COMPARATIVE COST ADVANTAGE AND TRADE PERFORMANCE IN SOUTH AFRICAN MANUFACTURES: 1970-2000

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The Ricardian model of Comparative Costs is used in this study in an attempt to explain changes in the competitiveness of South African manufactures by relying solely on cross-country differences in labour requirements. There are many shortcomings of focusing on a single factor of production i.e. labour, such as overlooking the important contributions to overall productivity of capital, technology and factors such as scale economies. However, an empirical test of the Ricardian Model for South African manufactures is deemed a valuable exercise. This is especially true, when we take into consideration, that labour is the most readily measurable of the various productive resources, and recognise that neither multi-factor productivity measures nor capital productivity estimates have the same degree of precision that labour productivity measures have.

The fact, that labour requirements are at the centre of the discussion, makes an analysis of the study's model even more desirable. This is especially so, when viewed against the environment in which South African trade flows take place. The importance in understanding the implications for competitiveness of cross-country and industrial sector differences in labour requirements cannot be over-emphasised, especially for a country, which despite having made substantial industrial progress, is still very much a developing economy, characterised by a shortage of capital and financial inflows, yet in desperate need of growth in both output and employment.

1. INTRODUCTION

Economists have long realised that no country can be an island unto itself; South Africa with its very substantial involvement in and dependence upon the rest of the world can ill afford not to heed this fundamental truth.

Differences in prices from country to country are the basic cause of trade. They reflect differences in costs of production. Trade serves in turn to minimise the real resource costs of worldwide production, which is a way of saying that trade serves to maximise the real value of production from worldwide resources. It does so by permitting and encouraging producers in each country to specialise in those economic activities that make the best uses of their country's resources.

In a world where labour is the key productive resource, cross-country differences in relative prices are due to differences in labour requirements. One country may use less labour in all its industries. Its absolute advantage in efficiency, however, does not prevent it from trading beneficially with other, less efficient countries. It will have a comparative cost advantage in those activities where its absolute advantage is largest.

What comparative cost theory states, is that each country will have a comparative advantage and will export those commodities for which its relative output per worker exceeds its relative money wage rate in the respective industry.

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Comparative cost advantage plays an important role in determining a country's trade flows, particularly so in commodities originating from manufacturing industry, while changes in comparative advantage are a significant contributing factor in large South African current account deficits. In response, manufacturing industries have renewed their emphasis on the analysis of production costs as a means for improving their trade position. In particular, the role of unit labour costs in the determination of trade flows has received increased attention and is the focus of this study.

This paper consists of four sections. The first section introduced the topic, whereas the contents of the remaining sections are as follows:

Section 2 undertakes an in depth examination of the Doctrine of Comparative Costs. The theory behind the concept is discussed with David Ricardo's -by now famous numerical illustration of Comparative Cost Advantage - serving to enhance its explanation.

A discussion of the numerous empirical tests of the Ricardian model of Comparative Cost, to date, precedes the theory, as does a brief mention of the major problem one faces in testing comparative cost theories. The section ends with an exposition of the most widely employed methods of measuring international competitiveness.

Section 3 begins with an attempt at providing an empirical test of the Ricardian Model from a South African perspective. More specifically, in support of Ricardian Comparative Cost Theory, a systematic relationship between relative South African output per worker and relative South African export quantities is sought. Failing this, section 3 proceeds with a more detailed examination at the industry level, for the period 1970 to 2000, of the relationship between the components of labour cost and the structure of South African trade flows.

Section 4 concludes the paper, with a summary of the most important findings from our study together with some policy recommendations arising from the discussion of comparative cost theories in the South African context.

2.1 THE DOCTRINE OF COMPARATIVE COSTS

To the question which goods a country will import and which it will export, classical theory gives the following answer. Each country will produce those goods for the production of which it is especially suited on account of its climate, of the qualities of its soil, of its other natural resources, of the innate and acquired capacities of its people, and - this must be given special emphasis - of the real capital which it possesses as a heritage from its past, such as buildings, plant and equipment, and means of transport. It will concentrate upon the production of such goods, producing more of them than it requires for its own needs and exchanging the surplus with other countries against goods, which it is less suited to produce, or which it cannot produce at all.

Supposing for the moment that there are only two countries, each will supply its own needs for goods whose conditions of production are about the same in both countries, or which cannot be transported, or whose transport costs more than offset the gain from specialisation. But in the production of other goods a division of labour will come about under unrestricted trade, between the countries concerned. This division of labour will clearly represent a gain to the world as a whole in so far as it enables more of each good to be produced than would otherwise be the case (Haberler, 1937).

