PRODUCT LEVEL DECOMPOSITION OF SOUTH AFRICA'S EXPORT GROWTH: A COMPARATIVE ANALYSIS

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Abstract

A significant constraint to economic growth in South Africa, as identified by the international advisory panel for the Accelerated Shared Growth Initiative (ASGISA, 2005), is its 'external constraint' – the inability to grow without running into balance of payments constraints. Key to combatting this constraint is the promotion of export growth. However, South Africa's export performance has been lagging in terms of growth and sophistication (Hausmann & Klinger, 2008). Export growth occurs along a number of margins: increased volume (intensive margin), increased sophistication (quality margin) and a change in composition (extensive margin). In order to gain insight into the evolution of South Africa's export performance, this study provides an analysis on the extent to which South Africa's export growth is driven by these margins. Using an extension of the Zahler (2011) decomposition technique, this study identifies the relative importance of the margins of export growth and whether these vary by regional, product and industry characteristics. The analysis is enhanced by the use of a highly disaggregated data (HS 6-digit). Evidence shows that the extensive margin is a key driver of export growth in South Africa. However, much of export growth into new product and new destination markets is concentrated in natural resource-based products. Regression analysis shows that there is natural-resource factor bias to export growth along both the intensive and extensive margins in South Africa.

I. INTRODUCTION

In 2005 an international advisory panel for the Accelerated Shared Growth Initiative (ASGISA) was tasked with identifying the key constraints to economic growth in South Africa. One of which was South Africa suffering from an 'external constraint' – the inability to grow without running into balance of payments constraints[1] (Hausmann, 2008)[2]. Trade performance, and in particular export performance, is a central factor influencing the external constraint. Hausmann & Klinger (2008) point to South Africa's relatively poor export performance over the past 50 years stating that exports per capita in constant dollars in 2004 are no higher than they were 40 years earlier[3]. The broad solution to this economic imperative comprises two parts: firstly, South Africa's tradable sector needs to grow relative to its non-tradable sector and secondly, the South African economy needs to diversify its export portfolio[4]. In other words, South Africa needs to increase exports to existing markets and expand into new markets.

A number of studies in the development literature explore the link between export growth[5] and the processes of economic growth and development. Hausmann & Rodrik (2003) advocate government policy incentivising the 'cost discovery' process[6], which they believe is explains why some developing countries are more successful than others in diversifying toward 'rich country' products. Hausmann, Pritchett & Rodrik (2005) find that episodes of accelerated economic growth require the raising of exports. Furthermore, Hausmann, Hwang & Rodrik (2006) argue that merely increasing the volume of existing exports is not enough because countries become what they export. The implication is that countries diversifying into more sophisticated products grow faster than countries specialising in less sophisticated products. Brenton & Newfarmer (2009) and Zahler (2011) contend the assertion that expansion into new product markets is the sole driver of export growth by highlighting the importance of diversifying into new destination markets. Cadot, Carrére & Strauss-Kahn (2011) explore the evolution of export diversification patterns along the economic development path and find a hump-shaped pattern of export diversification. Economic development is accompanied by export diversification until a country reaches a 'turning point' level of economic development, whereupon its export portfolio starts to reconcentrate along comparative advantage lines. Hummels & Klenow (2005) and Schott (2004) show that the "quality" of exported products increase with the level of GDP per capita thus suggesting that higher levels of development are associated with specialisation in products higher up the quality ladder.

This focus on export growth, diversification and value-addition has been articulated into a number of South Africa's economic policy documents. For instance, a key component of The National Industrial Policy Framework's (NIPF)[7] vision for the South African economy is: "*To facilitate diversification beyond our current reliance upon traditional commodities and*

[1] Higher domestic growth requires greater imports, which need to be financed by exports otherwise the economy will run into an external constraint – a lack of foreign exchange required to finance the import of intermediates.

[2] Similar discussion concerning the 'external constraint' is made in studies by Bell, Farrell & Cassim (2002:182-185) and Edwards & Lawrence (2008:586, 595).

[3] See also Edwards & Alves (2006) and Edwards & Lawrence (2008) for similar explanations of South Africa's recent export performance.

[4] This is not a recent idea because it is present in the Reynders Commission of Inquiry in 1972, which emphasises the need for South Africa's export trade to diversify into non-gold exports.

[5] Not merely export growth in terms of volume exported, but also in terms of a more diversified and/or sophisticated export portfolio.

[6] In summary, their formal framework describes how entrepreneurs, facing cost uncertainties in the production of new goods (i.e. diversification of country's export portfolio), are not able to appropriate sufficient rents to warrant the costs associated with the 'cost discovery' process. Therefore, there is under-provision of investment in new activities and a suboptimal level of innovation.

[7] The NIPF sets out the South African government's broad approach to industrialisation.

non-tradable services. This requires the promotion of increased value-addition per capita characterised particularly by movement into non-traditional tradable goods and services that compete in export markets as well as against imports." (Department of Trade and Industry [DTI], 2007). The New Growth Path (NGP) emphasises not only on the need to promote growth in terms of the volume and the range of products exported by South Africa, but also to "*widen the market for South African goods and services through a stronger focus on exports to the region and other rapidly growing economies*" (Economic Development Department [EDD], 2010). This suggests that focus must be placed on expanding the geographic composition of South Africa's export portfolio. The National Development Plan (NDP) is consistent with the NGP in that it seeks to promote exports and competitiveness. The NDPs vision is that "*the share of exports in South African output will rise and the profile will be more diverse with a growing portion of non-mineral manufactures and services. A greater proportion of exports will be directed to emerging markets…*" (National Planning Commission [NPC], 2011). The South African Trade Policy and Strategic Framework (SATPSF) "*outlines how trade policy and strategy in South Africa can make a contribution to meeting the objectives of upgrading and diversifying the economic base in order to produce and export increasingly sophisticated, value added products that generate employment*." (DTI, 2010). Therefore, South African economic policy emphasises the need to raise exports, not only in terms of volume but also in terms of increased sophistication of these exports as well as expansion into new product and geographic markets.

Therefore, in light of the economic imperative of dealing with South Africa's external constraint, South Africa's poor export performance, and the related policy focus, there is need to generate a deeper understanding of the dimensions, composition and dynamics of South Africa's export flows. In particular, a deeper understanding of the evolution of exports in terms of the 'what' – what products markets are being exploited – and the 'where' – which destination markets are being exploited. In order to generate a deeper understanding of the 'what' and 'where' of South Africa's exports, this paper employs decomposition analysis, which decomposes export growth into intensive and extensive margins.

Typically, the margins of trade growth are decomposed into the intensive and extensive margins of growth. At the most basic level, the intensive and extensive margins refer to growth in existing and new trade relationships, respectively (Besedeš & Prusa, 2011:374-375; Zahler, 2011). Despite the generic use of the terms intensive and extensive margin in the literature, what these margins actually measure differ according to the unit of analysis applied (Besedeš & Prusa, 2011). This paper employs a product-variety style decomposition along the lines of Zahler (2011), which defines the unit of analysis as a product-destination variety[8]. Thus the extensive margin refers to growth in existing and new products to new destination markets and the expansion of new products to old destination markets (Besedeš & Prusa, 2011:374-375; Brenton & Newfarmer, 2009:112; Zahler, 2011). This paper benefits from the use of the Zahler (2011) decomposition because of the detailed measure of the extensive margin, which enables clearer insight into the dimensions and composition of South Africa's export flows.

Therefore, this paper evaluates the evolution of South Africa's exports at the product level along the intensive and extensive margins for the period 1995 to 2011. Specific objectives of this paper are to:

- measure the extent to which South Africa's exports are driven by the intensive and extensive margins

[8] A product-destination variety defines a variety as product A exported to destination Z being a different variety to product A exported to destination Y.

- measure the extent to which entry into new product markets – the 'what' – and entry into new destination markets – the 'where' – are driving the extensive margin
- analyse whether these margins vary by product characteristics and sector factor intensity.

A key contribution of this paper is that it is one of the first studies in South Africa to apply decomposition analysis to South African export flows at the product level. This paper benefits from the use of highly disaggregated 6-digit (Harmonised System) product level trade data from UN COMTRADE. Typically, studies examining South African trade flows employ aggregated trade data[9] and thus focus on aggregate trade flows. Decomposition analysis of trade data at higher levels of aggregation omit a significant amount of variation of trade flows at the extensive margin because most of this variation will be captured in the intensive margin. Applying decomposition analysis to this product level data best reveals the heterogeneity[10] present in trade flows and thus gives the clearest picture of the dimensions, composition and dynamics of South Africa's export growth.

This study finds that South African export patterns are largely shaped by growth in resource-based products. Both the intensive and extensive margins drive export growth with the latter accounting for a larger share of this growth. Export growth along the extensive margin suggests that both the entry into new product markets and the entry into new destination markets are driving export growth, with the latter constituting a larger share of extensive margin growth. The importance of natural resource-based products is epitomised in extensive margin growth where the majority of export growth along this margin is in resource-based products. In particular, the discovery of platinum is a key driver of product extensive margin growth. As such the natural resource-intensity embodied in the production of products is key determinant of the patterns of export growth in South Africa. However, the relative size and growth of medium-technology product exports suggests that the South African economy is not solely dependent upon natural resource based products and that the potential to diversify exists.

Section 2 starts by reviewing development literature linking export growth and diversification to economic growth and development. This is followed by a review of the trade decomposition literature and studies exploring South African export growth. Section 3 details the data employed in the analysis and the Zahler (2011) decomposition methodology. Section 4 presents the results of the analysis of product level export flows in South Africa. Section 5 provides concluding remarks.

[9] Edwards & Lawrence, 2008; Edwards & Alves, 2006; Flatters & Stern, 2008; Hausmann & Klinger, 2008; Naude, 2001; Petersson, 2005

[10] It is well documented in the literature that international trade flows are characterised by heterogeneity.

II. LITERATURE REVIEW

ECONOMIC DEVELOPMENT, ECONOMIC GROWTH AND THE COMPOSITION OF EXPORTS: THE 'WHAT', 'HOW' AND 'WHERE' OF EXPORTING

Recent policy documents designed to address economic growth and development in South Africa emphasise the need to promote export growth, diversify the export portfolio and move higher up the value-chain (DTI, 2007; DTI, 2010; EDD, 2010; NPC, 2011). Implicit behind the policy rationale are the following views: that the promotion of trade, specifically exports, is growth augmenting and that the public sector, to a greater or lesser extent, has an active role in the promotion and composition of export growth.

The former view is supported by two subdivisions in the literature. Firstly, by literature focusing on the impact of trade openness and the magnitude of trade flows on income levels and the rate of economic growth (i.e. trade leads to economic growth)[11]. In a review of this literature, Winters (2004) states that despite the presence of methodological issues and disagreements concerning the strength of the evidence, the most plausible conclusion is that trade is growth enhancing. In a liberalising world, export success is increasingly important to economic performance in terms of being a means to earning foreign exchange, realising economies of scale and specialisation, and accessing new technology (Lall, 2010).

