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**The Relationship between Firm Size and Exports  
in the Context of Merger Review in South Africa:  
*Is the International Competitiveness Public Interest Clause of  
the Competition Act Valid?***

***A Mini-Dissertation by  
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***Course: ECO539W -***

***Degree: Master of Business Science (Economics)***

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***Submitted: Julie Norris, Commerce Faculty Office***

***Date: 28 February 2005***

***Word Count: 11 803 (including all footnotes, tables, and  
reference list)***

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# **The Relationship between Firm Size and Exports in the Context of Merger Review in South Africa: *Is the International Competitiveness Public Interest Clause of the Competition Act Valid?***

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## **Abstract**

According to the Competition Act of South Africa, proposed mergers, if rejected on the grounds of anti-competitive effects as well as the efficiency considerations, may be passed on certain public interest grounds. The fourth public interest clause potentially allows mergers to be passed should the merged firm become more able to compete in international markets. This paper interprets the clause to refer to a relationship between firm size and exports, and investigates this supposed relationship and, in so doing, the validity of the clause. It is found that firm size is positively related to export propensity, the likelihood of exporting any output. However, firm size is found to be unrelated to the intensity of exporting, the proportion of output that is exported by the firm. This paper covers new areas of research, and its conclusions call into question the inclusion of the relevant public interest clause in the Competition Act.

*Key Words:* Exports, firm size, propensity, intensity, merger

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<sup>1</sup> I wish to thank my supervisor, James Hodge, for his advice, support, and patience, as well as my Lord for giving me the strength and ability to complete this.

## 1. Introduction and Background

In considering a potential merger, the Competition Act of South Africa (CASA) of 2001 sets out that the Competition Commission or Tribunal must assess the effect the merger will have on competition. Should a merger be deemed as preventing competition, clause 12A(1) of the Act stipulates that the merger could still be justified by “*any technological, efficiency or other pro-competitive gain*” that is sufficiently large to offset the anti-competitive effect of the merger. Failing the presence of such an efficiency effect, an anti-competitive merger could still be “*justified on public interest grounds*” (12A(3)). These public interests (12A(3)) include the effect on a particular industrial sector or region, the effect on employment, the ability of small businesses, or firms controlled or owned by historically disadvantaged persons, to become competitive, and clause 12A(3)(d) which reads as follows:

“(d) *the ability of national industries to compete in international markets.*”

It is this clause that is the basis for this investigation. Increasingly, merging parties are using the public interest section of the Act in attempting to justify mergers to the Competition Tribunal. The parties to a large merger will likely exhaust every option in their defence should the competition authorities oppose the merger, including the public interest clauses. However, the extent or importance of this particular clause is vague and undefined. The above-mentioned clause is not clear in its economic interpretation as competing in international markets could refer to various concepts such as imports, exports, efficiency, or even international market shares.

Should competing in international markets refer to a decrease in imports, this would most likely be attained through the abuse of the market power gained by the merging parties. Thus, there would be further domestic competition consequences, and the interpretation of the clause as concerning imports is therefore precluded. The clause is also unlikely to refer to the ability to compete in terms of efficiency. Should there be any efficiency gain in the merger, the parties would use the above-mentioned clause 12A(1)(a)(i), which specifically provides for the consideration of efficiency effects. Thus, the effect on exports is left as the most likely interpretation of the clause, and,

accordingly, this paper investigates the relationship between firm size and exports, noting that there is presently little research into this area in South Africa (Lewis, 2002a).

Reekie (1999) opposes the inclusion of such clauses in the competition legislation. He argues that the potential for subjectivity and flexible interpretation is increased. He also argues that “*relying on competition policy to achieve these (socio-economic) objectives is inappropriate*” (Reekie, 1999, p283). Lewis (2002b) supports their inclusion, arguing their inclusion is a necessity, as the influence of public interest is unavoidable. Lewis argues that it is better to have those public interest effects weighed up against the competition effects in the context of competition law rather than have another agency, or Minister, subsequently affect the Competition Tribunal’s decision. This paper attempts to analyse the implied assumption that lies behind such a clause: That there, in fact, could be some intrinsic relationship between firm size and international competitiveness, which is broadly understood here to mean exports. Clearly, the Tribunal will decide each case on its individual merits, however a deeper understanding of the relationship between firm size and exports could have an impact on such decisions.

As the following two sections show, this paper investigates the relationship between firm characteristics, focusing on firm size, and the export activity and orientation of firms. Other non-firm specific factors are controlled for at each stage of the analysis.

The export activity and orientation of firms is described in two ways. Firstly, one must consider the firm’s *export propensity*: the likelihood that the firm will export any of its output. In the competition context, this is important as if two merging firms are both non-exporters, it must be determined whether the merger, and thus the larger firm size, would increase the merged firm’s export propensity. Secondly, one must consider the firm’s *export intensity*: the proportion of the firm’s output that is exported. In a competition context this is a critical consideration as it must be determined if two merging firms are likely to export more output post-merger as this would also satisfy the international competitiveness clause. These two aspects of the relationship are dealt with separately in the following two sections. Section 4 describes the data used

in the analysis, while section 5 expands on the model used and the results generated by the model. Section 6 concludes.

## ***2. Firm Size and the Propensity to Export***

The first aspect of the relationship between firm size and exports to be considered is a firm's propensity to export. A firm's propensity to export represents the likelihood that a firm exports any of its output. Research, especially in firm-level surveys, often focuses on the characteristics of a firm that might influence whether a firm exports. Presented differently, researchers are concerned with firm-specific factors that influence the firm's *decision* to export. Characteristics such as efficiency, firm age, industry, location, and foreign ownership (Harding et al., 2002; Söderbom, 2001a) are suggested in the literature to influence the export decision. In addition to these factors, it appears that the size of the firm holds more explanatory power than any other firm attribute, as the following discussion will show.

When considering the export market as a whole, and the movements over time in export aggregates and export participation, the export activities of individual firms are most influenced by changes in foreign exchange rates. Most dynamic models of exports would have some exchange rate specification (such as Das et al., 2001). A weakening or weakened exchange rate would push up profits and thus attract more firms to enter the export market, while a stronger exchange rate would discourage firms from exporting. Exchange rate volatility does not, however, explain the differences between firms. There are vast differences in the export orientation of firms, and the basis for these differences is not always clear. This section considers the determinants of a firm's propensity to export and, more specifically, the relationship between a firm's size and its likelihood of exporting, or propensity to export.

### *Economies of Scale*

One of the most commonly cited grounds for a relationship between firm size and exports, in general, is economies of scale. Bigger firms would operate on a lower portion of their cost curves (Tybout, 2001; Piazolo and Würth, 1995). It is then argued

that these lower costs would translate into international competitiveness and therefore entry into the export market<sup>1</sup>. This argument is amplified for small economies such as those of the Third World. In these countries, firms might not be able to generate sufficient capacity in the relatively small domestic market and thus never become efficient enough to break into international markets. However, in the case of an anti-competitive merger, the resulting firm would likely be large in comparison to the original merging firms. With regard to these mergers in developing economies, Lewis (2002a, p6) recounts how some hold the opinion that “*the cost of regulatory error in merger review is particularly great because mergers are necessary if our firms are to achieve the minimum efficient scale necessary to compete on international markets.*” Lewis argues that there is little evidence to support this position, and indeed there is a lack of significant research into these issues in South Africa. Notwithstanding these effects, the economies-of-scale argument is more about efficiency than firm size directly. Efficiency considerations are provided for separately to the public interest considerations in the Competition Act, therefore one must be careful to consider the relationship between firm size and exports *after* controlling for the effect of efficiency, as is done in this paper.