In order to discuss the international division of labour more precisely, we must turn to the Doctrine of Comparative Costs. The Doctrine of Comparative Costs originated as an improvement and development of the eighteenth-century criticism of mercantilist policy, and it has continued to command attention mainly because of its use as the basic "scientific" argument of free trade adherents in their attack on protectionism. The doctrine maintains that if trade is left free, each country in the long run tends to specialise in the production of and to export those commodities in whose production it enjoys a comparative advantage in terms of real costs, and to obtain by importation those commodities which could be produced at home only at a comparative disadvantage in terms of real costs. In the exposition of the doctrine the "real" costs are expressed in terms of quantities of labour-time, but with the implication, as throughout the classical theory of value, that these quantities of labour-time correspond in their relative amounts within each country to quantities of subjective cost.

In his "Principles" first published in 1817, David Ricardo presented the doctrine of comparative costs by means of what was to become a famous illustration, in which the quantity of wine which requires for its production in England the labour of 120 men can be produced in Portugal by 80 men, while the cloth which in England requires the labour of 100 men can be produced in Portugal by 90 men.[1] Portugal would then import cloth from England in exchange for wine, even though the imported cloth can be produced in Portugal with less labour than in England. Although Portugal has an absolute superiority in both branches of production, this superiority is, however, greater in wine than in cloth. Portugal has a comparative advantage in the production of wine since here her cost difference is relatively greater than in the case of cloth. For 80/120 is less than 90/100.

Suppose as Ricardo does, there is no commodity trade between the two countries. Then in accordance with the relative costs, an exchange-ratio will be established in England of 1 unit of wine against 1,2 units of cloth, and in Portugal of 9 units of wine against 8 of cloth; that is to say of 1 unit of wine against 1,88 units of cloth. It is important at once to realise that the main task of the labour-cost hypothesis is to determine exchange-ratios or relative prices in distinction to absolute money prices. Assuming now that trade takes place. It is clearly advantageous to Portugal to send wine to England, where a unit of it commands 1,2 units of cloth. Under the assumption then, that within each country labour is completely mobile between the various industries, Portugal will take to producing wine instead of cloth. England, on the other hand, can obtain wine at much less expense by specialising in the manufacture of cloth and exchanging the cloth with Portugal against wine. For Portugal there is a sufficient inducement to engage in international trade if 1 unit of wine commands a little more than 0,88 units of cloth; for England, if a little less than 1,2 of cloth must be given for 1 of wine. Hence any exchange ratio between 0,88 and 1,2 cloth against 1 wine represents a gain to both countries. Let us suppose that the exchange ratio, which becomes established, is 1 to 1. Then for every 100 labour-units which England sends to Portugal embodied in the form of cloth, she receives 1 unit of wine which, in the absence of the international division of labour, would have cost her 120 labour-units to produce for herself; and Portugal obtains cloth at a cost of 80 per unit whereas to produce it for herself would cost 90. The consequence is that each country specialises upon that branch of production in which it enjoys a comparative advantage, thereby obtaining a greater total product from given factors of production. (Viner, 1937).

Since labour is the key productive factor in the Ricardian model, measures of comparative labour productivity have been designed to serve as a proxy for comparative costs. Given the existence of other productive factors and the fact that, in actuality, trade is determined by differences in absolute money prices among countries, the question becomes: How good is comparative labour productivity as an approximation of comparative total factor productivity and of comparative selling price?

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1. The Ricardian model is thus based on a labour theory of value, but Ricardo and other Classical economists used that theory only as an analytical convenience. It was not the centerpiece of Classical economics in a way that it became the centerpiece of Marxian economics. There is a role for capital in Classical economics, but it is complementary to the role of labour. Capital is used to hire labour (and buy raw materials) during the "period of production" before output emerges and can be sold. Capital constitutes a "wage fund' rather than a stock of machinery. When wage rates are the same in each industry, however, the wages fund is proportional to employment in each industry. Therefore, total costs, including the costs of capital are proportional to labour costs. When working with the Ricardian model, then, we can focus exclusively on labour requirements.

Empirical tests of the Ricardian model have foundered on this particular issue, and interest has increasingly focused on more comprehensive measures of inter-country differences in efficiency, especially in the context of estimating production functions. But even supposing that an empirical relationship is established between specialisation in trade and variations in comparative costs, this as Stern (1975) points out, does not answer the more fundamental question of what determines these variations in costs. The Ricardian model is not of much help here, since it presumes that comparative-cost differences are a fact of life and thus do not require separate investigation. This aspect of the Ricardian model has been the subject of much criticism of more recent works on comparative cost theory, but more on this a little later.