Secondly, by literature examining the relationship between the composition of trade flows and income levels (i.e. diversification and the composition of exports matter). Reviewing this subdivision of the literature, Hesse (2009) finds that the dominant empirical result on the link between export diversification and per capita income suggests a positive relationship[12]. An extension of these studies, the most notable being the seminal piece by Imbs & Wacziarg (2003)[13], analyse the process of diversification across income levels. These studies identify a robust non-linear pattern whereby diversification increases with the level of development up to a point, after which an economy starts to reconcentrate[14]. Cadot, Carrère & Strauss-Kahn (2012), extend the analysis by examining how the intensive and extensive margins of trade growth evolve with economic development. They find that the pattern of diversification and subsequent reconcentration takes place mostly along the extensive margin.

The latter view has seen much analysis and debate within the industrial policy and development literature (Pack & Saggi, 2006; Harrison & Rodrigues-Clare, 2012). In particular, the notion that the public sector can play an interventionist role in altering the structure of production in favour of sectors or industries that offer better prospects for economic growth, in a manner that would not occur in the absence of such intervention in the market equilibrium (Pack & Saggi, 2006).

Two earlier studies that provided rationalisation for such interventionist policy were those by Prebisch (1950) and Singer (1950). The authors argue that developing countries are constrained in their ability to grow, and lag behind industrial countries because of the former specialising in primary commodities whereas the latter specialising in manufactured products. Specialisation in primary commodities is argued to be disadvantageous due to the slow rate of

[11] A number of studies find that trade and hence exports is growth enhancing – see Frankel & Romer (1999); Wacziarg (2001); Wacziarg & Welch (2008). However, this notion is contested by Rodriques & Rodrik (2001). They accept that on balance the effects of trade liberalisation are beneficial but they dispute the notion that integration into the world economy is such a potent force for economic growth that that it can take the place of development strategy.

[12] See: Al-Marhubi (2000); Herzer & Nowak-Lehmann (2006); Agosin (2007); Lederman & Maloney (2007)

[13] Imbs & Wacziarg (2003) use domestic production and labour data to investigate this relationship. The subsequent studies test whether this patterns would hold for exports as well.

[14] Hesse (2009); Klinger & Lederman (2009); Cadot, Carrère & Strauss-Kahn (2012)

technical progress in this sector and the adverse trend in commodity terms of trade[15]. Therefore, the authors prescribe public sector policy intervention focused on facilitating industrialisation. The industrialisation process means reorienting the productive capacity of a country toward selected industries and therefore changing the composition of a country's export portfolio.

A more recent study by Hausmann & Rodrik (2003) advocates active industrial policy whereby the government incentivises the 'cost discovery' process. The authors investigate why some developing countries succeed in diversifying toward "rich" country products and subsequently experience economic growth and develop, while others struggle. In particular, they compare the experiences of Latin American countries in the 1990s with those of South East Asian countries – South Korea and Taiwan in the 1960s, China in the 1970s, and India in the 1980s. In summary, their formal framework describes how entrepreneurs, facing cost uncertainties in the production of new goods (i.e. diversification of country's export portfolio), are not able to appropriate sufficient rents to warrant the costs associated with the 'cost discovery' process. Therefore, there is under-provision of investment in new activities and a suboptimal level of innovation. Consequently, the authors suggest that government has an important role in industrial growth and structural transformation by promoting investment and creating the right incentives for firms to invest in a new range of activities[16] – i.e. facilitate diversification.

Given the arguments in favour of the government's role in facilitating the production and export of a greater volume and diversity of products, does it matter what type of products these are? A study by Hausmann, Hwang & Rodrik (2007) suggests that the mix of products that a country produces have important implications for economic growth – in a phrase – 'what a country exports matters'. The authors state that countries exporting products associated with higher productivity levels (i.e. 'rich country goods') will grow more rapidly than countries with exports associated with lower productivity levels (i.e. 'poor country goods') – i.e. you become what you produce. In line with Hausmann & Rodrik (2003), they assert that the 'cost discovery' process results in entrepreneurs discovering 'new'[17] products and the higher the productivity associated with these products the more favourable the effect on economic growth. This suggests that countries can diversify away from 'poor country goods' and toward 'rich country goods'.

A related literature emphasising the importance of what a country exports is that relating to the natural resource curse. Essentially, this literature explores whether countries that are dependent on the export of a few natural resources are condemned to slow economic growth because of their trade structure. This idea appears in Prebisch (1950), where observing slow regional growth in Latin America, argues that natural resource industries offer less potential for technical progress as well as being characterised by declining terms of trade. This destines these countries to slow economic growth. The empirical analyses by Sachs & Warner (1995, 2001) indicate a negative relationship between growth and the pervasiveness of natural resource exports. They contend that since the 1960s resource-rich developing countries have grown more slowly than other developing countries. However, Lederman &

[15] However, Cuddington, Ludema & Jayasuriya (2007) find they cannot reject that relative commodity prices follow a random walk across the 20th century.

[16] Adopting their framework, Hausmann & Rodrik (2003) suggest that the provision of rents by East Asian governments (e.g. through trade protection, tax incentives etc.) may have stimulated the cost discovery process and assisted industrial growth and diversification. Conversely, the rents received by firms in comparatively poorly performing Latin American countries were not accompanied by policies that rationalise industries and discipline firms that end up with high costs.

[17] New products are defined as products that have already been innovated and produced by firms in a certain country, which are being imitated by firms in other countries. These new products are also termed 'within frontier' innovations (Brenton, Newfarmer, Shaw & Wakenhorst, 2009).

Maloney (2007; 2009; 2012) assess the credibility of the resource curse hypothesis. They find little evidence for the curse, and when the curse is confirmed they find questionable statistical methods. Instead the authors express that it is important to distinguish between the effects of exporting natural resources and a concentrated export basket – suggesting that the resource curse is rather a curse of concentration.

Given the assertion that a concentrated export basket has adverse implications for export growth and economic growth, the complimentary assertion is that a more diverse export basket has favourable economic implications[18]. However, Hausmann & Klinger (2008) suggest that a country's ability to transform the structure of its economy and diversify its export portfolio is governed by its current production structure or 'product space'. Adopting the 'product space' methodology developed in Hidalgo, Klinger, Barabási & Hausmann (2007), the authors seek to explain why a developing country,[19] relative to its economic peers, has lagged in its ability to diversify toward more sophisticated products. The analysis suggests that a country's ability to jump from one product tree (diversify) to the next depends upon the proximity of the trees (products) to one another (the substitutability of the inputs used in the production of those products). According to the authors, a country's export performance can be partially explained by its current production structure. Countries with production structures focused on trees in the denser part of the forest are more able to jump to other trees and hence diversify their production structure. Conversely, countries with a peripheral production structure – production structure focused on trees in the sparse part of the forest – are limited in their potential to jump to new trees. Therefore, the diversification process is not merely explained by the dynamics of changing comparative advantage as country accumulates factors of production, but also by the potentiality that the current production structure offers.

More recently the debate has shifted focus away from the question – does what you export matter – toward the question – does how you export matter. Discussion in the literature on the class of product produced and exported and its impact on economic growth, emphasises the need for countries to pursue product- or industry-centred industrial polices. Hausmann, Hwang & Rodrik (2007) would suggest directing resources toward high productivity products. Sachs & Warner (2001) would advise moving away from resource based exports toward manufactures. Lederman & Maloney (2007, 2009; 2012) advise diversification away from concentrated export baskets Hausmann & Klinger (2008) recommend focusing production on products in the 'denser' part of the product 'forest'. However, recent insights in the literature question the assumption of the product as a homogeneous unit of analysis, produced uniformly across countries. Rather, evidence of within product heterogeneity and heterogeneity in the production of products suggest that how products are produced is as important as what products are produced from an industrial policy perspective (Lederman & Maloney, 2012).

Recent literature exploring within product heterogeneity, and as such the quality dimension of exports, has offered potential insights into broader development issues. Products in highly disaggregated trade data show a high level of differentiation. The primary source of this differentiation is evident in the quality dimension. One measure used to reveal quality differences are unit values[20] within these highly disaggregated product categories. Schott (2004) and Hummels & Klenow (2005) show that average unit values increase with the level

[18] As mentioned above, diversification of a country's export portfolio is positively correlated with GDP per capita. However, the question concerning what products to diversify toward is unclear and as such the debate in the literature is on-going (Lederman & Maloney, 2012).
[19] Hausmann & Klinger (2008) use South Africa as a case study (more on this below).
[20] The unit value is measured as the value of the exported product divided by the quantity of the product exported.

of GDP per capita. Therefore, the implication is that export quality and its dynamics offer potential insights into the growth process and its drivers and hence may inform development policies (Lederman & Maloney, 2012).

A key question in the literature is how much of the quality of a country's export basket is due to what it produces and how much is due to how it produces it. Exploring export quality dynamics, Krishna & Maloney (2011) show that rich OECD countries exhibit the highest rate of quality growth across regions. Since OECD exports are characterised by higher unit values, this suggests that average quality across regions is diverging over time. This divergence occurs in spite of evidence for convergence within products. The unit values of exported products from countries further from the quality frontier grow faster than those closer to the frontier. The authors assert that this divergence between OECD and non-OECD countries can be partly explained by product mix – OECD countries export products that are inherently products with higher growth rates[21] - hence the type of product exported matters. However, after controlling for product characteristics, divergence in average quality remains, suggesting that country characteristics remain important, and therefore suggesting that how each good is produced matters too.

In addition, evidence of heterogeneity in the production of goods may suggest that the type of product being produced by countries (the 'what') is not the best way of thinking about how exports drive the level of income of a country (Lederman & Maloney, 2012). The authors pose a question on whether the technology and learning externalities associated with high-tech products produced by advanced countries are guaranteed to materialise for developing countries producing the same products. The authors show that two developing countries, Mexico and Brazil, producing products in high tech industries, computers and aircraft, respectively, do not experience the knowledge spillover associated with the successful production in such industries. This aligns with Baldwin (1969) who cautions that expanding production in a sector associated with potential externalities does not necessarily imply that they will automatically occur. The same product can be produced in different ways and thus not bear the same externalities[22]. Furthermore, merely producing high productivity products as per Hausmann, Hwang & Rodrik (2007) does not imply that the same favourable externalities will materialise in a developing country imitating the production of these products. Lederman & Maloney (2012) discuss how the production of many products is fragmented globally. Therefore, what may appear as a developing country producing a high productivity product in the trade data may in reality be the assembly of the final product and represent a fraction of the total value add – termed commodification of the production of manufactures. Therefore, Lederman & Maloney (2012) conclude that from a development and policy perspective the notion of how a product is produced is as important as what product is produced.