#### *Changing Export Incentives for Large Firms*

The so-called “new trade theory” encompasses two basic premises: imperfect competition and increasing returns to scale (Tybout, 2001). It argues in support of the above-mentioned argument in that because of increasing returns to scale, larger firms are more efficient and thus more able to enter export markets than smaller firms. While Tybout (2001) has shown that many of the predictions of new trade theory are supported by empirical investigations, there are still specific developing country characteristics that must be considered (Alam, 1994). One aspect raised by Alam is the size of developing countries’ economies. If there is some minimum efficient scale or level of output required to compete on international markets, the size of the domestic market could prevent firms from attaining a sufficient scale. If a firm were to achieve that scale, by a merger for instance, then the incentives to enter

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<sup>1</sup> Note that it is also argued that the larger scale available by operating in the export market as well as the domestic market offers returns to scale and efficiency. This implies firms may become more efficient by operating in the export market and thus grow to export a greater proportion of the firms output. This belief was assumed in South Africa’s attempting to increase efficiency in the motor industry by creating policies to grow the export market and thus harness economies of scale (Black and Mitchell, 2002). However, only the possible relationship between firm size and propensity to export is being dealt with here.

the export market could change significantly (Lewis, 2002a). Should a firm attain this critical scale, the now-large firm could simultaneously gain a more dominant position in the domestic market. The firm is thus presented with two options. The first option involves entering a volatile, risky, and highly competitive export market. The second option involves remaining in, and focusing on, the domestic market and capitalising on its dominant position. Clearly, the domestic market would hold far greater incentives for the profit-maximizing firm, in the short term at least. However, if the firm is able to price discriminate across markets, the operational incentives may vary as the firm is able to charge an export and a domestic price. Indeed, the Competition Act and competition authorities of South Africa seem to subscribe to the Structure-Conduct-Performance (SCP) paradigm (Theron, 2001), at least in terms of merger notification. The implication of the SCP theory is that a larger firm will have more market power, and will invariably utilize that market power. Therefore, a sufficiently large firm, and thus one with significant market power, would sooner orientate its operations around the domestic market than the international.

The afore-mentioned public interest clause (d) in the Competition Act can thus be seen to be at odds with the theoretical approach used in deciding merger cases. The public interest clauses only come into reckoning should the Tribunal decide a proposed merger to be anti-competitive. However, greater incentives are likely to exist for the anti-competitively merged firm to use its market power in the less competitive domestic market than to use the scale effects in pursuing the international market for its exports.

However, in contrast to this argument, domestically orientated firms would likely still opt to enter the export market. Although these incentives are likely to decrease the propensity for large firms to export, this is opposed by the effect of the so-called vent-for-surplus behaviour of many firms. Firms are sometimes considered to treat the export market as an overflow market when domestic demand is low (Faini, 1988). Early theories of exporting were that exports consisted only of surplus output (Naudé, 2000). The empirical evidence for this is discussed below, and this type of export behaviour is discussed in more detail in the following section.<sup>1</sup>

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<sup>1</sup> Vent-for-surplus exporting and its effects are dealt with further in Section 3, Firm Size and Export Intensity.

### *Entry Costs*

In considering the exporting decision, exporting has thus far been treated as a market which is separate to that of the domestic market. This is justifiable as the export market has its own product bases and market players too. With any market, potential entrants face barriers to entry and entry costs, including the export market. When exporting is treated as a *decision* to enter the market, the relationship between firm size and propensity to export may be better understood. Researchers appear to agree that there exist significant export market entry costs that act as a barrier to entry of potential exporters. Here, these costs are divided into two broad categories, direct and indirect costs. Direct costs are any overt, measurable costs incurred by the firm in entering the market. They could include research and marketing costs (Rankin, 2002), setting up foreign distribution channels, export licences or other domestic regulations, specific machinery to meet international standards (Rankin, 2002), banking costs, foreign exchange charges and registration costs, and international transport costs (Das et al., 2001). For instance, South African ports charge a high *ad valorem* wharfage which is particular to South Africa (Naudé, 1999), and certain exporting firms will incur these costs, whether explicitly or through an exporting agent. Although a wharfage cost is variable for each company, some new exporters, in entering the export market, would find such costs unavoidable.

Indirect costs are incurred implicitly, or endogenously, in entering the export market. Firms would need to acquire the necessary knowledge of export systems and legal frameworks, and any regulating or overseeing institutions. While such intellectual capital does not have an explicit price, each firm needs to obtain it in order to export for the first time. Firms would also need to develop an understanding of the business customs and culture of foreign partners and countries. New managerial skills might be needed as well, though these could be a direct cost should suitable labour be employed instead. Whatever the type of costs, a firm can only enter a new market if it is able to bear the actual cost of entry.

### *The Risk Bearing Capacity of Larger Firms*

One aspect of entry barriers that is not mentioned or analysed in the literature is the provision for *risk* in the firms export market participation decision. Tybout (2001) refers to these entry costs discussed thus far as being sunk costs. Sunk costs are not

recoverable and thus there is a bearing of risk in entering or attempting to enter an export market. Exporting is likely to be far more risky than operating domestically. Potential risks could include default of payment risk, exchange rate risk, contractual risks, customs and border control risks, the risk of bureaucratic delays, and merchandise transport risk amongst others. Market entry will only occur should the firm be willing to bear the relevant risk. However firms can also hedge against some of these risks to reduce or eliminate them. However, hedging proves to be a cost in itself. A firm that reduces its risk exposure through hedging will find its entry costs increasing. In evaluating the international market, two factors are thus significant, expected entry costs and risk.

A firm's capacity to bear costs and risk can be closely related to firm size. Larger firms will naturally have a greater capacity to bear the costs of entering the market. Yet, for a smaller firm, the same entry costs are likely to be a much larger portion of any available capital. Small firms might not even have sufficient capacity to enter the market at all. Furthermore, should these entry cost be sunk, i.e. unrecoverable should the export venture fail, entering an export market could be more risky for a smaller firm as opposed to a larger firm. In addition, small firms are arguably more risk averse than large firms, at least in terms of entering new markets. Larger firms are likely to be far more diversified, and entering a new export market will not impact the firm considerably should the firm fail in that market. Small firms, however, will generally be involved in a few markets, perhaps just one, and entering the global market might prove to be excessively risky.

The consideration of only the decision to *enter* the market is a static approach whereas in reality firms enter, remain, and exit (and re-enter) continually. Just as there are certain sunk costs that must be incurred, so are there certain periodic fixed costs that must be incurred in order to remain in the market. These could include "*minimum freight and insurance charges, and the costs of monitoring foreign customs procedures and product standards*" (Das et al., 2001, p7). Once again large firms are more likely to be able to bear these costs. In addition, more diversified, larger firms may be more able to remain in an export market through times of low demand by relying more on other markets instead. It is seen later that larger firms are indeed more able to remain in the market during the lean times, whereas small firms are

forced to exit (Das et al., 2001). Clearly, larger firms are more able to bear the entry costs and risk associated with entering an export market.