2.2 EMPIRICAL TESTS OF THE RICARDIAN MODEL OF COMPARATIVE COSTS

Early empirical tests of the Ricardian model of comparative costs as conducted by Mac Dougall, Stern and Balassa were markedly simplistic[2]. Assuming a Ricardian world in which labour was the only factor of production, it was hypothesised that the relative export performance of the United States and United Kingdom in third markets (since there was little mutual trade between the countries) depended upon differences in output per man by industry, which in turn would be reflected successively in differences in unit wage costs, unit value added and unit prices.

Mac Dougall (1951) found that in 1937 average US. weekly wages in manufacturing industries were twice those in Great Britain. Where US. output per worker was more than twice that of the British, the United States was expected to dominate the export market, and where the US. output per worker was less than twice that of the British, Britain was expected to dominate the export market. The results indicated that 20 of the 25 industries (covering 97% of the sample by value) conformed to expectations. Mac Dougall also found a strong inverse relationship between 1937 relative US, and UK. wage costs per unit of output and relative exports, and a positive relationship between relative output per worker and relative exports. Balassa (1963) and Stern (1962) continued and updated Mac Dougall's original work. Their results indicated that the 1950 relative US and UK export performance followed established lines of comparative advantage as suggested by labour productivity. Furthermore, the introduction of differences in capital costs per unit of output did not have any significant effect on export performance.

Kreinin (1982,1984) extended the analysis by examining the unit labour costs of the motor vehicle and steel industries relative to national manufacturing average in the United States, Japan, and industrialised Europe. He concluded that relative unit labour costs did explain the trade position of the two industries and were a good indicator of comparative advantage.

In contrast to this, Bhagwati (1964), Kreinin (1969), Katrak (1969), and Stcrn (1975) concluded that their results did not support the comparative cost doctrine and that other factors were important in determining the pattern of trade.

In his 1969 survey of trade theory, Bhagwati examined the logic and underlying assumptions of the Ricardian model and the empirical procedure whereby Mac Dougall (1951), Stern (1962) and Balassa (1963) had tested the hypothesis. He argued that the procedure was defective insofar as relative export prices could not necessarily be approximated by labour productivities and the other measures employed. Bhagwati did not, however, directly test the doctrine himself, but instead regressed the relationship between relative unit labour costs and export price ratios. Since his tests produced poor results, he concluded (1969, pg22), "there is yet no evidence in favour of the comparative costs doctrine".

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2. For a summary of the findings of these early empirical tests, see Table I in the appendix.

In subsequent reflection on the issue, Daly (1972) attributed the lack of relationship between labour productivity and exports price ratios in part to the fact that the labour productivity calculations were based on measures of net value added, thus excluding intermediate inputs, while the export-price ratios were derived from measures conceptually closer to gross output. In his reaction to Daly's interpretation, Bhagwati (1972) reiterated his skepticism about the labour productivity approach to comparative advantage and expressed reservations as to whether the productivity data was in fact calculated on a net-value-added basis. On this same occasion, Balassa (1972) took issue with Bhagwati's contention about labour productivities and export prices, arguing that the unit values used as proxies for export prices reflected quality differences and were thus not good measures of price, and that, in any case, the hypothesis presupposed the existence of inter-country productivity differences.

A separate empirical investigation would be required to evaluate Balassa's assertion concerning the appropriateness of unit values. But even if they are appropriate, prediction based on the Ricardian model may be of limited interest, since, as Bhagwati (1964) and Johnson (1968) have noted, it does not shed much light on the nature and sources of comparative advantage.

The foregoing discussion brings out the limitations of treating labour productivity as exogenous and as the most important determinant of comparative cost differences. It would be no less arbitrary, as Bhagwati (1972) noted, to focus on the productivity of capital as the crucial factor, especially in view of the importance of human capital and capital inputs into natural resources. What this suggests, therefore, is that we should adopt a multi factor view of the world and premise the Ricardian model on the existence of inter-country differences in total factor productivity, that is, on inter-country differences in production functions for given goods.

It was in an article in which Arrow, Chenery, Minhas and Solow (1961) introduced the constant elasticity of substitution production function, that their data raised questions about the similarity of production conditions in different countries. In their conclusion they stated: "Although we began our empirical work on the naive hypothesis that observations within a given industry but for different countries at about the same time can be taken as coming from a common production function, we find subsequently that this hypothesis cannot be maintained. But we get reasonably good results when we replace it by the weaker, but still meaningful, assumption that international differences in efficiency are approximately neutral in their incidence on capital and labour. A closer analysis of international differences in efficiency leads us to suggest that this factor may have much to do with the pattern of comparative advantage in international trade"(Arrow et al, 1961, pg246).

