO certification		
	Service interruptions: (i) power outages (ii) insufficient water supply (iii) unavailable mainline telephone service (iv) transport failures	Days [(i) – (iv)]	Average duration [(i) – (iv)]	Lost value [(i) – (iv)]
		Annual number of days that the firm experienced service interruptions relating to the relevant infrastructure service	Average duration (in hours) of service interruptions relating to the relevant infrastructure service	Value of losses (expressed as a percentage of total sales) due to the relevant infrastructure service interruption
	Trade-related Infrastructure and Services			
	Average number of days and longest time (days) to clear customs for imports	Number of days from the time the goods arrived at their point of entry until they could be claimed from customs		
	Average number of days and longest time (days) to clear customs for exports	Number of days from the time the goods arrived in their point of exit until the time they clear customs		
	Delay in obtaining an import license	Actual delay experienced in obtaining an import licence (from the day the firm applied to the day it received the licence)		
	Imported inputs	Percentage of the firm's material inputs and supplies that are imported directly		

Table A.2: Export propensity analysis — region-industry average perception-based business climate constraints

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Firm-specific Characteristics							
Size (log)	0.276***	0.358***	0.326***	0.329***	0.322***	0.287***	0.329***
Age (log)	-0.123***	-0.200***	-0.174***	-0.174***	-0.179***	-0.115***	-0.175***
Ownership - some foreign (dummy)	0.285***	0.171**	0.194***	0.193***	0.189**	0.278***	0.192***
E-mail (dummy)	0.729***	0.742***	0.734***	0.748***	0.758***	0.682***	0.733***
Website (dummy)	0.284***	0.186***	0.206***	0.212***	0.166**	0.295***	0.214***
Skill intensity (dummy)	0.000493	0.0342	0.0205	0.0215	0.0301	-0.00906	0.0214
Manager has tertiary education (dummy)	0.315***	0.142*	0.178**	0.189**	0.174*	0.290***	0.180**
Country Dummies							
Kenya			-0.177	0.226		0.162	0.179
Madagascar	-0.146	-0.135	-0.187	-0.116	-0.0372	-0.0279	-0.00393
Mauritius	0.501	0.704***	0.673***	0.733***	0.782***	0.599***	0.752***
Morocco		0.454*	0.598***	0.543***	0.590***		0.597***
South Africa	-0.795**	-0.209	-0.0505	-0.000530	-0.278	-0.224	0.00961
Tanzania	-0.563*	-0.559**	-0.551***	-0.474***	-0.620***	-0.640***	-0.448***
Zambia	-1.136***	-0.601**	-0.801***	-0.617***	-0.681***	-0.594***	-0.537***
Business Climate Constraints							
Telecommunications	0.644	0.555	0.584*				
Electricity	-0.716	-0.354	-0.225				
Transportation	-0.495	0.175	0.127				
Access to land	0.438	0.239		0.108			
Tax rate	0.240	-0.647*		-0.519*			
Tax administration	-0.264	0.535		0.294			
Labour regulations	-0.544	-0.221		-0.349			
Skills and education of workers	1.587***	0.226		0.136			
Licensing & operating permits	-0.834	-0.407		-0.189			
Access to finance	-0.230	0.187		0.460			
Cost of financing	0.303	-0.0252		-0.425			
Economic and regulatory policy uncertainty	0.0494					0.0956	
Macroeconomic instability	-0.912*	-0.957***				-0.774**	
Corruption	0.320	0.674**			0.263		
Crime	-0.0294				0.188		
Anti-competitive or informal practices	-1.096***				-1.018***		
Legal system/conflict resolution	0.293	-0.755***			-0.427		
Customs and trade regulations							-0.221
Number of Observations	1543	2774	2961	2961	2109	2395	2961

Notes: *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level
[1] Dependent variable is an indicator variable of whether the firm exports or not
[2] Business climate constraints are region-industry averages
[3] All regressions include industry dummies for the Leather; Garments; Agro-industry; Food; Beverages; Metals and Machinery; Electronics; Chemicals and Pharmaceuticals; Wood and Furniture; Non-metallic and Plastic Materials; Paper; Other Manufacturing; and Auto and Auto Components industries (Textiles industry is the omitted category)

Table A.3: Export propensity analysis — region-industry average 'hard-data' business climate measures

	coefficient	Number of observations
Average days to clear customs for exports	0.01	2265
Average days to clear customs for imports	-0.01	2265
Average duration of insufficient water supply	0.00	2357
Average duration of power outages	0.00	2760
Average duration of transport failures	0.00	2265
Average duration of unavailable mainline telephone connection	0.00	2928
Business association (dummy)	0.00	2928
Cargo lost while in transit	-0.03	2924
Confidence in the judicial system (dummy)	-0.487*	2920
Cost of electricity	0.00	2723
Days insufficient water supply	-0.003*	1036
Days power outages	0.00	2779
Days transport failures	0.00	2517
Days unavailable mainline telephone connection	0.00	2182
Delay in obtaining a construction permit	0.001*	2121
Delay in obtaining a mainline telephone connection	0.00	2170
Delay in obtaining a water connection	-0.003***	2032
Delay in obtaining an electricity connection	0.00	1030
Delay in obtaining an import licence	0.00	2775
Delay in obtaining an operating licence	0.00	1280
Efficiency of government services (dummy)	-0.38	959
Generator (dummy)	0.00	841
Imported inputs	0.007***	2362
Informal payments to public officials	-0.032*	2202
ISO certified (dummy)	0.39	2333
Longest time to clear customs for exports	0.00	2875
Longest time to clear customs for imports	-0.008*	2875
Lost value due to insufficient water supply	0.004	2928
Lost value due to power outages	0.003	2012
Lost value due to transport failures	-0.065*	2801
Lost value due to unavailable mainline telephone connection	-0.031	2789

Notes: *** Significant at 1% level, ** Significant at 5% level, * Significant at 10% level

[1] Separate regressions are conducted for each business climate measure. The dependent variable in each case equals 1 if the firm exports, zero otherwise.

[2] Business climate measures are region-industry averages.

[3] All regressions include industry dummy variables, country dummies and firm-specific controls for age, size, ownership, use of information technology (e-mail and website), skill intensity, and manager's education (coefficients not reported to conserve space)