#### *How are the Variables Measured?*

Before the empirical evidence is discussed, how are the variables measured? There appears to a consensus in the research concerning the measurement of firm size. While Blomstrom and Lipsey (1986) defined firm size in terms of sales or assets, more recent research has used employment (number of employees) to proxy firm size. In "*What Determines Firm Size*", Kumar et al. (1999) endorse the measuring of size by employment, although they suggest a weighted employment figure to be more accurate. Indeed, in researching microeconomic issues such as firm size and exports, authors use an employment measure in first (Tan and Batra, 1995) and third world studies alike (Söderbom and Teal, 2003), as well as in South African research (Berry et al., 2002) to quantify firm size<sup>1</sup>. The National Small Business Act of South Africa (1996) also confirms this in part by defining three measures of firm size classes, employment, turnover, and gross asset value. It would seem that employment is the most robust and easily measurable proxy for firm size. Export intensity is measured as the proportion of output that is exported, or rather the ratio of exports (value) to turnover.

#### *The Empirical Literature*

As mentioned already, there is little research solely devoted to the relationship between firm size and exports, and that remains true for empirical studies too. The relationship is often mentioned in passing in an analysis of a firm-level survey of a country. However, here the focus will remain on the relationship between firm size and export propensity and later, intensity.

Of the most comprehensive research reviews is that of Tybout (2001, p14), which reviews a wide variety of research papers dealing with first and third world countries. Tybout makes the "*very robust finding that larger firms are more likely to export*". Thus there appears to be a significant positive relationship between firm size and exporting. According to Tybout, the evidence as to whether a firm's entering the

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<sup>1</sup> Most other authors referenced in this paper use employment as a measure of firm size.

export market leads to a larger firm (efficiency by learning-by-exporting), or whether larger (more efficient) firms self-select in the export market is unclear. Tan and Batra (1996) analyse cross-sectional surveys of four countries, Columbia, Indonesia, Malaysia, and Mexico, as well as census data for Taiwan. Their analysis displays strong evidence in all five economies for the positive firm size and export propensity relationship.

Similar evidence has recently been found in African countries. In a firm-level survey of Ghana, Rankin et al. (2002) find a positive relationship between the size and export propensity of firms. Dividing the firms into four divisions, 1% of micro-sized firms exported, 6% of small firms exported, 16% of medium-sized firms exported, and 49% of large firms exported. These descriptive statistics were confirmed by a probit regression. This regression showed a clear and highly significant relationship between the log of employment and the probability of a firm's exporting. However, these results are not isolated. Söderbom and Teal (2002b) found similar results for Nigerian firms. Although medium and large firms showed a similar propensity to export, a probit regression again showed employment to be a significant indicator of a firm's export decision. However, the magnitude of the regression co-efficient is much lower than that of the Ghanaian example. Söderbom and Teal (2002a) also collate the microeconomic data of five African countries and observe the same positive relationship between firm size and participation in the export market.

#### *The Empirical Literature for South Africa*

Basic evidence for the relationship between firm size and exporting can be found for the South African case as well. Naudé et al. (2002) studied the manufacturing firms of the North West province of South Africa. These firms were shown to exhibit a positive relationship between the variables although firms in the two largest size-classes, large and very large here, showed similar export propensities. However, it is possible that the thresholds for the size classes were set too high (100 employees for the large class and 250 for very large). Unfortunately, no other statistical methods were used to analyse the data. Relative to other research, Rankin (2002) provides the only somewhat comprehensive South African firm-level analysis of the relationship in question, in addition to export behaviour in general.

Rankin (2002) uses a nationally representative survey of the greater Johannesburg area of South Africa<sup>1</sup>. However, the sample used appears to be truncated as only larger firms were sampled, those being firms with over 50 employees. This could create biased estimators as an element of non-randomness is introduced into the sample. While the survey still holds explanatory power, a fuller survey, such as that used in this paper, would be more desirable. Nevertheless, Rankin divides the firms into three size classes. Very large firms are those with over 200 employees, large firms between 100 and 200, and medium firms less than 100 and greater than 50 employees. 86% of firms in the very large category export, while 74% of large firms participated in the export market. Of the medium firms, 60% exported any of their output. Rankin (2002, p10) suggests that "*larger firms find it easier to enter the export market*". Rankin offers three potential explanations. Firstly, firms face fixed costs in entering the export market. Secondly, larger firms may have better links with foreign companies, although one could argue this to be lowering the entry costs required. Thirdly, larger firms could be older and thus more likely to be an exporter, although, once again, any effect that firm age might have on exports could be explained through its impact on entry costs again. Older firms could have built up a knowledge base that would enable the firm to reduce sunk costs. Each of these potential explanations is now discussed.

#### *Fixed Entry Costs, Foreign Ownership and Firm Age*

This proposed effect of a fixed entry cost is also supported by the research of Eaton et al. (2004). Eaton et al. observe that in the French economy, variation in *total* exports is explained more by new participants in the market than by existing firms changing their export volumes. Thus, if new entrants were to be able to explain the export variation, it would imply that the export volumes of those new entrants are significantly large. This means that new participants in the market are unlikely to be small. Seeing that smaller export volumes per firm are not observed, one suspects that there are some fixed, or sunk, costs that need to be overcome in order to gain sufficient returns from the market (to justify entry).

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<sup>1</sup> The survey was conducted jointly by the Greater Johannesburg Metropolitan Council and the World Bank.

While foreign ownership indices are often found to be significant indicators of the probability of exporting (Harding et al., 2002), firm age variables are only occasionally significant (Söderbom and Teal, 2000). Firm age has even been found to have a statistically significant negative relationship with exporting, though of a relatively small magnitude, in Ghana (Rankin et al., 2002) and Nigeria (Söderbom and Teal, 2002b). Newer firms could have more advanced equipment or capital that would enable them to enter the market more easily (Rankin et al., 2002). It is also possible that older firms are able to attain some form of domestic market power, and thus the incentive to remain in the international market decreases. Söderbom and Teal (2002a) find that firm age and foreign ownership are not significant explanatory variables for African countries. Despite the fact that these variables do sometimes explain some of the effects of firm size on export propensity, firm size nonetheless appears to hold considerable explanatory power.

#### *The Conclusions for South Africa*

Returning to Rankin's (2002) research on South Africa, logit estimation techniques are used to ascertain the firm-level determinants of South Africa's exports. Once again, employment, or firm size, is found to be a highly significant indicator of the export decision, with efficiency the only other non-sectoral variable to be significant. Firm size is shown to be more closely related to exports to SADC countries rather than non-SADC countries. Thus larger firms are more likely to export to SADC countries than smaller firms. Rankin suggests that this contradicts the fixed cost argument as one would expect greater costs in exporting to the international market. Rankin then suggests that perhaps it is explained by the more efficient firms' exporting out of SADC and less efficient firms to SADC.