Thus what this implies, is that the Ricardian model could be tested by fitting production functions for industries in different countries, with the expectation that a country's exports would be concentrated in its relatively most efficient industries and its imports in its least efficient ones. In this regard, Katrak (1969) has the following to add: "we have tested the Ricardian theory in terms of the inter-country differences in production functions whereas previous tests of that theory have been in terms of labour productivity ratios. Our reason for preferring the former method is that the interpretation of any empirical relationship involving labour productivity ratios is not unambiguous. It is true that in the original Ricardian formulation in terms of a single-factor model, inter-country differences in productivity ratios can arise only if production functions differ between the two countries. But in the situations with which we are concerned capital as well as labour is used as an input, so that the labour productivity ratios will reflect capital/labour ratios (which in turn may reflect factor costs) as well as differences in production functions; in such situations an empirical relationship between cost ratios and labour productivity ratios is not of much importance" (Katrak, 1969, pg 395).

Unfortunately the Katrak study is limited to testing the correlation between production function differences and comparative costs. Since interest in theories of comparative costs arises, at least in some part, from interest in their predictions about the pattern of international trade, it would be, as Katrak himself admits, interesting to extend the analysis to include foreign trade patterns. It is recognised however, that such an exercise would be much more difficult. As Katrak (1969) notes, "it is easy to adjust comparative cost ratios for inter-country differences in production functions; but a corresponding adjustment of the ratios of two countries' exports of comparable commodities - or of products of comparable industries - would require detailed knowledge of the cross-elasticities of the various commodities in particular geographical markets. The present lack of such data would seem to preclude such an exercise" (Katrak, 1969, pg395).

Stryker (1968) conducted a similar study on inter-country efficiency differences in industrial production. Using a Cobb-Douglas framework he constructed a model to explain differences over time in the growth of exports for the United States and Canada in twenty-four manufacturing industries in terms of differing rates of technological progress, scale effects, and factor-price changes. While his results were suggestive, they were not particularly strong for a variety of reasons, such as the framework chosen, the assumption that technological change was disembodied and could be approximated by a linear time trend, and the application of US industry coefficients to industries in Canada. Moreover, Stryker encountered difficulty in making Canadian - US comparisons for manufactured exports, since the United States is dominant in Canadian markets, and the countries do not compete extensively in exports to third markets.

The need thus, to check the relative importance of the cost of other factors of production and their relative rates of return, and the relationship between total costs and export prices is something few economists would deny.

Having said this, one should at the same time recognise the extreme shortcoming most international trade theory faces by dealing with trade almost exclusively as a function of price. That is demonstrating how comparative advantage and variability of availability of factors between countries, lead to different prices. This may have been adequate for the~ kind of trade in food, raw materials and simple standardised manufactures that developed in the nineteenth century. But for the kind of trade which has developed in manufactures during the last few decades an explanation in terms of price alone is quite inadequate. Devons (1961) points out how in many products and markets: design, marketing, repair facilities and after-sales service are at least as important as price, and how these have played an important role in post-war international trade in motor vehicles especially.

The importance of these non-price elements in trade - many others in addition to those, which have been mentioned - may be recognised in a very general way, but it is not as easy to absorb them into the traditional framework of international trade theory. Competitiveness in price can be objectively determined and analysed, in principle at least; but once we move to other aspects of selling and marketing, we depend very much more on impression and judgments.

Returning to traditional comparative cost differences as an explanation of international trade flows; much has been said, yet the question still remains: How are we to explain the observed inter industry differences in productivity ratios that appear to be correlated with export ratios?

As already noted, the Ricardian hypothesis presupposes the existence of inter-country differences in production functions and then proceeds to take labour productivity differences as a proxy for differences in production functions. Any empirical study, hence claiming to be a valid test of the Ricardian hypothesis, must of necessity unquestioningly accept such a presumption. Yet the reliance of both the hypothesis and tests thereof, on labour productivity unaccompanied by an explanation of why labour productivity is what it is, undoubtedly restricts their usefulness as explanations of real world trade patterns.

On the more positive side though, most trade theorists would agree that we do not have enough data at the industry level on productivity differences, cost differences, price differences, and international trade for different countries to test fully the Ricardian assumptions in relation to domestic production and trade.