In addition to the attention placed on what products are exported and how those products are produced, recent studies have emphasised the importance of 'where' a country exports those products to. Brenton & Newfarmer (2009) challenge the persistent and sole focus on export discovery – 'what' a country exports – in policy prescription for export growth. The authors assert that the export process for a product is complex and can be comprised of four phases comparable to a product life-cycle. They describe the discovery phase as one where firms seek out profitable activities abroad and introduce a new product into a foreign market. The following phase is the rapid growth phase in which successful firms reinvest and expand into existing and new destination markets. The maturation phase is characterised by successful

[21] This aligns with Hausmann, Hwang & Rodrik (2007) who assert that the type of product a country exports matters.
[22] Just because an innovative company such as Nokia emerged from the forestry industry in Sweden does not imply that the same sort of company will emerge from the forestry industry in Brazil or Chile (Lederman & Maloney, 2012).

firms improving quality and productivity in order to maintain market share in the face of increased competition. The final phase, the declining phase, is where successful firms exploit existing products for rent that are invested in new activities.

In light of these phases of the export process, Brenton & Newfarmer (2009) examine the margins of export growth by decomposition analysis for a sample of 99 developing countries for the period 1995 to 2004. They find that most of the export growth for developing countries has been driven by the intensifying of growth in existing products to existing markets (intensive margin). The remaining share of export growth, the extensive margin, is driven predominantly by diversification into new destination markets during the acceleration and maturation phases while the introduction of new products in the discovery phase is marginal[23]. Therefore the authors challenge the notion that policies to promote exports should focus solely on export discovery phase – 'what' a country is exporting – as per Hausmann & Rodrik (2003). A broader policy that also targets the acceleration and maturation phases by promoting the intensification of export growth into existing export markets and the expansion of existing products into new destinations. The later component is key to the notion that where a country exports matters too.

This section refers to a broad literature examining the relationship between the growth and composition of exports and economic development. The literature suggests that what a country exports (Hausmann, Hwang & Rodrik, 2007), how a country exports (Lederman & Maloney, 2012), and where a country exports (Brenton & Newfarmer, 2009), are key to understanding the dynamics of export growth and its relationship to economic growth and development. It is evident from the literature that this relationship is complex as there is variation across countries. The next section examines a literature that measures the 'what' and the 'where' of export dynamics[24].

EXPORT DECOMPOSITION LITERATURE: EXPORT PATTERNS ACROSS TIME AND SPACE

A related literature, one in which this paper fits, explores the evolution of a country's exports across space and time. Zahler (2011) terms this the export decomposition literature. In particular, there is a focus on the measurement and understanding of the channels through which a country's exports grow. Key to this literature is the decomposition of a country's export growth into growth margins, namely, the intensive, extensive and quality margins.

A key issue in this literature is concerned with which margin is the most important channel through which exports grow. The importance of this issue is explained by Bingzhan (2011) who states that the channel through which a country's exports grow has implications on the country's growth trajectory. For instance, if export growth is driven mainly by quantity growth (intensive margin) then, in the absence of productivity improvements, this suggests that the country is using large amounts of capital, labour and natural resources, which is not sustainable in the long-run. However, if growth is through price – and hence quality – then this suggest that the country is adopting technological innovation and increased human capital which suggests a more sustainable economic growth trajectory. In addition, Zahler (2011) suggests that the type of innovations required for firms to increase quality are distinct to those required to produce new goods, or to enter a new geographic market, or to increase the quantity of goods exported. Therefore, deeper understanding of channels through which exports grow may provide important insights to countries' trade and industrial policies.

[23] Analyses by Zahler (2011) and Evenett & Venables (2002) provide comparable findings.
[24] The 'how' is a more complex analysis that falls out of the scope of this paper.

Brenton & Newfarmer (2009) link this literature's investigation into the relative importance of each margin in driving export growth with the economic development literature, by questioning the primacy of the discovery stage of exporting (the product extensive margin). They challenge the argument made by Hausmann, Hwang & Rodrik (2007) that 'what you export matters'. They assert that the export cycle for a product is more complex than purely the 'discovery' and imitation of existing products innovated by pioneer countries. Rather, export growth occurs along different margins at different points in the export cycle of a product.

According to Brenton & Newfarmer (2009), there are four phases to the export cycle of a product. Discovery – where firms seek profitable activities abroad and launch a new product into a foreign market. Intensified growth – where successful firms reinvest and expand into existing and new geographic markets. Maturation – where in the face of widespread competition, successful firms seek to maintain market share by improving quality and productivity. Declining phase – where successful firms exploit existing products for rent that are invested in new activities. This poses a number of key questions such as: do successful exporters perform well because at the mature stage of a products lifecycle, they invest by raising quality or introducing differentiation that allows them to exploit the extensive margin? At what stage of the export cycle do firms choose to seek new geographic markets – at a point when existing growth is slowing or during the acceleration phase? From a policy perspective, Brenton & Newfarmer (2009) stress that focusing solely on the discovery phase is narrow and limited as there are other avenues for export growth that call for a more detailed policy prescription. The export decomposition methodology allows for the measurement and subsequent analysis of these varied channels of export growth.

Hence, a key question in the export decomposition literature enquires which margin is the most important in driving export growth[25]. Table 1 contains a summary of trade decomposition studies detailing the importance of each margin to export growth[26]. There are two broad groups of decomposition studies in the literature: those that use country-product level data[27][28] and those that use firm-product level data[29]. The former typically provides annual trade values of products exported from an origin country to a destination country while the latter provides annual trade values of products exported from uniquely identified firms in an origin country to a destination country. As is evident in Table 1, studies from the former group typically find that across different samples of countries, the intensive margin accounts for a greater share of export growth – generally in excess of 70% – than the extensive margin – generally less than 30%[30]. However, analyses by Amurgo-Pacheco & Pierola (2008), Brenton & Newfarmer (2009) and Zahler (2011) who employ similar decomposition techniques, find that the importance of the intensive margin relative to the extensive margin declines as one moves from developed to developing countries.

[25] Evenett & Venables (2002); Zahler (2011); Besedeš & Prusa (2011); Bingzhan (2011)
[26] See appendix Table A1 for details on data and sample analysed in each study. Table A1 also details each author's conception of each growth margin hence detailing how this varies across studies.
[27] I term these product level studies.
[28] Most studies analyse export patterns and dynamics at the country-product level. This is a result of the greater availability of country-product level trade data as opposed to firm level trade data. This is especially the case for studies examining export patterns across multiple countries.
[29] I term these firm level studies.
[30] Amurgo-Pacheco & Pierola (2008); Brenton & Newfarmer (2009); Amiti & Freund (2010); Besedeš & Prusa (2011); Bingzhan (2011); Zahler (2011)

Table 1: Trade decomposition studies – relative importance of intensive and extensive margins

STUDIES[1]	UNIT[5]	INTENSIVE MARGIN	EXTENSIVE MARGIN	
			PRODUCT	DESTINATION
PRODUCT LEVEL				
Hummels & Klenow (2005)[2]	p	Within product categories, richer countries export higher quantities at modestly higher prices.	EM accounts for 60% of the greater exports of larger countries.	
Evenett & Venables (2002)[3]	p-c	Long standing trade relationships = 60%	New products = 10%	Continuing products to new destinations = 30%
Amurgo-Pacheco & Pierola (2008)	p-c	Full sample: 85.1%	Full sample: 3.5%	Full sample: 11.4%
		Developed: 96.0%	Developed: 0.2%	Developed: 3.8%
		Latin America: 76.3%	Latin America: 6.9%	Latin America: 16.8%
		Asia: 83.0%	Asia: 3.9%	Asia: 13.1%
		South Africa: 48.3%	South Africa: 2.3%	South Africa: 49.4%
Brenton & Newfarmer (2009)	p-c	Developing: 80.4%	Developing: 1.0%	Developing: 18.6%
		Africa: 43.3%	Africa: 10.6%	Africa: 46.1%
Amiti & Freund (2010)	p	China: 74%	China: 26%	
Bingzhan (2011)[4]	p	Quantity = 76.97% / Price = 6.18%	Total extensive margin: 16.85%	
Zahler (2011)	p-c	Full sample: 72.4%	Full sample: 3.0%	Full sample: 24.6%
		Developed: 82.9%	Developed: 0.3%	Developed: 16.7%
		Developing: 55.3%	Developing: 7.4%	Developing: 37.4%
		South Africa: 39.8%	South Africa: 7.0%	South Africa: 53.2%
FIRM LEVEL				
EEKT (2007)[7]	f	1yr avg.: 90%	1yr avg.: 10%	
		96-05: 74%	96-05: 26%	
BJRS (2009)[8]	f-p-c	1yr avg.: 105%	1yr avg. Net entry and exit: -40%	
			1yr avg. Net drop and add: 35%	
		93-03: 35%	93-03 Net entry and exit: 24%	
			93-03 Net drop and add: 42%	

Note: 1. The table provides a sample of the most cited studies in the trade decomposition literature and should not be considered as an exhaustive list of studies. 2. Hummels & Klenow (2005) adopt a cross-sectional analysis where they decompose the world market ratio of a country's exports into three margins: extensive margin, quantity and price. 3. Evenett & Venables (2002) do not mention the terms intensive margin and extensive margin. However, one can interpret their methodology and results to get an idea of the values of these two margins. 4. Bingzhan (2011) employs a similar methodology to Hummels & Klenow (2005) but instead to decomposing trade shares across countries, he decomposes growth rates. 5. The units of analysis are defined as: p – product; c – country; p-c – product-country; f – firm; f-p-c – firm-product-country. 6. Hummels & Klenow (2005) define the extensive margin differently to the other studies. They define the extensive margin as more products (weighted) compared to growth in export value due to the export of new products, new destinations or new product-destination combinations. 7. EEKT = Eaton, Eslava, Kugler & Tybout. 8. BJRS = Bernard, Jensen, Redding & Schott.

It is important to take note of a key paper in the literature by Hummels & Klenow (2005) who employ a cross-sectional decomposition across a sample of developed and developing countries. They find that the extensive margin accounts for 60% of the greater exports by larger countries thus highlighting the importance of this margin. This finding does not contradict the evidence in the literature above. Rather it highlights two different manners of examining export patterns in relation to the intensive and extensive margins. Through the lenses of the intensive and extensive margins, Hummels & Klenow (2005) assess why larger countries export more in absolute terms than smaller countries. They adopt a cross-sectional analysis where they decompose a country's export trade share relative to total world exports. Hummels & Klenow (2005) ask, at a point in time, what share of a larger country's greater exports is explained by the number of (extensive margin), by the quantity of (intensive margin), and by the price (intensive margin) of unique products exported. Most of the other decomposition analyses decompose export growth between two time periods – see Appendix Table 1. These studies ask what share of export growth between the base period and the final period is accounted for existing trade relationships and new trade relationships.