However, this explanation does not satisfy. In consideration of the risk theory mentioned previously, Rankin's result is possibly not unexpected. Firms could consider the SADC market to be more risky than the global one. With corruption and perceived bad policies of SADC governments, a lack of efficient regulations, and the highly volatile exchange rates of some countries, the risk-averse firm would more likely look to the more predictable non-SADC market. In addition to the risk element, there are the sunk costs of time delays, costly bureaucratic procedures, and even a lack of infrastructure. Das et al. (2001) show that larger firms are more able to

operate through lean times in export markets without being forced to exit. Similarly, large firms should be more able to sustain the additional risks of SADC countries such as Zimbabwe. Thus this observation in the South African case might indeed further reinforce the fixed costs hypothesis.

Table 2.1 below summarises the results of studies into African countries. The table shows that both logit and probit estimation techniques are used in the literature and the evidence strongly suggests, as already detailed, that there is a clear, and significant, positive relationship between firm size and the propensity to export.

Table 2.1 Studies of the relationship between firm size and export propensity

	<i>Paper</i>	<i>Firm Size Variable</i>	<i>Region</i>	<i>Relationship</i>
<b>PROBIT</b>	Rankin et al. (2002)	In employment	Ghana	0.44***
	Söderbom&Teal (2002a) <sup>†††</sup>	In employment	Ghana, Kenya, Nigeria, South Africa, Tanzania	0.33***;0.34***
	Söderbom&Teal (2002b) <sup>††</sup>	In employment	Nigeria	0.02***;0.03***
	Bigsten et al. (2004) <sup>†</sup>	In employment	Cameroon, Kenya, Ghana, Zimbabwe	0.273**
	Harding et al. (2002)	In employment	Tanzania	0.47***
<b>LOGIT</b>	Rankin (2002)	In employment	South Africa	0.809***
	Söderbom&Teal (2000)	In employment	Ghana	0.53***
	Söderbom (2001b) <sup>†</sup>	In employment	Ghana, Kenya, Zimbabwe	0.70* (Kenya) Others insignificant

**Notes:**

1. Significance is indicated by \*\*\* for significance at the 1% level, \*\* for the 5% level, and \* for the 10% level.
2. † These papers use panel data to investigate the entry and export behaviour of firms over time. The lagged export participation dummy included in these regressions is likely to be strongly correlated with firm size and thus the significance of the firm size explanatory variable is often less significant or even insignificant.
- †† The two results presented in the last column correspond to regressions using two different measures of technical efficiency.
- ††† The two results presented here refer to exports within and out of Africa respectively.
3. In all cases the dependent variable is binomial with 1 indicating the firm is an exporter and 0 not.
4. "In employment" refers to the natural logarithm of the employment level

With only Rankin's (2002) research contributing substantially to the exploration of firm size and export propensity relationship in South Africa (though using a limited sample), there is clearly scope for further research, and for the application of more powerful statistical methods. The following section investigates the relationship between a firm's size and its intensity of exporting.

### **3. Firm Size and Export Intensity**

The second aspect of the relationship between size and exports to be focused on is the firm's intensity of exporting, and this aspect is also not well researched. The export intensity of a firm denotes how much of its output is exported, and is calculated as the value of exports over turnover. Firms with higher export intensities export a higher proportion of their output. The discussion here involves export intensity rather than the absolute level of exports for each firm, as size and absolute export levels would most certainly be strongly correlated. Only firms that already participate in an export market are considered in this section, and the characteristics which could possibly influence the firm's intensity-of-exports decision are identified. More importantly, this section considers how much a participating firm exports, and whether it is related to firm size.

The Competition Act of South Africa (1998) provides for the approval of anti-competitive mergers if the merger would make the new firm "internationally competitive". An internationally competitive firm could possibly not be a firm that merely participates in the export market, but rather a firm that *competes*. This implies that relatively large volumes would be exported. Assuming the export market is large relative to the domestic market, internationally competitive firms should be export intensive. Conversely, firms that are not export intensive could not even be classified as internationally competitive. Thus it is important to analyse the export intensity of firms in South Africa. The following discussion shows that the effect of firm size on export intensity is ambiguous and dependent on many varied factors.

#### *Scale Economies and Efficiency*

Economies of scale may enable a firm to operate more efficiently and even further penetrate the export market, however the effect on export intensity is ambiguous. As the size, or scale, of a firm increases, there are two likely effects. Firstly, the output of the firm is set to increase. Secondly, the exports of the firm would likely also increase. However, the effect on the export intensity of the firm is more difficult to predict as it depends on the relative movements of both output and exports.

Should there exist some minimum efficient scale that is necessary to export (Lewis, 2002a), exporting could become increasingly more attractive than supplying the domestic market as the firm size increases. In this case, export intensity could increase with firm size. However, should domestic demand be more elastic, global prices be too low, or export costs be too high, the opposite effect might be observed, that being a decrease in export intensity. If one adds to that the more dynamic possibilities of competitive behaviour such as third degree price discrimination between the domestic and foreign markets, the situation becomes even more ambiguous.

### *Large Firm Effects*

The profit-maximising firm will weigh the relative profitability of the export and domestic markets. The effects that influence this decision for large firms and the resulting changing in intensity are discussed here.

As discussed in the previous section, a large firm in South Africa is likely to have a degree of domestic market power, and this will affect the incentives of the large firm (Lewis, 2002a). The profit-maximising firm would put more emphasis on production for the domestic market relative to the export market than it would in the absence of domestic power. Clearly, the dominant firm would see the local market as more profitable and less risky than the export market. Thus, one would expect to see lower export intensities for the very largest firms.

However, even the domestically dominant firm would have a good use for the export market. Faini (1988) argues that firms first decide how much to produce, by setting productive capacity, and then decide on the allocation of output between foreign and domestic markets. If a large firm could claim some monopoly rents from the domestic market then the foreign market would in effect become a surplus market. This is also referred to as vent-for-surplus export behaviour (Holden and Gouws, 1997). Following this reasoning, the larger firms would be expected to have lower export intensities in times of high domestic demand, and higher intensities in times of lower domestic demand. Therefore, export intensities are likely to be volatile and unpredictable.

An additional complication is that in extracting rents from the domestic market, the dominant firm restricts output in order to increase prices. The decrease in output could in turn increase export intensity.

#### *Small Firm Effects*

Small firms are likely to have more “lumpy” export orders than larger firms, as well as fewer foreign clients. One export order for a small smaller firm would likely form a greater proportion of output than that for a larger firm. It has also been shown in the previous section that small firms enter, exit and re-enter the export market far more often than larger firms (Das et al., 2001). Therefore, even though the export propensities of smaller firms may be lower, it is possible that when smaller firms do in fact enter the export market, they would indeed have higher export intensities in comparison to other firms.

#### *The Empirical Literature*

There is very little quantitative firm-level research on the determinants of export intensities<sup>1</sup>. Evidence on the relationship between firm size and exports is also scarce. Firm-level surveys provide descriptive statistics, but only Söderbom and Teal (2002a), as described below, use more powerful methods to investigate the observed results.