2.3 A LIKELY PROBLEM IN TESTING COMPARATIVE COST THEORIES

Before proceeding, we consider a specific problem that arises from the nature of the predictions made by theories of comparative costs. These theories attempt to explain the pattern of comparative costs in the "pre-trade" situation, and the problem arises from the fact that we have no data relating to that situation.

Once countries begin to trade, these differences in comparative costs are reduced, although, owing to impediments to trade such as tariffs, transport costs and imperfect knowledge on the part of traders, they are not eliminated completely. We hence observe differences in costs between any two countries even though they may be trading with each other.

The differences in costs we observe may not however be of the same magnitude as the differences that may have existed in the pre-trade situation. But we may use the former in our tests in lieu of the latter on the assumption that the observed pattern of costs is the same as the pre-trade pattern; e.g.: if we find that commodity X is relatively cheaper in country A, and Y is relatively cheaper in B, we test the theories on the assumption that X would have been cheaper in A in the pre-trade situation.

2.4 MEASURING INTERNATIONAL COMPETITIVENESS

While the concept of international competitiveness or comparative advantage of a country's commodities is relatively simple, the actual measurement of this is difficult. Balassa (1965) argued that there are three ways of measuring comparative advantages.

The first method is to measure the surplus or deficit of exports over imports of each commodity. Where exports exceed imports the commodity is considered as having a comparative advantage. This method will be made use of later on in this paper, in the section, which examines the relationship of the components of labour cost to the structure of South African trade flows in manufactures over the period 1970 to 2000. The major criticism of using export-import ratios is that it is severely affected by inter-country differences in tastes, as well as by inter-industry disparities in the degree of protection. Moreover, in the case of intermediate products, export-import ratios are often influenced by demand for purposes of further transformation in producing for export.

The second measure is to measure production costs of relevant competing commodities by a census undertaken simultaneously and using identical methods of investigation for all countries. In practice, production censuses are conducted at different times, using different methods of enquiry, thus sufficient comparable information for making inter-country cost comparisons is not available.

The third approach suggested by Balassa (1965) for measuring international competitiveness of a country's commodities is that of "revealed comparative advantage". According to this method the international competitiveness (or comparative advantage) of country i's commodity j is measured by its relative export share in the relevant foreign markets. It is postulated that if country i's relative export share in the relevant foreign market of commodity j is greater than country i's relative export share in the relative foreign market of commodity k, country i enjoys a comparative advantage in commodity j. In other words, country i has a better ability in international trade with commodity j.

In the real world of many commodities however, it is postulated that ranking country i's commodities according to their relevant export share in the world, is a better indicator of their relative international competitiveness. It is worth mentioning that the method of export shares is actually based on the concept of market share, which is a widely accepted criterion for sales performance. It is believed by Hirsh (1970) and others, that the calculated magnitudes of export shares indicate the degree of export success in the face of international competition, from the point of view of a given country. The method of export shares has often been used to reveal South African comparative advantage, see in particular Ariovich (1979) Standish and Galloway (1990) Golub and Edwards (1999) in this respect, with the added advantage that the commodity pattern of trade it suggests, reflects not only differences in relative cost but also differences in important non-price factors.

A fourth way of measuring comparative advantage is worthy of mention. This is the model developed by Parry (1975), which is essentially an extension of the Balassa export share model. Parry argued that the determinants of the relative export performance of an industry could be grouped into two areas: comparative advantages in production and comparative advantages in marketing. The former encompasses the traditional factors of trade, labour and capital while the latter includes advantages inherent in the firm, such as marketing expertise and product differentiation. The actual "revealed" comparative advantage of an industry's exports to a particular market will be the result of both production and marketing factors.

He argued further that where an industry is involved in direct operations in a particular market, in place of or in addition to exporting to that market, a measure of revealed export performance ignores the non-trade manifestation of any intrinsic "non-traditional" advantages of the industry. For example, an industry in South Africa may suffer a comparative disadvantage in production within the home market employing domestic factors, while enjoying a comparative advantage in production within a foreign market employing either South African or foreign factors, or both. Thus, a South African producer of clothes may have a poor export share while subsidiaries operating directly in a foreign market may enjoy a comparative advantage in the production of clothing as a result of marketing skills. In such a situation, where the industry's advantage is exploited via non-trade servicing, the revealed advantage will show up in non-trade performance.

The "revealed" comparative advantage approach to international non-trade competitiveness suggests that if country i's relative share in the rest-of-the-world production increases, then country i has a revealed comparative advantage in producing commodity j within the rest-of-the-world markets. This "revealed" advantage reflects both an advantage in production as well as an advantage in marketing, exploited by direct operations in the rest-of-the-world. In summing up Parry's model, the proper assessment of an industry's international competitiveness thus requires consideration of both trade and non-trade international considerations.