The extensive margin still accounts for a significant share of export growth, especially in developing countries, and thus a number of studies examine the extensive margin in greater detail[31]. They are interested in whether growth into new markets is driven by expansion into new product markets – product extensive margin – or new destination markets – destination extensive margin. In particular, Zahler (2011) finds that 44.7% of developing country growth is along the extensive margin of which, 37.4% and 7.4% is along the destination and product extensive margins, respectively. This pattern of the growth into new destination markets being more important than the growth into new product markets applies generally across studies – see Table 1. This finding and relative importance of the intensive margin is utilised by Brenton & Newfarmer (2009) to question the primacy of the discovery stage of exporting – as per Hausmann & Rodrik (2003) and Hausmann, Hwang & Rodrik (2007).

Product level studies provide insight into which margin is driving export growth at a country level but in reality it is firms that trade not countries. With the increased availability of firm level trade data and the related development of heterogeneous firm models, there has been further investigation into the margins of trade at the firm level. In particular, the extensive margin of trade has received increased focus as a result of empirical analysis indicating that the extensive margin is driving trade variation and patterns at the firm level and in turn at the aggregate level[32]. Initially, the decomposition of trade growth at the firm level was informed by heterogeneous firm models that assumed single product firms (i.e. the Melitz (2003) model). Therefore, in these earlier decompositions the extensive margin was defined as the entry and exit of firms[33]. Subsequent empirical research using firm level data has revealed that firstly, trade is concentrated within a minority of firms accounting for the majority of trade[34]. Secondly, that multiproduct firms exporting to a variety of destinations (as opposed to single product firms exporting to one destination) account for a disproportionately small share of exporting firms yet account for a disproportionately large share of aggregate export

[31] Evenett & Venables (2002); Amurgo-Pacheco & Pierola (2008); Brenton & Newfarmer (2009); Zahler (2011)

[32] See Bernard, Jensen, Redding & Schott, 2007 (henceforth BJRS, 2007), Eaton, Eslava, Kugler & Tybout, 2007 (henceforth EEKT, 2007), Bernard, Jensen, Redding & Schott, 2009 (henceforth BJRS, 2009), Bernard, Redding & Schott, 2010 (henceforth BRS, 2010), and Bernard, Redding & Schott, 2011 (henceforth BRS, 2011). Furthermore, a number of these studies suggest that the gravity relationship between trade flows and distance is driven predominantly by the extensive margin.

[33] In the single-product firm case, firm and product-market entry and exit are equivalent (BRS, 2010).

[34] BJRS (2007) and BJS (2010) show that the top 1 percent of trading firms by value accounted for over 80 percent of the value of total trade, while the top 10 percent accounted for over 95 percent of the value of total trade.

value (BJRS, 2007)[35]. Thirdly, analysis of product switching among trading firms shows that multiproduct firms are most likely to change their product mix and that these firms account for a relatively large share of aggregate trade value (BRS, 2010). These empirical findings provided clues suggesting that the extensive margin of trade plays an important role in understanding trade patterns and trade flows. Therefore, subsequent studies expanded the definition of the extensive margin to include the number of goods exported by firms and the number of countries these goods are exported to[36].

Firm level trade data allows for the measurement of more variation along the extensive margin than in product level studies. Firm level trade data exhibits variation in the origin of an export (the firm), the products exported by each firm and the destination of each product from each firm. Whereas product level data exhibits variation in the range of products exported and the range of destinations those products are exported to. Consequently, in firm level studies the extensive margin of trade can account for an even larger share of the variation in exports and imports across countries (BJRS, 2009). However, this is not clear in the analysis by Eaton, Eslava, Kugler & Tybout (2007)[37] who analyse Columbian export growth between 1996 and 2005 using firm level data. They estimate year-to-year decompositions by dividing growth into entering, exiting and continuing firms, with 74 and 26 percent of growth being represented by continuing and net new firms, respectively (see Table 1). This result is comparable with decompositions in product level studies. However, BJRS (2009) adopt a broader definition of the extensive margin. They define the extensive margin as the net entry of firms (firms entering trade less firms exiting trade) plus the net value of product-country switching[38]. They define the intensive margin as the net change in the value of existing firm-product-country combinations. The decomposition estimates by BJRS (2009) for US exports over the period 1993 to 2003 indicate that the intensive margin and the extensive margin through the net entry of firms and the net adding of products, accounts for 35, 24 and 42 percent of export growth, respectively. Therefore, the empirical literature analysing the margins of trade using firm level data[39] find the extensive margin to be key in driving trade patterns.

The firm level decomposition results also show that over short-periods of time the intensive margin accounts for the majority of export growth while over longer timer periods the extensive margin becomes more important. This is particularly evident in BJRS (2009) where the decomposition of year-to-year export growth shows that, on average, the intensive and extensive margin accounts for 105 and -5 percent, respectively. However, over the period 1993 to 2003 the intensive and extensive margins account for 34 and 66 percent of export growth in the United States, respectively. One reason for such small contributions of the extensive margin over short time periods is that entering and exiting exporters, as well as

[35] BJRS (2007) shows that 64 percent of trading US manufacturing firms export to a single destination and account for 3.3 percent of aggregate export value, while 13.7 percent of trading US manufacturing firms export to five or more destinations and account for 92.9 percent of export value.

[36] BRS (2011) refer to the extensive margin as including, within-firm product extensive margin (increase in the share of products exported to a given country by existing exporters), within-firm country extensive margin (increase in the number of countries to which a given product is supplied by existing exporters), and the across firm extensive margin (increases in the share of firms that export).

[37] Henceforth, EEKT (2007).

[38] Product-country switching refers new product-country relationships less retired product-country relationships. When a firm exports a product to a destination for the first time, then that is a new product-country combination and similarly, when a firm stops exporting a product to a destination then that is a retired product-country combination. Product-country combinations can be comprised of existing products to new destinations, new products to existing destinations and new products to new destinations. For the purposes of brevity, BJRS (2009) group these possible combinations simply as a new product-destination combination rather than identifying each of them separately.

[39] BJRS (2009) suggest that a substantial fraction of the extensive margin growth is lost within the aggregated data used in product-country studies. This suggests that the importance of the extensive margin is understated in these studies.

recently-added and dropped product-destination combinations, are relatively small compared to continuing exporters and product-destination combinations. However, BJRS (2009) suggest that once entering exporters or recently added product-destination combinations survive an initial period they grow more rapidly than incumbent exporters and product-destination combinations. This aligns with the intensification stage of Brenton & Newfarmer's (2009) export cycle of the product, thus suggesting that facilitating the survival and deepening[40] of export relationships has policy merit.

A key theme in the literature is whether export growth and diversification patterns differ along country and income groupings[41]. For instance, Hummels & Klenow (2005), examined how large countries export more than smaller countries. Do they export larger quantities of each good (intensive margin), a wider set of goods (extensive margin), or higher-quality goods? The authors find that larger countries export more through greater variety – the extensive margin accounts for approximately 60% of the greater exports of larger economies. Furthermore, they find that within product categories richer countries export higher quantities at higher prices, which is consistent with higher quality. Countries with more workers export higher quantities of each good, but not at higher prices. As mentioned above, the relative importance of the extensive margin increases as one moves from developed or high income countries to developing or low to middle income countries (Zahler, 2011; Brenton & Newfarmer, 2009) [42].

Relatedly, and more importantly from a policy perspective, a number of studies examine whether the export patterns of successful exporters differ from those of poor performers[43]. Zahler (2011) shows that the same decomposition patterns emerge across countries and regions but that the successful exporters differ from the unsuccessful exporters in that the former export to more destinations. As with Zahler (2011), Brenton & Newfarmer (2009) emphasise the importance of the geographic component of the extensive margin by arguing that the relative contribution of the product component of the extensive margin is minimal. This contradicts the importance placed on the discovery of new products to export growth as suggested by Hausmann & Rodrik (2003). Furthermore, Brenton & Newfarmer (2009) show that unsuccessful exporters are primarily countries that experience greater rates of product deaths. This is supported by Besedeš & Prusa (2011) who argue that the intensive margin, in particular, the survival and deepening of export relationships, is vital for export growth.

A further factor that influences balance between extensive and intensive margins is the manner in which countries' export structures change in response to structural changes in the economy. Kehoe & Ruhl (2009) find that there are significant changes along the extensive margin over periods marked by significant and permanent structural change, such as that resulting from trade liberalisation. The authors find that in countries that experience no structural change there is very little variation in trade along the extensive margin. Similarly, Debaere & Mostashari (2010) show that trade liberalisation through a drop in tariffs is partly responsible for the increased range of products (extensive margin) exported to the United States over the period 1989 to 1999 and 1996 to 2006. Such a finding is interesting from a

[40] It is important to note that any new export relationships that occur within the decomposition period and subsequently survive and experience intensified growth (deepening) will be captured as extensive margin growth. This occurs even though in periods subsequent to its introduction, the export relationship is experiencing intensive margin growth. Only analyses such as that by Besedeš & Prusa (2011), which adopt a dynamic decomposition analysis, pick up the survival and deepening of new export relationships.

[41] Amurgo-Pacheco & Pierola (2008); Brenton & Newfarmer (2009); Zahler (2011)

[42] It must be noted that one possible explanation for this, particularly in product level studies, is that developed or high income countries have already established a large percentage of their possible export relationships and thus have little scope for gain along the extensive margin.

[43] Brenton & Newfarmer (2009); Besedeš & Prusa (2011); Zahler (2011)

South African perspective because the post-apartheid period, the period of analysis in this paper, was a period of substantial trade liberalisation in South Africa (Edwards, 2005). Therefore, if the findings in Debaere & Mostashari (2010) apply to South Africa, this period of liberalisation should have been accompanied by growth in exports along the extensive margin.

Reconciling the differing results in the trade decomposition literature must be done with some caution as these studies employ different units of analysis and thus apply different definitions of each margin of growth[44]. Table 2 provides a summary of key studies in the literature and provides examples on how the growth margins in two trade transactions will be measured differently in these studies. For instance, studies with limited definitions of the extensive margin, such as Amiti & Freund (2010), Bingzhan (2011) and Helpman, Melitz & Rubenstein (2008)[45] measure transaction 1 as intensive margin growth whereas studies with broader definitions of the extensive margin measure the transaction as extensive margin growth. It is also important to note that firm level studies may also apply narrow definitions of the extensive margin (EEKT, 2007) and are thus not guaranteed to capture the full extent of extensive margin growth. This is observed in transaction 1, where EEKT (2007) measure it as intensive margin growth while a number of product level studies measure it as extensive margin growth. The unit of analysis used by HMR (2008) is the country – whether or not a country is traded with – and thus the extensive margin measure is limited in its scope. This is evident in transaction 2 where it would be the only study to measure the transaction as intensive margin growth. The key insight from Table 2 is that the results of decomposition studies need to be interpreted and compared with caution – what one study measures as extensive margin growth another measures as extensive margin growth. Data limitations restrict this paper to a product level analysis. However, this paper applies the Zahler (2011) decomposition methodology, which provides the most detailed definition of the extensive margin for this level of analysis.