Rankin et al. (2002) tabulate the export intensities for Ghanaian firms and sectors. Firms in each of the size categories export similarly high proportions of their output, and there is no apparent relationship with size, although no more revealing methods were applied to the data<sup>2</sup>. This provides weak evidence against there being any relationship between export intensities and firm size. This result is also supported in other firm-level investigations. However, Söderbom and Teal’s (2000) data suggest that export intensities in Ghana are positively related to firm size, however this does appear to be a fairly isolated result in the literature.

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<sup>1</sup> There is, however, much research on a sectoral or national level such as Naudé (2000) for South Africa.

<sup>2</sup> Firms in the *micro* size class (less than six employees) displayed a much smaller export intensity. However only two firms were observed, therefore the segment is ignored.

For South Africa, Edwards (2002) demonstrates not only that there are no apparent differences between the export intensities of small and large firms, but also that South African firms have a high propensity to export, yet firms are not export orientated and have low export intensities. These observations concur with Rankin (2002) who also finds that a high proportion of firms export (71%), yet the proportion of output exported of those exporting firms is very low (18%). This seems to support the surplus market theory as most very large South African firms (86%) participate in the export market but they do not specialise in exporting.

Another interesting aspect of the data presented by Rankin (2002) is that large firms (100 to 199 employees) are slightly more intensive exporters than very large firms (200 and more). Naudé et al. (2002) find less consistent results. Export intensity fluctuates across different size classes, with medium-sized firms exporting more of their output. However, the more limited statistics presented by Edwards (2002) show that large firms still export a little more than small firms. Clearly, this basic evidence is unreliable as presented, but it does suggest that additional analytical methods should be applied to the data. One might find a non-linear relationship between firm size and intensity where the very largest firms export less of their output compared to firms of all other sizes.

It would appear that only Söderbom and Teal (2002a) use a regression in attempting to isolate the determinants of export intensity for export within and outside of Africa. Besides sectoral variables, none are found to be significant. The only exception is firm age, which is slightly significant and negatively related to the percentage exported outside Africa. The analysis presented thus far displays much scope for further research in the relationship between firm size and exports. Two merging firms could argue, in terms of the Competition Act, that their export intensity as a merged firm would increase post-merger due to their combined size, and thus the merge would enable the firms to become more internationally competitive. Therefore, a more rigorous analysis of the relationship between firm size and export intensity especially is required. However, one can not consider the intensity of firm exports without also considering the factors that affect the likelihood of a firm's participating in the export market, the propensity to export. The following two sections describe the empirical analysis of these questions.

## **4. The Data**

This paper's research is conducted using the National Enterprise Survey, a cross-sectional firm-level survey of South African manufacturing firms. However, just as Rankin (2002) states, a time dimension in the data would be more optimal. A panel data set such as those used by Das et al. (2001) and Söderbom (2001b) can be particularly helpful in understanding the factors that determine what causes firms to enter and exit, and whether smaller firms enter and exit more often than larger firms, for example.

However, the cross-sectional data is still valuable in identifying specific firm characteristics that are related to exporting and export intensity respectively. As the discussion has already shown, there is an opportunity for the use of various analytical methods to explore a firm-level data set further than is typically done in the literature.

The National Enterprise Survey was conducted in 1999 and 2000, with a total of 1432 firms surveyed, of which 945 observations are of manufacturing firms and 487 of service firms. This study focuses on manufacturing exports and thus only the manufacturing firms are included in the analysis. The survey consisted of two questionnaires, one for larger firms and another for small sole ownerships, and the variables used in this study are only those common to both questionnaires. Seven observations were omitted due to missing data, and thus the final sample size was 938 manufacturing firms. Table 4.1 below offers a broad summary of the manufacturing firm data.

Table 4.1 Export market participation and intensity over sector and size class (by employment)

	Small (≤50)		Medium (50-100)		Large (100-250)		Very Large (>250)		All firms	
	%Exp orting	%Exp orted	%Exp orting	%Exp orted	%Exp orting	%Exp orted	%Exp orting	%Exp orted	%Exp orting	%Exp orted
Food and Beverages	29.4 (14.7)	24.0	37.5 (25.0)	27.9	50.0 (45.0)	20.9	60.9 (56.5)	4.6	42.6 (32.7)	15.8
Wood, Pulp and Paper	21.7 (13.3)	20.2	50.0 (36.4)	9.6	50.0 (50.0)	13.9	91.7 (79.2)	25.2	44.1 (34.7)	19.4
Chemicals, Oil & Rubber	28.8 (18.6)	8.2	59.3 (44.4)	9.1	50.0 (50.0)	13.8	78.9 (78.9)	13.1	46.2 (37.8)	11.1
Auto	12.5 (7.5)	10.2	38.5 (30.8)	7.8	50.0 (44.4)	24.6	77.3 (77.3)	34.4	38.7 (34.4)	27.0
Clothing	25.0 (14.6)	12.7	38.5 (23.1)	14.9	50.0 (40.9)	24.9	55.0 (50.0)	7.0	37.9 (27.6)	14.8
Fabricated Metal	26.1 (21.7)	14.3	45.0 (40.0)	13.5	81.0 (66.7)	20.2	86.7 (80.0)	27.5	50.0 (43.1)	19.7
Furniture	17.9 (7.7)	5.6	50.0 (50.0)	19.8	78.6 (78.6)	31.9	88.2 (82.4)	12.7	47.7 (41.9)	19.6
Machinery	38.9 (16.7)	6.7	50.0 (45.0)	5.5	84.6 (84.6)	34.8	87.0 (82.6)	11.7	56.4 (43.6)	15.5
Printing and Publishing	24.5 (16.3)	12.2	26.7 (26.7)	3.4	25.0 (25.0)	4.7	58.8 (41.2)	3.1	31.2 (23.7)	6.7
All Sectors	25.4 (14.9)	12.9	44.8 (35.5)	12.3	58.2 (53.4)	23.4	76.1 (70.0)	16.9	44.0 (35.5)	16.9

**Notes:**

1. The first figures in the “%Exporting” column indicate the percentage of firms that answered “Yes” to the question: “Are you an exporter?” However, many firms did not provide details as to the actual value of exports in the last financial year. Accordingly, the figures in parentheses indicate the percentage of firms who actually reported a positive value for exports.
2. The figures in the “%Exported” column represent the proportion of exports to output for firms participating in the export market, or rather the value of exports over turnover.
3. As employment is measured in terms of full time equivalence, fractions of employment are observed. Thus the lower bound on each size class is exclusive while the upper bound is inclusive.
4. Due to space constraints, the number of firms in each category could not be included, however the wood-large firm combination, and the printing-large firm combination exhibited the lowest number of firms, with 12 each).

The above table shows that in terms of South African manufacturing, bigger firms are more likely to be exporters. 25.4% of small firms claim to be exporters while as much as 76.1% of very large firms claim to participate in the export market. In the economy as a whole, one finds that 44% of firms export any of their output. The export market participation rates here undercut those of Rankin (2002). When considering just the firms of over 50 employees (as in Rankin’s data), 59.7% of firms are exporters, and these firms export 17.8% of their output. This compares to the respective figures of 71% and 18% respectively of Rankin. This could be due to Rankin’s using a sample of firms from the greater Johannesburg area. The Johannesburg sample might not be a “*nationally representative data set*” as claimed (Rankin, 2002, p7).