Having thus set-out - in fair detail - the methods by which comparative advantage may be measured, our attention is now re-focused on comparative cost advantage and the task at hand, taking comparative advantage, that is South Africa's international competitiveness as a given.

3. COMPARATIVE COST ADVANTAGE: A SOUTH AFRICAN PERSPECTIVE

Researchers and policy makers have spent a great deal of time and effort on the subject of South Africa's international competitiveness and in the examination of the factors influencing it. The purpose of this study is not however, to provide the reader with another assessment of South Africa's international competitiveness. See Ariovich (1979), Standish & Galloway (1991), Kahn (1998), Tsikata (1999), Golub (2000), Edwards (2001) in this regard. Rather the study undertakes, to update the pioneering study by Kohler & Holden (1992) by offering an empirical test of the accuracy of the Ricardian model of Comparative Costs as an explanation of trade flows in South African manufactures.

However, it is apparent from the literature on the subject that little, if any empirical research has been devoted to an empirical verification of the predictive power of the Ricardian Theory of Comparative Cost Advantage in the context of South Africa's trade flows in manufactures. Although this may seem surprising, it is quiet understandable when viewed against the somewhat oversimplified, and sometimes far from realistic explanation of comparative advantage that this model has to offer. Despite this, the reliance by the Ricardian model on a single factor or production as the reason for production differences, comparative cost advantages, and hence international competitiveness, makes it a very attractive, simple and empirically testable hypothesis. The fact, that the single productive factor happens to be labour, makes testing the model's hypothesis even more desirable, especially when viewed against the environment in which South African trade flows take place. Many of South Africa's exports are destined for markets of countries more developed than her own, and in comparison to these economies she is regarded as a labour abundant country. The importance of labour in the production process cannot be over-emphasised, especially for a country, which despite having made substantial industrial progress is still very much a developing economy (characterised by a shortage of capital and financial inflows) in desperate need of growth in both output and employment.

Although we are quite aware of the serious shortcoming associated with focusing on a single factor of production: labour, ignoring the important contributions to overall productivity of capital and other relevant factors; it is felt nevertheless that a test of the Ricardian Model – a model which relies solely on labour productivity differentials as an explanation of international competitiveness – for South African trade flows, is deemed a valuable exercise.

This is especially true, when we take into consideration, that labour is the most readily measurable of the various productive factors, and at the same time recognise as Mark (1986) does, that neither multi factor productivity measures nor capital productivity estimates have the same degree of precision that labour productivity measures have. On the assumption then – in the true Ricardian spirit – that there exist inter-country differences in production functions, and that in a single factor world, we can proceed to take labour productivity differences as a proxy for differences in production functions (without furthermore, offering an explanation as to why labour productivities are what they are), we attempt now to determine whether or not comparative cost differences do – as the Ricardian hypothesis proposes – account for observed differences in South African trade.

The definition of comparative costs is of key importance to the analysis. These costs are measured on the basis of relative output per worker, and are presumed to reflect differences in marginal costs in the countries South Africa and the World. A systematic relationship between relative South African output per worker (in other words South African labour productivity) and relative South African export quantities will be taken as evidence in support of the Ricardian proposition.

It is worth noting here that, numerous empirical tests of comparative cost theory have been undertaken to date in other countries. Most of these studies have foundered on the central issue of how good labour productivity is as an approximation of comparative total factor productivity and of comparative selling prices. On the basis of this, and the many difficulties associated with the data compromises required to estimate equation (1), our study recommends testing the Ricardian model in a slightly less conventional manner. Recognising that comparative cost advantage plays an important role in determining commodity trade flows, (particularly so in manufacturing), we proceed to examine the relationship between the components of labour costs, that is: labour productivity and labour compensation, the exchange rate and the structure of South African trade flows. This is undertaken for the period 1970 to 2000 and is carried through for the manufacturing sub-sectors as a whole in panel data form and over time for each of the major industrial sectors as classified by ISIC.

The model used is as follows:

$$\log[X/M]it = a + b.\log[P]it + c.\log[W]it + d.\log[R]it + Uit\ldots equ(1)$$

$$\log[X/M]_{it} = a + e.\log[ULC]_{it} + f.\log[R]_{it} + U_{it} \ldots equ(2$$

where: X/M, is South Africa's trade performance (real exports of sector i/real imports of sector I).

P, is labour productivity per employee in each South African industrial sector, that is, real value added per employee in sector i.