Table 2: Trade decomposition studies

STUDIES[1]	**UNIT**[1]	**INTENSIVE MARGIN**	**EXTENSIVE MARGIN**	
			PRODUCT	**DESTINATION**
Transaction 1: In period t+1 existing exporter, Firm A, exports product X, a product that other firms in the country export but which is a new export product for Firm A, to destination market J, a destination that no firm from the country has exported product X to before but which other products have been exported to before.				
PRODUCT LEVEL				
Hummels & Klenow (2005)[2]	p	..		
Evenett & Venables (2002)	p-c			Δ
Amurgo-Pacheco & Pierola (2008)	p-c			Δ
HMR (2008)	c	Δ		
Brenton & Newfarmer (2009)	p-c			Δ
Amiti & Freund (2010)	p	Δ		
Bingzhan (2011)	p	Δ		
Besedeš & Prusa (2011)	p-c		Δ	
Zahler (2011)	p-c			Δ
FIRM LEVEL				
EEKT (2007)	f	Δ		
BJRS (2009)	f-p-c		Δ	
Transaction 2: In period t+1, Firm B, a first time exporter, exports product Y, a product that has never been exported by any other firm in the country before, to destination K, a destinations that has been exported to before by other firms exporting different products.				
PRODUCT LEVEL				

[44] Examples of these differences are contained in Appendix Table 1.
[45] Henceforth HMR (2008)

STUDIES[1]	UNIT[1]	INTENSIVE MARGIN	EXTENSIVE MARGIN	
			PRODUCT	DESTINATION
Hummels & Klenow (2005)	p	..	..	
Evenett & Venables (2002)	p-c		Δ	
Amurgo-Pacheco & Pierola (2008)	p-c		Δ	
HMR (2008)[3]	c	Δ		
Brenton & Newfarmer (2009)	p-c		Δ	
Amiti & Freund (2010)	p		Δ	
Bingzhan (2011)	p		Δ	
Besedeš & Prusa (2011)	p-c		Δ	
Zahler (2011)	p-c		Δ	
FIRM LEVEL				
EEKT (2007)[4]	f		Δ	
BJRS (2009)[5]	f-p-c		Δ	

Note: 1. The units of analysis are defined as: p – product; c – country; p-c – product-country; f – firm; f-p-c – firm-product-country. 2. Hummels & Klenow (2005) decompose countries' share of exports in the world export market and divide this into trade weighted margins. This is a cross-sectional decomposition whereas the other studies decompose export growth between a base period and an end period. 3. HMR (2008) = Helpman, Melitz & Rubenstein (2008). 4. EEKT (2007) = Eaton, Eslava, Kugler & Tybout (2007). 5. BJRS (2009) = Bernard, Jensen, Redding & Schott (2009).

TRADE THEORY AND TRADE MARGINS

Recent empirical regularities have driven changes in trade theory. Bernard, Jensen, Redding & Schott (2011) state that the empirical findings from micro level data on firms challenged existing models in international trade and thus inspired the development of new trade theories that incorporated firm heterogeneity into the equation as such. It is possible for one to trace the evolution of how the margins of trade have been incorporated and understood within international trade models. Old trade theory models, fall within the category of representative firm models where it is assumed that all or no firms within an industry participate in international trade. The direction, composition and extent of trade between countries is explained in terms of comparative advantage, which arises as a result of cross-country differences in productivity ("Ricardian" comparative advantage), or cross-industry differences in factor intensity and cross-country differences in factor abundance ("Heckscher-Ohlin" comparative advantage). In these models the emphasis is on the intensive margin where the size of the country and its productive capacity influences the absolute value of exports for the respective comparative advantage industries. Conversely, new trade theory models[46], which also fall within the category of representative firm models, emphasise the extensive margin in determining trade patterns. Larger countries are able to produce a greater number of varieties and thus export more than smaller countries. However, new trade theory models assume that all product varieties are traded in equilibrium and thus export growth occurs along the intensive margin.

However, heterogeneous firm trade models are better able to identify, explain and predict trade patterns along the intensive and extensive. As mentioned above, the empirical regularities inspired changes to international trade theory. Micro level firm level transaction data and subsequent research reveals that the representative firm assumption of old and new trade theories is inconsistent with the substantial variation in productivity, capital intensity and skill intensity across firms within industries (BJRS, 2007). Firm level analysis reveal that exporters are rare and that they are larger, employ more workers, pay higher wages, are more capital and skill intensive and more productive than non-exporting firms (BJRS, 2007; Eaton, Kortum & Kramarz, 2004). Furthermore, the analysis of exporters indicates substantial heterogeneity within this subgroup of exporting firms. For instance, trade is

[46] Along the lines of Krugman (1980)

concentrated within a small percentage of exporters that export multiple products to multiple destinations (BRS, 2010). Firm level analysis reveals that there is variation in the number of firms that export, the number of products that each firm exports and the number of destinations that firms export these products to, which suggests that there are multiple avenues for changes in trade patterns along the extensive margin.

Therefore, this evidence of firm heterogeneity and the importance of understanding how this impacted international trade resulted in the development of heterogeneous firm models. Heterogeneous firm models, such as and not limited to Melitz (2003), Bernard, Redding & Schott (2007) and Eaton, Kortum & Kramarz (2011) explain how firms self-select into export markets. Although there are differences in the specifics of each model, the general principle is that entry into export markets is based on productivity, with only the most productive firms being able to profitably absorb fixed and variables costs to exporting. These models explain and predict how export patterns vary along the margins of growth, in particular the extensive margin. Firms enter and exit new export markets based on their ability to profitably absorb the fixed and variable costs associated with each product market and destination market.

However, the value of trade depends upon the number of goods exported (extensive margin), the amount of each good exported (intensive margin) and the prices that they are sold for (price margin). Changes in export patterns and growth also occur along the price margin. In assessing how large countries export more than small countries, Hummels & Klenow (2005) first look to trade theory. Similarly, to what is mentioned above, they find that standard trade theory models are able to explain and predict variation along one or maybe two of the intensive, extensive and price margins, but not all three. Heterogeneous firm trade models are better able to explain and predict changes in trade patterns along the intensive and extensive margin than standard trade theory models but until recently they are unable to explain the price margin. Baldwin & Harrigan (2011) propose a variant to the Melitz (2003) model that is able to explain and predict the price margin. In their model, firms' competitiveness depends upon their quality adjusted price and, in equilibrium, higher quality goods are more costly, more profitable, and better able to penetrate distant markets.

Empirical analysis of firm level export patterns and related heterogeneous firm trade theory reveal and explain firm level trade patterns. Despite the analysis in this paper being a product level analysis, these firm level empirical findings and theories provide insight because product-country level export dynamics is an aggregation of firm level dynamics

SOUTH AFRICAN EXPORT PATTERNS

This paper examines South African export patterns and thus it is important to examine the literature focusing on South Africa's trade performance.

In examining the South African trade literature, it is apparent that South Africa's recent export history can be divided into two periods[47], the pre- and post-1990 periods, with the later exhibiting greater export growth. The pre-1990 period is characterised by weak or stagnant export growth. In volume terms, merchandise exports only grew by 1% per annum between 1970 and 1990 (Edwards, Rankin & Schöer, 2008)[48]. Conversely, the post-1990 period displayed improved export growth. Over the period 1994 to 2004 annual export growth averaged approximately 5.6% (Flatters & Stern, 2008). A more recent study by Edwards,

[47] Some studies mention this explicitly (Edwards & Lawrence, 2008; Edwards, Rankin & Schoer, 2008) while other studies reflect this division inherently in the analysis (Hausmann & Klinger, 2008).
[48] The authors state that this stagnant export growth is largely reflected by a persistent decline in gold exports despite non-gold export volumes growing 4% per annum over the same period.

Rankin & Schöer, (2008) describes how non-gold exports grew by a factor of 2.7 over the period 1990 to 2007. Smet (2007) provides another perspective looking at export shares[49] over the period 1993 to 2006 and finds growth of 2.1% percent per annum.

Recent studies have tried to further understand export growth by disaggregating exports by sector and industry. Edwards & Lawrence (2008) divide exports into non-commodity and non-gold commodity exports[50]. They find that non-commodity and non-gold commodity exports where only 11% (0.5% p.a.) and 20% (1% p.a.) higher in 1991 than they were two decades prior, respectively[51]. They find that the period 1990 to 2001 showed more favourable export growth with non-commodity and non-gold commodity exports growing by 50% (4.2% p.a.) and 200% (16.7% p.a.), respectively. Smet (2007) examines exports by industry[52] and finds that between 1993 and 2006, exports were dominated by mineral and mining industries and that the main products exported by these industries were ferro-alloys, flat rolled products of iron, non-alloysteel or stainless steel, coal, iron, titanium, aluminium, gold, platinum and diamonds. Furthermore, the machinery and equipment, and the motor vehicles, parts and accessories industry aggregates displayed growth over the same period and thus increasing their share in exports[53]. Edwards & Alves (2006) examine South African export flows aggregated according to the technology-based product classification developed by Lall (2010)[54] for the period 1988 to 2002. The authors find that within the manufacturing sector there has been a movement away from resource based exports toward medium and high technology exports, especially automotive exports within the medium technology category. However despite this diversification into medium and high technology products, South Africa remains dependent upon resource based exports.

A number of studies have explored whether South Africa's export portfolio has diversified over time. Petersson (2005) examines the diversification of South African exports using Standard Industrial Trade Classification 4-digit data for the period 1990 to 2003. Using cumulative export experience functions, shift-share and correlation analyses that aim to identify export specialisation or diversification and intra-industry trade, the author concludes that South Africa has experienced a shift toward non-traditional export sectors over the period. The main driver of this export diversification has been the motor industry, which has been incentivised by the MIDP (Edwards, Rankin & Schöer, 2008). Naudé and Rossouw (2011)[55] examine the extent of diversification that Brazil, China, India and South Africa have undergone over the period 1962 to 2000. From 1962 to 1970 South Africa diversified its exports. The reverse trend occurred between 1970 and 1995. The authors cite reasons such as sanctions against the Apartheid regime, price booms in the international gold price in the late 1970s, international and national debt crises in the 1980s, and import protection over this period. From 1996 to 2000, the South African export structure diversified.

[49] Export shares are expressed as exports as a percentage of GDP over time.
[50] Edwards & Lawrence (2008) include non-commodity exports with high resource contents into non-gold commodity exports. They reason that due to South Africa's dependence on commodity based manufactures, the traditional separation of primary and manufactured exports does not suffice.
[51] Gold exports were declining over this period and thus export growth was driven primarily by non-gold commodity exports (Edwards & Lawrence, 2008).
[52] Smet (2007) uses the South African Standard Classification, which comprises 35 industries.
[53] The growth experienced in these industries is a result of the incentives provided by the Motor Industry Development Programme (MIDP).
[54] Lall (2000) group's exports that are classified according to the 3-digit Standard International Trade Classification (SITC) into primary products, resource based manufactures, low technology manufactures, medium technology manufactures and high technology manufactures.
[55] The authors use world Export and Import data which was constructed from United Nations data by Robert Feenstra and Robert Lipsey for the National Bureau of Economic Research (NBER). The database contains bilateral trade data of 140 countries and 1,042 SITC sectors covering the years 1962 to 2000.