The table also shows the proportion of output exported by each firm class and sector. These results display no apparent relationship between export intensities and firm

size, although large-sized firms do appear to export more of their output than other firms, bigger and smaller. This could lend to the suggestion that the very largest firms use the export market as a vent-for-surplus due to their preference for the domestic market, however a more thorough analysis is clearly needed.

In terms of the sectors of the economy, it seems that firms in printing and publishing export the least of all the sectors, while firms in the automotive industry export far more than other sectors. The table shows clear variation across sectors, and this would need to be controlled for in the empirical analysis.

The data is used in further empirical investigations in the next section. The sample is assumed to be representative and thus no weighting is applied in any of the estimations.

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## 5. Model and Results

### Variable Specification

Even though previous studies, especially those of South Africa, have left much scope for further research, they are nevertheless useful in specifying the model here. The following table, table 5.1, details the model specifications used by researchers recently in estimating the factors that determine whether a firm exports.

Table 5.1: Specification of export participation models

	Firm size (In employment)	Technical Efficiency (Output)	Technical Efficiency (Value Added)	Firm Age	Firm Age <sup>2</sup>	Some Foreign Ownership	In Capital/Labour	Sector Dummies	Location Dummies
Rankin et al. (2002)	•*** •***	•**	•***	•*** •***		• •		• •	• •
Söderbom&Teal (2002a)	•*** •***			• •		• •	•** •*	• •	• •
Söderbom&Teal (2002b)	•*** •***	•**	•**	• •*	• •**	• •		• •	
Harding et al. (2002)	•*** •***	•***	•***	•* •		•*** •***		• •	• •
Rankin (2002)	•***	•		•	•	•	•	•	
Söderbom&Teal (2000)	•***		•*	•*	•***		•***	•	

#### Notes:

1. Significance is indicated by \*\*\* for significance at the 1% level, \*\* for the 5% level, and \* for the 10% level. A bullet point indicates that the variable was included in the model specification. No indication is provided here as to whether any sector or location dummy variables are significant, only an indication of the inclusion of any such variables.

2. Bigsten et al (2004) and Söderbom (2001b) are omitted here as these papers rely on panel data to investigate the entry and exit behaviour of firms over time. The dataset used in this paper precludes the consideration of these models and thus they are omitted.

3. Papers with two sets of model specifications have two regressions, one using a value-added efficiency measure, the other using an output based technical efficiency (as indicated). The two specifications of Söderbom and Teal (2002a) refer to firstly, exports within Africa, and secondly, exports out of Africa.

4. The firm age squared variable is sometimes divided by 100 in order to interpret co-efficients more easily.

The above table shows that the variable specifications are fairly consistent in the literature, and that firm size is a highly significant indicator of the probability of exporting. One also sees that technical efficiency, firm age, the square of firm age, foreign ownership, and the capital-labour ratio are all found to be statistically significant in one or more papers. In terms of estimating the intensity of firm exports, no additional variables are specified in the only reviewed paper (Söderbom and Teal,

2002a) to analyse this. The only variable that can not be obtained directly from the data set is the measure of technical efficiency. This is obtained by first estimating the production function (Rankin, 2002). The estimation of technical efficiency as per Rankin's (2002) method is discussed in the following section.

#### *The Production Function*

The production technology is estimated with a Cobb-Douglas production function, which is specified as follows:

$$Y_i = A_i K_i^\alpha L_i^\beta$$

Output is specified as Y, Capital as K, Labour as L, and A is any firm specific productivity factor. The (monetary) turnover of each firm is used as a proxy for output, while the value of fixed assets and the full time equivalent employment level are used for capital and labour respectively. Due to the limitations of the data set, a measure for human capital could not be obtained, and significant sectoral dummies are included to account for sectoral differences in technical efficiency. Using the production function estimation below, a relative efficiency measure can be calculated. Taking the natural logarithm of the production function above, the followed equation is derived:

$$\ln Y_i = \ln A_i + \alpha \ln K_i + \beta \ln L_i$$

The above equation is estimated using an ordinary least-squares regression. Excluding all insignificant variables, the regression results are detailed in table 5.2 below.

Table 5.2: Regression of the production function

Variable	Coefficient	Std Error	$\beta$ /SE	P-Value
Constant	3.21	0.13	24.09	0.000
Ln Capital	0.39	0.03	13.49	0.000
Ln Labour	0.64	0.04	14.65	0.000
Wood, pulp & paper	-0.28	0.11	-2.54	0.011
Clothing	-0.34	0.10	-3.49	0.001
Fabricated metal	-0.23	0.11	-2.10	0.036
Furniture	-0.39	0.10	-3.82	0.000
Machinery	0.22	0.11	2.12	0.035

Notes:

1. The dependent variable is here is  $\ln Y$ , approximated by the natural log of turnover.
2. The last five variables represent sector-specific dummies.

The above results show that the natural log of capital and labour are both extremely significant. Five significant sectoral dummies are also included: wood, clothing, metal, furniture, and machinery. The sum of the co-efficients for the logarithm of capital and labour is 1.03, which indicates that returns to scale are constant. Using this specification of the production function, predicted values for output can also be generated. Technical efficiency is thus calculated as the ratio of actual output to predicted output (Rankin, 2002). Due to the absence of a measure for human capital in the production function specification, the efficiency measure is expected to capture a degree of human capital as well. Thus firms with higher human capital levels are likely to have higher levels of technical efficiency.

The Breusch-Pagan test of the production function specification confirms that there is evidence of heteroscedasticity in the model of the production function. The variance of the residuals appears to decrease slightly as the dependent variable increases. The presence of heteroscedasticity is not surprising however, as a primary cause of heteroscedasticity is the misspecification of the model through the omission of a variable (Gujarati, 1995). This is the most likely culprit in this case as, in using the residuals to infer firm specific efficiency levels, there is in fact an assumption of some non-randomness in the residuals and thus one would likely find a non-constant variance thereof. The estimates of the coefficients are still unbiased (though not most efficient) in the presence of heteroscedasticity and the sample size is suitably large, therefore the results can be treated with some confidence. In addition, the adjusted and correct standard errors and p-values are reported in table 5.2 as per White's method.

#### *Introducing the Sample Selection Model*

As discussed so far, there exist two clear aspects to the relationship between firm size and exports. First, firms appear to decide whether to participate in the export market. Following that, firms decide how much of their output to export. There are two distinct stages, however one can not analyse the intensity of exports by only considering exporting firms. This is because the second stage, the determination of export intensity, depends in part upon the first. Breen (1996) explains this in showing that the observed sample of exporting firms is not a random one, and thus one can not analyse it with the standard regression method that implicitly assumes a random

sample. The researcher must account for the “sample selection” process of whether the firm opted either to enter the export market, or to remain solely focused on the domestic. Two-stage sample selection models incorporate both aspects of the firm size and exports relationship in a single model, and account for the non-randomness of the sample of exporting firms.

Using a two stage model, one must specify variables to explain the probability of a firm’s exporting any of its output, and define a separate specification to explain the intensity of exports given that a firm is exporting at all. These two specifications need not be the same. This paper uses a Heckman two-step estimator. The export participation decision is analysed more closely at first, with Heckman’s method being introduced later.