W, is an index of labour compensation per employee in each South African industrial sector, that is, total real compensation per employee in sector i.

ULC, is the unit labour cost in each SA industrial sector, (ie, labour compensation to labour productivity ratio per employee in sector i.)

R, is the inverse of the REER of the South African rand

I is the industrial activity as classified by ISIC

t is the year of analysis, and

Uit is the stochastic error term

And where the coefficients are:

a= *intercept term,*

b = *sensitivity of export performance to changes in labour productivity, the expected sign is positive,*

c= *sensitivity of export performance to changes in labour compensation , the expected sign is negative,*

e= *sensitivity of export performance to changes in unit labour costs (wages divided by value added), the expected sign is negative,*

d & f = *sensitivity of export performance to changes in the* REER *of the South African rand (inverted), the expected sign is positive.*

The study recognises that by embarking on a time series analysis, although we are able to account for differential trade restrictions amongst the industries, the same cannot be said for changes in trade barriers between time periods.

The industries were categorised by the International Standard for Industrial Classification (ISIC) system at the 3-digit level. Values for exports, imports, total compensation, value added, and total employees were all obtained from the industrial Development Corporation of South Africa's 2001 publication: "Sectoral Data Series on Manufacturing". The REER of the South African rand –on the other hand- were collected from various issues of the South African Financial Statistics.

3.1 THE TESTING PROCEDURE

If one runs 28 cross-sectional regressions (one for each industry) separately using Ordinary Least Squares (OLS), the results are inefficient. This is because equation-by-equation regression fails to account for the fact that the errors are correlated across equations (for example, due to a common excluded factor such as a downturn in the economy). The correlation across the errors is made evident by the use of the Seemingly Unrelated regression (SUR) model. Here, the Breush-Pagan test suggests that the null hypothesis of independence can be decisively rejected (at greater than the 1% level of significance). There is a highly significant relationship (at all conventional significance levels) between unit labour costs and the dependent variable for 18 of the 28 manufacturing industries (shown in Appendix B).

The purpose of this paper however, is to test whether unit labour costs are a significant determinant of a country's international competitiveness in manufactured commodities as a whole. The data was hence pooled over the industries and years as this provides "more informative data, more variability, less collinearity among variables, more degrees of freedom and more efficiency" (Baltagi in Gujarati; 2003; pp. 637). The implicit assumption here is that we are constraining our coefficient vector to be the same for the 28 different manufacturing industries. Since we are using pooled data we checked for heteroscedasticity, particularly as the variances did not appear to be constant across industries. A Cook-Weisberg test for heteroscedasticity using the variables specified, reveals heteroscedasticity relative to the industries. Allowance was also made for the possibility of correlation of the errors across industries because, as noted above, these industries are likely to be affected by similar macroeconomic factors (such as a depreciating exchange rate, economic downturns etc). The correlation between industries was indeed found to be significant. Finally, the presence of first-order autocorrelation was confirmed. Enhancements to the model were made in a systematic way, using a Likelihood-Ratio test at each stage to reveal any significant difference between regressions. The model was finally re-estimated using a full information method i.e. Generalised Least Squares allowing for cross-sectional (groupwise) heteroscedasticity, together with cross-sectional correlation and panel-specific first order autocorrelation. The Likelihood-Ratio test showed that the final enhancement was strongly justified. A plot of the residuals showed no evidence of autocorrelation or heteroscedasticity and so suggests that our model is appropriate (i.e. constraining the coefficient vector to be the same for the different industries).

3.2 THE TEST RESULTS

The results for the manufacturing sector as a whole are as follows:

$\log [X/M]_{it}$	=	–4.65	– 0.47 log[ulc]	+ 0.62 log[r]
se	=	(0.08)	(0.03)	(0.01)
z	=	(-55.94)	(-18.36)	(43.52)
p	=	(0.000)	(0.000)	(0.000)

Wald chi2(3) = 1939.42
Prob>chi2 =0.000
N = 868
*Standard errors, z values and their associated probabilities are shown in parentheses.

The signs for both variables (the log of unit labour costs and the log of the exchange rate) are in line with our expectations, and they are both individually highly significant (significant at greater than the 1% level). A Wald-test reveals that the regression is furthermore highly significant overall. The results strongly suggest that changes in these two variables contribute significantly to South Africa's international competitiveness in manufactured commodities. This lends support to the contention that the Ricardian model is not to far from the truth in its explanation of South African trade flows, as unit labour costs are a significant determinant of our export competitiveness in manufactures. Thus labour productivity; labour compensation and the exchange rate-when taken together- are important determinants of the structure of commodity trade flows.