The literature suggests that South Africa has experienced export growth and diversification since the 1990s but has it been enough? A number of studies, while finding evidence of export diversification and growth in South Africa over the 1990s, suggest that it has not been enough and compares poorly to other developing countries and resource rich countries (Edwards & Alves, 2006; Flatters & Stern, 2008; Smet, 2007; Edwards, Rankin & Schöer, 2008; Naudé & Rossouw, 2011). Hausmann & Klinger (2008) track exports per capita over the period 1965 to 2004 and state that despite export growth in absolute terms over this period, exports per capita in constant dollars in 2004 are no higher than they were forty years prior. In the same study, the authors examine the structural transformation of South Africa's exports using the revealed sophistication measures as per Hausmann, Hwang & Rodrik (2007)[56]. The authors find that South Africa has been lagging in the upgrading of its export basket in terms of sophistication and this is largely a result of the stagnation over the period 1985 to 1995 (explained by part of this period being marked by international sanctions). Exports have increased in sophistication since 1996 and this has been largely due to increased exports of cars, motor vehicle parts and chassis, filtering and purifying machines for liquids and natural gases, pharmaceuticals and ferro-alloys. However, when compared to other countries over time, South Africa, after starting ahead of a number of countries in terms of export sophistication, has now fallen behind. Applying 'product space' methodology developed in Hidalgo, Klinger, Barabási & Hausmann (2007), the authors argue that South Africa's relatively poor export performance can be partially explained by the limited potentiality to jump to more sophisticated products that its current production structure offers. In essence, if 'what' a country exports matters South Africa needs to undergo significant structural transformation of its economy.

This paper aims to generate a deeper understanding of the composition and dynamics of South Africa's export flows by analysing the margins of export growth. The literature is limited in terms of previous analysis of the margins of South Africa's export growth[57]. Although, Amurgo-Pacheco & Pierola (2008) and Zahler (2011) analyse the decomposition of export growth across samples of developed and developed countries. Table 3 displays their estimates of the margins of export growth for South Africa over two overlapping periods. It is interesting to see that the margin accounting for the largest share of South Africa's export growth is the extensive margin – in excess of 50% in both studies. The weighty contribution of the destination extensive margin is particularly interesting because it provides an indication that the question of where, not just what or how, matters for South Africa's export performance.

Table 3: Trade decomposition studies – margins of growth for South Africa

STUDIES	UNIT[1]		INTENSIVE MARGIN	EXTENSIVE MARGIN	
				PRODUCT	DESTINATION
Amurgo-Pacheco & Pierola (2008)	p-c	1990-2005 HS6 (±5000 products)	48.3%	2.3%	49.4%
Zahler (2011)	p-c	1984-2000 SITC 4-digit (±772-909 products)	39.8%	7.0%	53.2%

Note: 1. The units of analysis is defined as: p-c – product-country.

[56] Hausmann, Hwang and Rodrik (2007) use a measure called PRODY, which is the revealed sophistication for each product that a country exports. PRODY is the revealed comparative advantage weighted GDP per capita of each country that exports the good. The PRODY for each good is used to measure the EXPY for a particular country, which is reflects the income level associated with a country's export basket and hence the sophistication of that basket. EXPY is the PRODY for each product weighted by the products share in the country's export basket.

[57] At present, I'm not aware of any study in the literature that specifically studies South Africa's export growth by analysing the intensive, extensive and price margins of growth.

However, it must be noted that the studies by Amurgo-Pacheco & Pierola (2008) and Zahler (2011) focus on the margins of export growth across country groupings and thus the focus is not specifically aimed at a middle income resource abundant country such as South Africa. The analysis in this paper utilises Zahler's (2011) decomposition technique, which provides a more detailed dissection of the extensive margin than the technique applied by Amurgo-Pacheco & Pierola (2008). In addition, the analysis in this paper is likely to pick up more variation along the product extensive margin than the Zahler (2011) analysis. This is because the analysis in this paper uses trade data from the Harmonised System 6-digit classification– approximately 5000 products – as opposed to the Standard Industrial Trade Classification – approximately 900 products – which Zahler (2011) uses.

CONTRIBUTIONS AND MOTIVATION

The study of the literature above reveals areas of contribution and points of motivation for this paper.

Firstly, one can motivate for South Africa as a unique case study because:

- typically, decomposition studies examine trade patterns across a large sample of countries, which focus on aggregate cross-country trade patterns. Single country studies focus on developed countries such as the United States or large developing countries such as China. South Africa, a resource abundant middle income developing country that is geographically remote, offers a unique composition and pattern of exports.
- the period of analysis, 1995 to 2011, coincides with a period of trade liberalisation in South Africa, which may impact on export patterns.

Secondly, this paper contributes empirically by:

- being one of the first studies to explore the margins of export growth in South Africa.
- employing the Zahler (2011) decomposition method, which generates a highly detailed measure of the extensive margin of trade. This is important because it is already evident in Amurgo-Pacheco & Pierola (2008) and Zahler (2011) that the extensive margin is an important channel of export growth in South Africa.
- utilising highly disaggregated product level trade data from UN Comtrade. Studies examining South Africa's export growth and diversification patterns generally use more aggregated datasets. The use of a highly disaggregated product level dataset exposes more variation along the extensive margin, especially the product extensive margin.
- exploring the growth and patterns of the geographic diversification of South Africa's exports (the 'where' of the export growth question), which is not well explored in the South African literature. South African studies tend to focus on the 'what' question of export patterns.

The economic development literature points toward three important aspects of export dynamics – what a country exports (as per Hausmann, Hwang & Rodrik, 2007), where a country exports (as per Brenton & Newfarmer, 2008 and Zahler, 2011) and how a country exports (as per Lederman & Maloney, 2012). The export decomposition literature offers an empirical method for analysing the 'what' and 'where' of export dynamics. Therefore, this paper employs the Zahler (20111) trade decomposition technique to gain deeper understanding of the 'what' and the 'where' of South Africa's exports.

III. DATA AND METHODOLOGY

As mentioned in the previous section, this paper employs the Zahler (2011) decomposition technique to examine the intensive, product extensive and destination extensive margins of South Africa's export growth. This section describes the data and decomposition methodology applied in this paper.

DATA

PRODUCT LEVEL TRADE DATA

This paper uses South African export data at the 6-digit level of the Harmonised System (HS) classification from the UN COMTRADE database[58]. The period of analysis for this paper is 1995 to 2011 and export data for these years is appended and cleaned. The 1988/1992 revision of the HS6 classification is chosen so that a consistent set of product categories is analysed over time. This is important in a decomposition study because one does not want to bias changes in the extensive margin with the re-classification of HS6 product categories. The HS 6-digit level of classification is highly disaggregated, comprising 5017 product categories. Over the period of analysis, between 4393 and 4742 South African exports are shipped to between 195 and 215 destinations.

The dataset is constructed by appending the export data for the years 1995 through to 2011. The Zahler (2011) decomposition entails creating a product-destination space which is comprised of each possible product-destination combination. The unit of analysis in the Zahler (2011) decomposition is defined as a product-destination combination or a variety. The export data from COMTRADE contains only positive trade flows for a product to a destination in a specific year. The COMTRADE data does not contain zero trade values, which means that one has to rectangularise the dataset. The result of which is a dataset made up of every possible product-destination combination (i.e. variety) in each year with trade values that are either positive or zero for each product-destination combination. The purpose of doing this is that one can compare the product-destination space for each time period and see whether a country has exported new 'varieties' (a zero trade value becomes positive), or old varieties have died (a positive trade value becomes zero) or old varieties either increase or decrease in value (a positive trade value either increase or decreases in the next period).

There are a number of countries that are initially classified as one country and then become two separate countries at a later stage during the period of analysis. In these instances it is impossible to separate the earlier data for each separate country. Therefore, the trade values for the two separate countries in the later stages of the period of analysis are merged and thus treated as one country throughout the entire period of analysis. There are three instances of this in the data where Belgium and Luxembourg is treated as one economic entity, Italy and The Holy See is treated as one economic entity, and the Czech Republic and the Slovak Republic are treated as one economic entity (Czechoslovakia). This is done so as not to confuse what Felbermayr & Kohler (2006) call a 'psuedo extensive margin' with the real extensive margin. The 'psuedo extensive margin' is extensive margin growth resulting from a country separating into two new nation states, whereas real extensive margin growth is exporting to a destination market that has not been serviced before.

[58] Available on the World Integrated Trade Solutions (WITS) database (http://wits.worldbank.org/wits/)

As stated on earlier in the paper, a key advantage of using highly disaggregated product level trade data at the 6-digit level is that it reveals more variation along the extensive margin than data at higher levels of aggregation. This is valuable to the analysis because the extensive margin is a key area of interest in the paper. With higher levels of aggregation it is more likely that a new product (as it would be captured in a more disaggregated product definition) will be defined as an existing product – intensive margin growth –rather than a new product – (extensive margin growth). Despite the highly disaggregated nature of the data at the 6-digit level, it is possible that some extensive margin growth in terms of new products may be missed. The 1988/1992 revision of the HS6 classification details products specific to that time period and do not account for the innovation of new products. It is possible that some new products that start getting traded during the period of analysis may fall within a 6-digit product grouping and thus get identified as belonging to growth at the intensive margin. Nevertheless, this is the most disaggregated trade data available for South Africa and is likely to capture a significant share of the extensive margin growth.

FACTOR INTENSITY DATA

In addition to examining changes in the growth and composition of South African exports through the lens of the intensive and extensive margins, this paper also explores whether there is a factor bias to the margins of trade growth. Such analysis requires data on factor intensities of which this paper has a relatively new source.

The source of the factor intensity data is the relatively new product level revealed factor intensity data constructed by UNCTAD (United Nations Conference on Trade and Development) (Shirotori, Tumurchudur & Cadot, 2010). These measures estimate the revealed factor intensity of traded products applying a methodology similar to that applied by Hausmann, Hwang & Rodrik (2007). Hausmann et al. (2007) estimated the revealed technology content of traded products (known as PRODY). The revealed technology content of a product is estimated as the weighted average of the GDP per capita of countries that export the product, where the weights are the exporters' revealed comparative advantage (RVA) indices for that product.

A similar method is applied to the revealed factor intensity measures[59]. For instance, the revealed physical capital content of a product is measured as the weighted average of the capital abundance of countries that export the product, where the weights are the exporters' RCA indices for that product. The intuition behind the measure is that a product exported by a country that is richly endowed in physical capital is supposed to be capital intensive. If a product is exported by Germany and Japan it is revealed to be capital intensive and if it is exported by Vietnam and Lesotho it is revealed to be labour intensive.