#### *The Propensity of Exports: The Probit Model*

A probit specification of the decision to export follows in table 5.3. Here the dependent variable is defined as 1 when a firm does export and 0 when a firm does not participate in the export market. The reported coefficients represent the effect that a unit change in the explanatory variable has on the probability of a firm participating in the export market. The following equation represents the probit (Breen, 1996)<sup>1</sup>:

$$pr(z_i=1) = \Phi(\mathbf{w}_i'\boldsymbol{\alpha})$$

In this equation, the probability that a firm participates in the export market ( $z_i=1$ ) is modelled by a set of explanatory variables ( $\mathbf{w}_i$ ) yielding the vector of coefficients ( $\boldsymbol{\alpha}$ ). The following table shows the results of two specifications for the probit model of export participation.

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<sup>1</sup>  $\mathbf{w}_i$  is vector notation for  $w_{1i}, w_{2i} \dots w_{ni}$  and  $\boldsymbol{\alpha}$  is  $\alpha_1, \alpha_2 \dots \alpha_n$  where  $n$  is the number of explanatory variables.

Table 5.3: Two probit models of export participation

Variable	Model 1: All Variables		Model 2: Significant Variables	
	Coefficient	P-Value	Coefficient	P-Value
Constant	-3.06	0.000	-2.80	0.000
Ln Employment	0.31	0.000	0.32	0.000
Ln Efficiency	0.17	0.017	0.18	0.012
Firm Age Squared	-0.01	0.137		
Firm Age	0.01	0.118		
Foreign Ownership	0.75	0.000	0.79	0.000
Ln Capital/Labour	0.22	0.000	0.22	0.000
Wood, pulp & paper	0.60	0.008	0.42	0.013
Chemicals, oil & rubber	0.41	0.069		
Auto	0.20	0.433		
Clothing	0.21	0.363		
Fabricated metal	0.70	0.002	0.56	0.002
Furniture	0.76	0.002	0.61	0.001
Machinery	0.77	0.001	0.62	0.001
Printing & Publishing	-0.05	0.836		

**Notes:**

1. The omitted sector dummy and thus base sector in the first specification is Food & Beverages.
2. Foreign Ownership is a dummy variable that indicates if the firm has any foreign ownership.
3. "Ln" indicates that the natural logarithm of the variable was used.
4. The p-value is a precise measure of statistical significance. A variable is significant at the 5% significance level if the p-value falls at or below 0.05.
5. Firms who claimed to be exporters but could not report how much they exported in the previous financial year were excluded from the sample. The remaining firms without missing data formed a sample of 656 firms.

The first specification above, which includes all possible variables, shows that firm size (employment), technical efficiency, foreign ownership, and the capital-labour ratio are all significant indicators of the probability of a firm exporting any output. The positive sign of each of these coefficients agrees with the theory as well as previous results in the literature. Without the sector dummies included in the specification, firm age and firm age squared are significant at the 10% and 5% levels respectively. The signs of the firm age coefficients suggest that an increase in firm age makes a firm more likely to participate in the export market, but the magnitude of this effect is less the older the firm is, hence the negative sign on the quadratic firm age squared variable. This specification generates results that are in concordance with current research on African countries, although nearly all the proposed explanatory variables are significant here. This could be due in part to the relatively large sample size of 656 firms.

The second specification is such that only significant variables are included. The firm age variables and certain sectoral variables are excluded, however this specification

predicts the export participation variables more accurately than the first specification, and is thus used in our model of export intensity, which is discussed further below.

Once again we see an extremely significant relationship between firm size and export propensity of firms. From the coefficient in the second specification, it is deduced that the probability of a firm of 100 full-time equivalent employees exporting would be approximately 10% higher than a firm of 50 employees, holding all other explanatory variables constant. Clearly, even after accounting for firm efficiency, firm age, and the presence of any foreign ownership in the firm, firm size still has a highly significant, positive impact on the probability of a firm's being an exporter. The potential explanations discussed thus far are the likely presence of fixed entry costs in entering the export market as well as the costs of remaining in the export market, and the greater ability of larger firms to bear the risk associated with entering new markets.

#### *The Intensity of Exports: Heckman Two-step Estimator*

Using the two-step method of regression, it is possible to uncover the so-called *latent* relationship between the explanatory variables. Instead of merely analysing the relationship between the export intensity relationship for just the exporting firms, sample selection models such as the Heckman estimator account for the non-random selection of the sample of exporting firms, for which intensity is observable. Here the first stage is estimating the best probit model<sup>1</sup>, using only significant explanatory variables, and the second stage a variation of the ordinary least squares regression, which incorporates the probability of selection and thus the non-randomness of the sample. The following equation is estimated in the regression stage of the Heckman procedure (Breen, 1996)<sup>2</sup>:

$$E(y_i | z=1, \mathbf{x}_i) = \mathbf{x}_i' \boldsymbol{\beta} + \theta \lambda_i$$

Where the latent relationship is:  $E(y_i^* | \mathbf{x}_i) = \mathbf{x}_i' \boldsymbol{\beta}$

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<sup>1</sup> The second specification of the probit model in table 5.3 is used in calculating the inverse Mill's ratio for the regression.

<sup>2</sup>  $\mathbf{x}_i$  is vector notation for  $x_{1i}, x_{2i} \dots x_{ni}$  and  $\boldsymbol{\beta}$  is  $\beta_1, \beta_2 \dots \beta_n$  where  $n$  is the number of explanatory variables.

In the first equation above, the expected value of the observed export intensity ( $y_i$ ) is modelled by a vector of explanatory variables ( $x_i$ ) and an estimate of the Inverse Mill's Ratio (IMR) which is represented here by  $\lambda_i$ . This is calculated by using the probit of export participation. The second equation describes the relationship between the latent, and sometimes unobservable, value of  $y$  ( $y^*$ ) and the explanatory variables  $x_i$ . The set of results of this regression are shown below in table 5.4.

Table 5.4: The Heckman two-step estimator of export intensity

Variable	Model 1		Model 2		Model 3	
	Coefficient	P-value	Coefficient	P-value	Coefficient	P-value
Constant	0.414	0.009	0.757	0.016	0.479	0.000
Ln Employment	0.006	0.702	-0.017	0.474		
Ln Efficiency	-0.053	0.004	-0.066	0.004	-0.052	0.004
Firm Age Squared	0.002	0.179	0.003	0.126		
Firm Age	-0.004	0.010	-0.005	0.007	-0.002	0.000
Foreign Ownership	0.066	0.090	0.010	0.870		
Ln Capital/Labour	-0.025	0.035	-0.040	0.041	-0.031	0.006
Wood, pulp & paper			-0.033	0.599		
Chemicals, oil & rubber			-0.064	0.213		
Auto			0.045	0.443	0.096	0.024
Clothing			-0.036	0.508		
Fabricated metal			-0.063	0.370		
Furniture			-0.084	0.283		
Machinery			-0.116	0.106		
Printing & Publishing			-0.044	0.471		
$\lambda$ (IMR)	-0.119	0.097	-0.252	0.054	-0.170	0.000

**Notes:**

1. Each pair of columns refers to a separate specification of the model. The final pair of columns, model 3, represents the model with only statistically significant variables specified.