4. CONCLUSIONS

This paper highlights the importance of cross-country and industrial sector differences in unit labour costs in influencing the direction of trade flows of South African manufactures. Given that differences in labour requirements take center stage in the paper's analysis of international cost competitiveness, the findings of the paper are particularly relevant for policy-making in the country. This is so when viewed against the environment in which South African trade flows take place. It is important to understand the implications for competitiveness of cross-country and industrial sector differences in labour requirements, especially for a country, which despite having made substantial industrial progress, is still very much a developing economy (characterised by a shortage of capital and financial inflows) yet in desperate need of growth in both output and employment.

The paper finds that labour costs per unit of output are indeed a highly significant determinant of trade competitiveness in South African manufactures over the period under investigation, namely: 1970-2000. This finding provides robust support for the Ricardian Model, despite its highly simplistic nature and dependence on a single productive factor (labour and differences in its costs) in its explanation of comparative cost advantage.

Furthermore the paper's findings lend support to the notion that organized labour, business and government policy makers in South Africa need to exercise restraint in wage negotiations, or they risk jeopardising South Africa's ability to compete internationally in manufactured goods (where the wage bill is a significant proportion of overall production costs). In particular, the paper argues that for international cost competitiveness to be maintained, wage increases in South African manufacturing industries can only be accommodated in the context of rising labour productivity.

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APPENDIX A

Table 1
Test of the Comparative Cost Theory

STUDY	REGRESSION RESULTS	R^2	N	YEAR	COUNTRY
McDougal (1951)	X1/X2 = A + 4P1/P2	0.64	25	1937	US/UK
Balassa 1963	X1/X2 = -1.76 + 1.59 P1/P2 (0.18)	0.74	28	1950	US/UK
	X1/X2 = -5.16 +1.46 P1/P2 + 1.25 W1/W2 (0.33) (0.57)	0.77	28	1950	US/UK
	X1/X2 = 6.16 - 1.59 N1/N2 (0.30)	0.50	28	1950	US/UK
Stern (1962)	X1/X2 = -0.68 + 1.27 P1/P2 (0.43)	0.19	44	1950	US/UK
	X1/X2 = 0.01 - 1.40 L1/L2 (0.59)	0.18	44	1950	US/UK
	X1/X2 = 0.01 - 1.41 N1/N2 (0.59)	0.13	44	1950	US/UK
Krenin (1969)	X1/X2 = 0.37 + 5:50 P1/P2 (1.76)	0.43	14	1947	US/Can
	X1/X2 = 1.37 - 6.68 W1/W2 (2.24)	0.38	14	1947	US/Can
Stryker (1968)	(X1/X1-X2/X2)= -0.02 + 1.98 (P1/P1 -P2/P2) (0.09)	0.15	24	1949-62	US/Can
	(X1r/X1r-X2r/X2r)= -0.02 + 1.72 (P1/P1 -P2/P2) (0.82)	0.13	24	1949-62	US/Can
	(X1t/X1t-X2t/X2t)= -0.02 + 1.93 (P1/P1 - P2/P2) (0.73)	0.21	24	1946-62	US/Can

Where X1/X2 = third market exports; X1r/X2r = reciprocal exports; X1T/X2t = total exports; P1/P2 = productivity per employee ratio; W1/W2 = wages per employee ratio; L1/L2 = unit labour cost ratio; N1/N2 = net cost ratio. Standard errors are in parentheses.

Source: Solocha A (1991) "Comparative Cost Advantage and Trade performance : A Panel Data Approach" , The International Trade Journal, Vol. 5, No 3: 403 - 416.

APPENDIX B

Industry	**Significant at the 1% level (*significant at 5% level)**	**Not significant at 5% level**
Food		✕
Beverages	✔	
Tobacco		✕
Textiles	✔	
Wearing Apparel	✔	
Leather and leather products	✔ *	
Footwear	✔	
Wood and wood products	✔	
Paper and paper products	✔	
Printing, publishing and recorded media	✔	
Coke and refined petroleum products		✕
Basic chemicals	✔	
Other chemicals and man-made fibres	✔	
Rubber products		✕
Plastic		✕
Glass and glass products	✔	
Non-metallic minerals		✕
Basic iron and steel	✔	
Basic non-ferrous metals	✔	
Metal products excl. machinery	✔	
Machinery and equipment	✔	
Electrical machinery and apparatus	✔	
Television, radio and communication equipment		✕
Professional and scientific equipment		✕
Motor vehicles, parts and accessories	✔	
Other transport equipment		✕
Furniture	✔	
Other manufacturing		✕