The revealed factor intensity measure is constructed by compiling data on national factor endowments of physical capital, human capital and natural resource endowments for countries from which the data is available. The measure is estimated for each product as per the HS 6-digit and SITC 5-digit product classifications and covers the period 1962 to 2007. Three revealed factor intensity measures are estimated: revealed human capital intensity (constructed from yearly data on average years of schooling from Barro & Lee, 2010), revealed physical capital intensity (constructed from data on capital stocks per worker using the PENN World Table Database) and revealed natural resource intensity (constructed from data on arable land per person taken from the World Development Indicators).

The advantage of the revealed factor intensity data is that it is constructed at the 6-digit product level (HS), which means that it aligns with the product level trade data mentioned

[59] See Appendix for a detailed explanation of these indices and their construction.

above. Therefore, one is able to explore at a highly disaggregated level – product level – whether there is a factor bias to changes in the growth and composition of South Africa's exports. Furthermore, Shirotori, Tumurchudur & Cadot, 2010 believe that the contribution of the RFI indices is that they will make it possible to control for Heckscher-Ohlin effects in the analysis of trade diversification in a manner that was not possible before.

DECOMPOSITION METHODOLOGY

THE ZAHLER (2011) PRODUCT VARIETY STYLE DECOMPOSITION METHOD

The Zahler (2011) decomposition method is based on the Eaton et al (2007) decomposition method with the former adopting varieties[60] or product-destinations and the later the firm as the unit of analysis, respectively. This paper uses product level data at the country level and thus the Zahler (2011) decomposition method is most applicable. This method allows for export growth between two points in time to be decomposed into the contribution of new products, new destinations (extensive margin) and the growth in value of previously exported varieties (intensive margin).

The logic of the decomposition is explained using **Error! Reference source not found.**and **Error! Reference source not found.** which are adapted from Zahler (2011). **Error! Reference source not found.** shows exports for a hypothetical country in base period t_0. Exports are shown across three dimensions, with the x-axis measuring the number of potential products the country can export, the y-axis measuring the number of potential destinations it can export to and the z-axis measuring the value of each product-destination combination.

Each bar represents a product-destination combination and hence a variety that the country exports in the base period. It is evident that this country does not export every product to every destination but rather four products to a subset of three countries. Each of these product-destination combinations represents a variety and thus this country exports seven varieties in the base period t_0. The labels on the bars represent the value of these exports, with the total export value for this country in base period t_0 being the sum of all these (R19). The dashed lines divide the product-destination space into quadrants with the lower left quadrant being what Zahler (2011) calls the country's "potential product-destination space". This space represents potential product-destination combinations of existing products and destinations. The remaining three quadrants represent avenues in which exports can grow along the extensive margin.

[60] Zahler's (2007) idea of variety comes from the exporter perspective. He argues that even though a product exported from a country to two different destinations may be the same, that these two different product-destination combinations represent two varieties of this product. He reasons that these product-destination combinations potentially differ in terms of costs, externalities, uncertainties etc. associated with different export destinations.

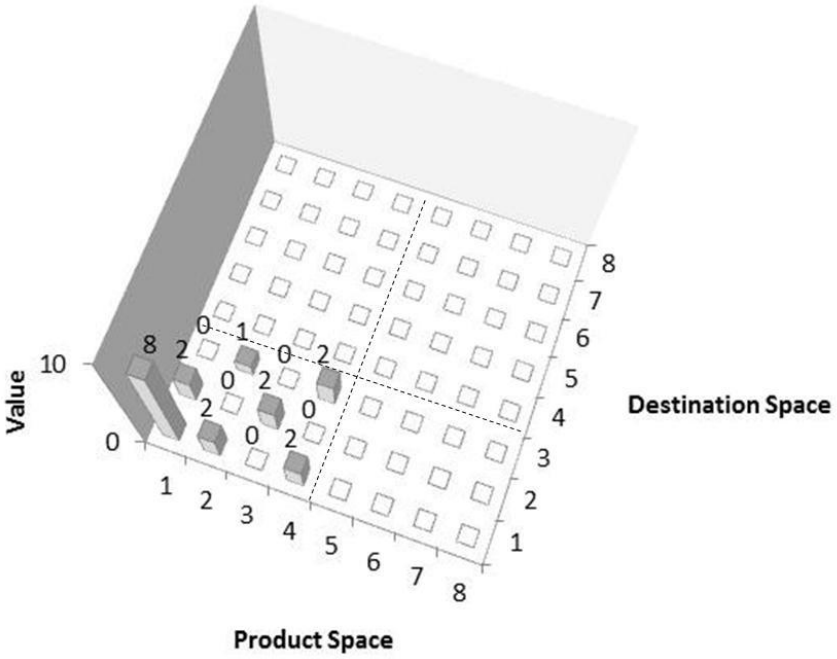

Figure 1: Export portfolio in time period t_0
Source: Adapted from Zahler (2011)

By comparing Figure 1 to Figure 2 one can see how exports have grown in this hypothetical country between the base period t_0 and period t_1. By summing the export values for each period and subtracting the former from the later one can estimate that exports have grown by R40[61]. The export growth can be divided into two parts. The first part looks at the export values of varieties from the t_0 export portfolio which are either higher (e.g. product 1 to destination 1), lower (e.g. product 3 to destination 2) or disappearing (e.g. product 4 is no longer exported to country 3). The net growth[62] of the base year export portfolio is known as growth at the intensive margin. The second part looks at growth in new product-destination combinations[63] and is known export growth at the extensive margin.

The extensive margin can be separated into four instances. First, looking at the bottom left quadrant, countries can expand existing products to new but known destinations (e.g. product 4 to country 2). Second, looking at the top left quadrant, countries can expand exports of existing products to new destinations. The two left quadrants represent the expansion of existing products into new markets. Third, looking at the bottom right quadrant, exports can be expanded by new products to existing markets. Fourth, looking at the top right quadrant, exports can be expanded by new products to new destinations. The two right quadrants represent the expansion of exports into new products.

[61] R59 (time period t_1) - R19 (base period)
[62] Sum growth of existing varieties (R4+R3+R7+R4+R2+(-R1) = R19) less death of varieties (R2 – variety marked by a cross) = R17 (intensive margin growth)
[63] These are varieties not exported in t_0 and are represented by the dark bars.

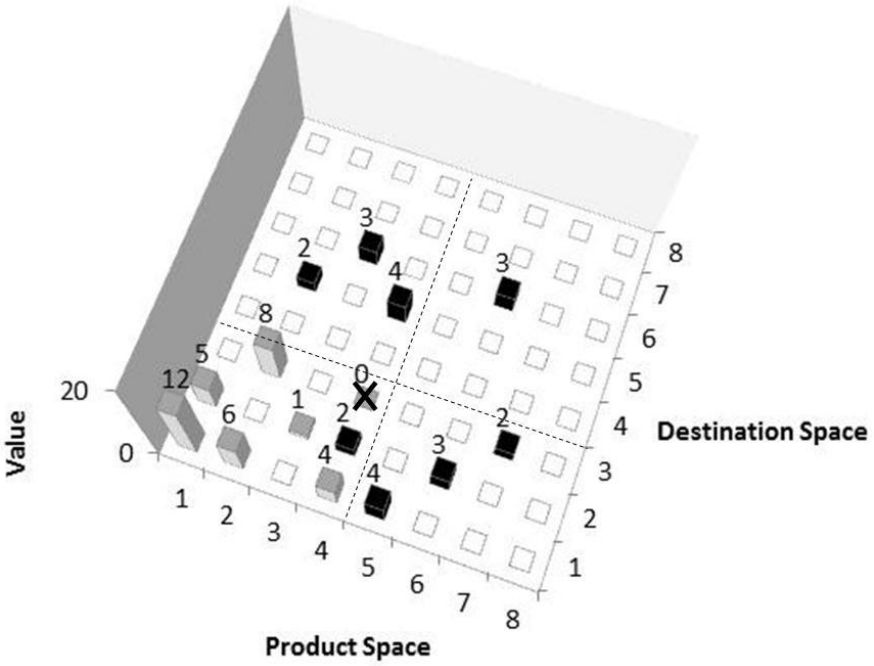

Figure 2: Export portfolio in time period t_1
Source: Adapted from Zahler (2011)

A formalisation of the decomposition logic explained and depicted above is adapted from the Zahler (2011) decomposition as follows: South Africa's (SA) exports in time period t_1 can be thought of as the following

$$\sum_{pd \in PD_{t_1}} X_{pd,SA,t_1} = \sum_{pd \in PD_{t_0} \wedge PD_{t_1}} X_{pd,SA,t_0} \times \left(1 + \Delta\% X_{pd,SA,t_1/t_0}\right) + \sum X_{newpd,SA,t_1} \tag{6}$$

where

$$\Delta\% X_{pd,SA,t_1/t_0} = \frac{\sum_{pd \in PD_{t_0} \wedge PD_{t_1}} X_{pd,SA,t_1} - \sum_{pd \in PD_{t_0} \wedge PD_{t_1}} X_{pd,SA,t_0}}{\sum_{pd \in PD_{t_0} \wedge PD_{t_1}} X_{pd,SA,t_0}} \tag{7}$$

and

$$\sum X_{newpd,SA,t_1} = \sum_{\substack{p \in P_{t_0} \wedge_{t_1}, d \in D_{t_0} \wedge_{t_1} \\ pd \notin PD_0 \wedge pd \in PD_t}} X_{pd,SA,t_1} + \sum_{\substack{p \notin P_{t_0} \wedge p \in P_{t_1}, \\ d \in D_{t_0} \wedge d \in D_{t_1}}} X_{pd,SA,t_1} + \sum_{\substack{p \in P_{t_0} \wedge P_{t_1} \\ d \notin D_{t_0} \wedge d \in D_{t_1}}} X_{pd,SA,t_1} + \sum_{\substack{p \notin P_{t_0} \wedge p \in P_{t_1} \\ d \notin D_{t_0} \wedge d \in D_{t_1}}} X_{pd,SA,t_1} \tag{8}$$

Together, equations (6) to (8) express the sum value of product-destination varieties exported by South Africa in time period t_1. Equation (1) shows that this value is comprised of two terms. The first term takes the t_0 value of product-destination varieties that exported in both time periods and multiplies this by one plus its growth between these two periods (this is displayed in equation 7). The second term takes the value of new product-destination varieties, which as explained above can be divided into four components. Equation (8) formalises the summed value of new product-destination varieties. The first term represents the value of product-destination varieties exported in t_1 where South Africa exported the product and exported to the destination but not in that combination in t_0 (depicted by the black bar in the bottom left quadrant in Figure 2). The second term represents the value of exports of new products to existing destinations (depicted by the black bars in the bottom

right quadrant in Figure 2). The third term refers to the value of exports of existing products to new destinations (depicted by the black bars in the top left quadrant of Figure 2). The final term captures the value of new products exported to new destinations (depicted by the black bars in the top right quadrant in Figure 2).