As with the export participation model, the export intensity model has found more significant explanatory variables than the current literature such as Söderbom and Teal (2002a) who find no highly significant variables besides sectoral dummies. Here efficiency, firm age, and the capital-labour ratio are found to be highly significant.

The above table shows, most importantly, that firm size (employment) has no latent relationship to export intensity. Differences in firm size between firms can thus not describe differences in firms' export intensities. This paper thus finds that firm size is significantly and positively related to the firm's decision to enter the export market, but *not* the firm's decision as to how much of its output it should export.

The efficiency measure is found to be significantly related to export intensity, however the results show a negative relationship. This seems counter-intuitive, and

is not the expected relationship. Although this measure is used in the literature, it does suggest that either the limited efficiency measure is flawed or there is a misspecification of the model (e.g. an omitted explanatory variable). Due to actual output's being proxied by (monetary) turnover in the production function, the limited efficiency measure could thus capture high turnover firms as well as firms with high human capital, as mentioned previously. Thus the observed relationship might be showing that firms with abnormally large turnovers tend to export less of their output. Fedderke et al.'s observation of high margins in South African industries (Fedderke et al., 2001) could possibly support this explanation. Firms with higher margins (i.e. those in high-margin industries) would, by implication, tend to have greater domestic market power and, as argued previously, would focus on the domestic market rather than the export market. Thus if these firms with higher margins also generate a higher efficiency measure, it could explain the negative relationship, as they would tend to export less of their output. However, this explanation does not fully satisfy as significant sectoral effects were controlled for. Perhaps if larger firms in South Africa had higher margins than smaller firms, the results could then be understood. Clearly, subsequent surveys should cover the specifics of production in more detail.

Firm age is also negatively related to export intensity, a result which has been found in some studies. This implies that older firms export less of their output than newer firms. There are some possible explanations for this. One could be that newer firms have newer equipment facilities that meet international standards, or newer firms could have access to newer technologies (Rankin et al., 2002) and exporting is easier or less costly for those firms. Newer firms may be more export-orientated due to government policy shifting away from import substitution industrialisation to a greater focus on exporting. Surviving older firms may be those that have found a degree of market power that they can exploit in order to operate in the long run.

The negative relationship between the capital-labour ratio and export intensity suggests that more labour-intensive firms tend to export more of their output. Labour intensive products are possibly produced on a larger scale and could also be globally homogenous, giving them greater export potential.

It can also be seen that the automotive sector is likely to export more of its output than other sectors, which is likely due to the specific incentives for the exporting automotive industry in South Africa.

#### *Differences between Firm Size Divisions*

Although the model of export intensity found that firm size is not a significant explanatory variable, it is possible that different firm size classes are significantly different from each other. Once again the Heckman two-step estimator is used, but now with dummy variables for the four firm sizes included. These firm sizes are described in Table 4.1: Small, Medium, Large, and Very Large. Table 5.5 below summarises the results of the regression. The significant (third) model specification from table 5.4 is used here.

Table 5.5 The Heckman two-step estimator of export intensity with firm size dummies

Variable	Coefficient	Std Error	$\beta$ /SE	P-Value
Constant	0.559	0.09	6.44	0.000
Ln Efficiency	-0.060	0.02	-3.09	0.002
Firm Age	-0.002	0.00	-2.94	0.003
Ln Capital/Labour	-0.035	0.01	-2.75	0.006
Auto	0.104	0.04	2.40	0.017
Small	0.012	0.05	0.24	0.809
Medium	-0.050	0.04	-1.30	0.195
Very Large	-0.082	0.04	-2.16	0.031
$\lambda$ (IMR)	-0.226	0.06	-3.64	0.000

Notes:

1. The base firm size class here is "Large". Firm classified as per table 4.1

Table 4.1 suggested that large sized firms exported more of their output than the remaining three classes of firms. The model above tested the hypothesis that other size classes might export less (or more) than those firms classified as "Large". The results show that small and medium sized firms do not show any significant difference in export intensity given other significant explanatory variables. However, very large firms appear to export significantly less of their output. This means that given all the other variables in the specification above, very large firms have lower export intensities than other firms. It also suggests that the very largest of South Africa's profit-maximising firms opt to focus their operations on the domestic market even though it is easier for a larger firm to enter the export market than a smaller firm. It follows that the domestic market must be more profitable and this is likely because of the market power which is exercisable by the very large firms.

## **6. Conclusions**

In the context of competition policy and law, the relationship between firm size and exports is important. It is possible, if not likely, that more merging firms will tend to motivate and justify anti-competitive mergers on the basis of needing to be internationally competitive as per the Competition Act of South Africa.

This paper has found there to be a strong relationship between firm size and export propensity in South Africa. The firm's decision of whether to enter and participate in the export market is significantly related to firm size, that is larger firms are more likely to export some of their output than smaller firms. It was found that export propensity in South African firms is also significantly related to efficiency, foreign ownership, the capital-labour ratio, as well as wood, fabricated metal, furniture, and machinery sector dummies.

However, this paper has found that there is no significant relationship between firm size and the export intensity of South African firms. Export intensity is found to be related to a basic measure of efficiency calculated in this paper, the capital-labour ratio, firm age, and automotive sectoral dummy. In developing a model for export intensity, the sample selection process in the sample of exporting firms was taken into account using a Heckman two-step estimator. Cursory evidence was also found to show that the very largest firms in South Africa used exporting as a vent-for-surplus rather than exporting larger proportions of their output.

Although efficiency, in part, explains export intensity, this is separate from the firm size-export discussion here. Firms applying for a merger can only argue the public interest clauses if the Competition Tribunal has decided that, firstly, the proposed merger would be anti-competitive and, secondly, the proposed merger could not be justified on efficiency grounds. Thus, the scenarios in which (potentially) merging parties would opt to argue with public interest clause (d) of the Competition Act of South Africa are limited. Should two non-exporting firms apply for a merger, they could argue that their increased size will make them more likely to enter the export market, and thus the merged firm would be more able to compete in international

markets. The merging parties would be able to draw on the positive relationship between firm size and export propensity.

In the second scenario, at least one of the merging firms is an exporter. Thus the firms could only argue that the merger would somehow increase their intensity of exports post-merger. However, the evidence presented here would argue against this in that there is no apparent relationship between firm size and the intensity of exports in South Africa. It might even be true that if a merger moved a firm from the large to the very large category, the merged firm could export less of its output, due to vent-for-surplus behaviour.

Although each case would, and should, be treated individually by the Competition Tribunal, this paper casts doubt over the merits of the fourth public interest clause's inclusion in the Competition Act of South Africa.

This analysis was limited by the data set, in that many firms were listed as exporters but could not, or did not, report the level of exports. These firms were omitted from the statistical model. The cross-sectional nature of the dataset also prevented any analysis of trends and movements over time. There was also insufficient scope in the dataset to produce a reliable measure of technical efficiency for each firm. It is recommended that future surveys have questions dealing more specifically with the inputs and materials used in the production function as well as questions addressing the level of human capital in each firm. This paper reveals much opportunity for further research in this area.

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