South Africa's exports in t_0 can be decomposed as follows:

$$\sum_{pd \in PD_{t_0}} X_{pd,SA,t_0} = \sum_{pd \in PD_{t_0} \wedge PD_{t_1}} X_{pd,SA,t_0} + \sum_{pd \in PD_{t_0} \wedge pd \notin PD_{t_1}} X_{pd,SA,t_0} \quad (9)$$

The first and second terms refer to product-destination varieties that "survive" and "die" over the period t_0 to t_1, respectively.

By taking (6) and (9) together, the percentage change in South African exports between t_0 and t_1 is captured in equation (10) below:

$$\frac{\sum_{pd \in PD_{t_1}} X_{pd,SA,t_1} - \sum_{pd \in PD_{t_0}} X_{pd,SA,t_0}}{\sum_{pd \in PD_{t_0}} X_{pd,SA,t_0}} = \frac{\sum_{pd \in PD_{t_0} \wedge PD_{t_1}} X_{pd,SA,t_0} \times \left(1 + \Delta\% X_{pd,SA,t_1/t_0}\right)}{\sum_{pd \in PD_{t_0}} X_{pd,SA,t_0}} +$$

$$\frac{\sum X_{newpd,SA,t_1} - \left(\sum_{pd \in PD_{t_0} \wedge PD_{t_1}} X_{pd,SA,t_0} + \sum_{pd \in PD_{t_0} \wedge pd \notin PD_{t_1}} X_{pd,SA,t_0} \right)}{\sum_{pd \in PD_{t_0}} X_{pd,SA,t_0}}$$

$$= \frac{\sum_{pd \in PD_{t_0} \wedge PD_{t_1}} X_{pd,SA,t_0} \times \Delta\% X_{pd,SA,t_1/t_0} + \sum X_{newpd,SA,t_1} - \sum_{pd \in PD_{t_0} \wedge pd \notin PD_{t_1}} X_{pd,SA,t_0}}{\sum_{pd \in PD_{t_0}} X_{pd,SA,t_0}}$$

(10)

The equation shows that South African export growth can be explained by the growth of surviving product-destination varieties (first term of the numerator), plus new product-destination varieties (second term of the numerator), less deaths of product-destination varieties between t_0 and t_1 (third term of the numerator), all divided by exports in the initial period as a point of comparison (Zahler, 2007). The net effect of the first and third term captures the intensive margin of growth and the second term captures the extensive margin of growth.

A key advantage of this method is that it provides a comprehensive account of the various sources of export growth contained within the intensive and extensive margins. In particular, the disaggregation of the extensive margin into product and geographic components, which are important aspects of export growth.

IV. RESULTS

SOUTH AFRICA'S EXPORT PERFORMANCE – AGGREGATE ANALYSIS

This section provides an analysis of South Africa's export structure and performance at the aggregate level for the period 1995 to 2011. An aggregate picture of the structure and performance of exports using the technology-based product classification developed by Lall (2010) and a World Bank regional classification is provided in Table 4.

The estimates pertaining to the Lall (2010) classification in Table 4 suggest that South Africa's export performance is heavily reliant on its resource intensive sectors, with the primary and commodity manufacturing sectors[64] contributing 40.8% and 27.9% of export growth over the period 1995 to 2011[65]. Over the period, the fastest growing export sector in the South African economy is the primary sector. As shown in Table 4, on average, total exports grew by 9.5% per annum, whereas exports in the primary sector grew at 12.9% per annum. Exports in the manufacturing sector grew slower than total exports at 8.2% and 8.1% per annum, in commodity and non-commodity manufacturing, respectively. The prominence of the resource-based sectors is further evident when looking at the share structure of South Africa's exports where the primary and commodity manufacturing sectors comprise 66.6% of South Africa's exports in 2011 – this is up from 58.8%. Figure 3 depicts this by showing the evolution of the share structure of South Africa's exports over the period. The primary sector has become the most important export sector while the non-commodity or 'pure' manufacturing sector has declined significantly.

As is evident in Figure 3 and Table 4, Non-commodity or 'pure' manufacturing has declined in relative importance. At the start of the period, non-commodity manufacturing constituted 40.9% of South Africa's exports whereas 17 years later it constituted only a third of South Africa's exports. Within this sector, the poorest performer is the low technology product sector, which has experienced the slowest growth in exports at 3% per annum and thus contributed only 2.4% to total export growth over the period. This sectors relative importance has declined significantly by experiencing the greatest loss in export share – from 13.4% to 4.7%. The medium technology product sector is the star performer in the non-commodity manufacturing sector growing faster that total exports over the period and contributing a quarter of South Africa's export growth over the period[66]. This sector has slightly increased its share of total exports. Although having experienced growth over the period, the high technology product sector remains the smallest non-commodity manufacturing sector.

Referring back to the economic development literature, the prominence of natural resource based exports is a potentially troubling scenario. Prebisch (1950) warns of the limited scope for technological progress associated with natural resource exports and declining terms of trade effects. Relatedly, Sachs & Warner (1995b, 2001a, 2001b) warn of the negative economic growth effects associated with natural resource based exports (i.e. the resource curse). Hausmann, Hwang & Rodrik (2007) would suggest a movement away from natural

[64] Commodity manufacturing is distinguished from non-commodity manufacturing because the final products of the former have a high share of primary product inputs in their value. Lall (2010) terms such products resource-based manufacturing products. In terms of the Lall (2010) classification, non-commodity manufactured products are made up of low, medium and high technology products.

[65] This aligns with general findings on South Africa's export structure (Edwards & Alves, 2006; Hausmann & Klinger, 2008; Smet, 2011)

[66] Flatters & Stern (2008) state that the strong performance of the medium technology sector is almost fully explained by subsidised automotive exports.

resource based exports and toward higher productivity manufactured products that are associated with higher rates of economic growth. However, the relatively healthy performance of the medium technology manufacturing sector would be considered a positive development to the like of Hausmann et al. (2007).

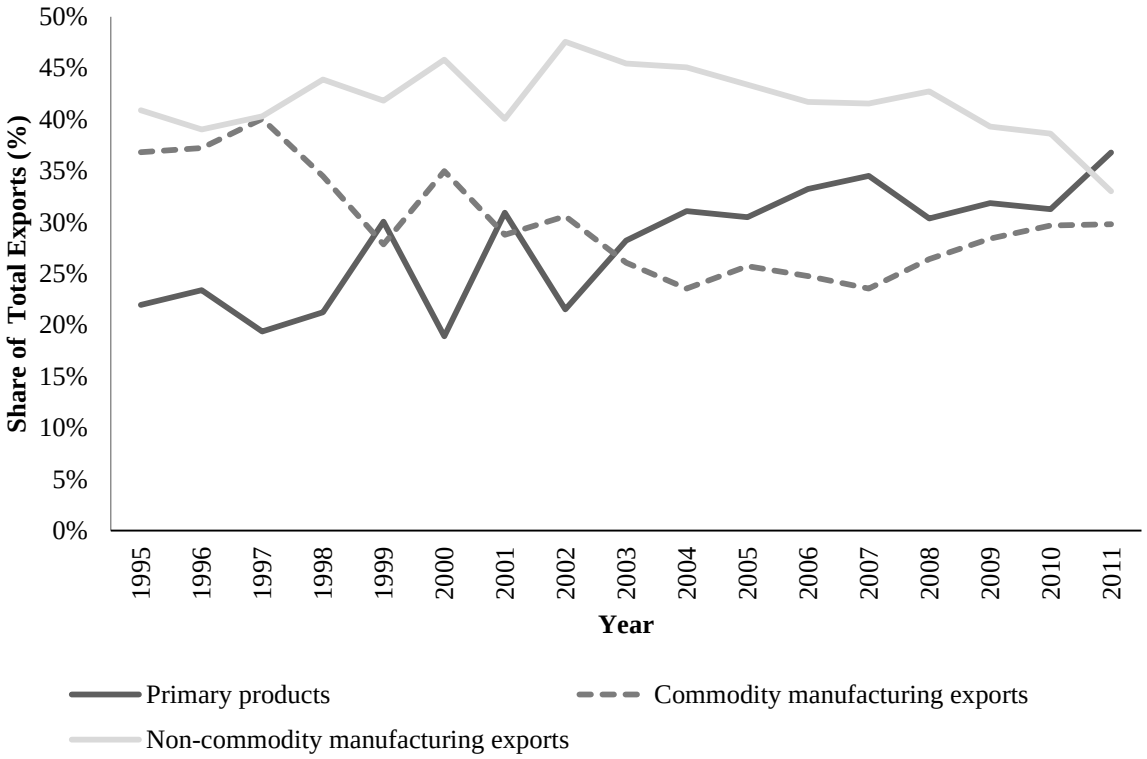

Figure 3: Sector share of South Africa's exports, 1995-2011
Source: UN COMTRADE – own calculations by author.
Note: The Lall (2010) classification is applied to the above aggregation of exports – see Appendix Table 2. Commodity manufacturing is comprised of resource-based exports. Non-commodity manufacturing exports are comprised of low-technology, medium- technology and high- technology exports.

The regional picture of South Africa's export structure and performance suggests the emergence of the 'east' as a major export market. In terms of average annual growth rates, East Asia & Pacific and the Rest of Asia are the two fastest growing regions, growing well above the average annual growth rate for total exports. While the later has only contributed 6.2% to total export growth over the period the former has accounted for nearly a third of total export growth. Furthermore, the share structure of South Africa's exports indicates a shift toward the East Asia & Pacific region with the share of exports growing from 19.8% to 29.5%. The East Asia & Pacific region is now the largest regional export market for South Africa's exports.

Conversely, while South Africa's exports have shifted eastwards, exports to its previous top export market, Europe, has declined significantly. The share of exports to Europe has declined from 42.8% to 25.3%, which is evident in the average annual growth of 6.2% per annum – the slowest of all regions. However, it is still the second most important regional export market, contributing 20.5% of total export growth and comprising 25.3% of South Africa's exports in 2011.

From a regional perspective, there are two other export markets of importance – North America and Sub-Saharan Africa. Over the period, export growth of 9% per annum to Sub-Saharan Africa has contributed 15% to total export growth while export growth of 10.9% per

annum to North America has contributed 10% to total export growth. As such, these are the third and fourth most important regional markets accounting for 9.5% and 15.3% of South Africa's exports in 2011.

The aggregated analysis above provides a basic view of the 'what' and 'where' of South Africa's export dynamics. However, this paper aims to generate a more detailed understanding of the composition and dynamics of export growth in South Africa using disaggregated product level data. Using this data, one could count the number of products South Africa is exporting and the number of countries it is exporting to. This would indicate whether South Africa is expanding into new product and destination markets. This is depicted in Figure 4 where these two counts are displayed. These count series indicate that changes in the number of product markets and destination markets serviced by South Africa is minimal.

However, if one applies a more detailed definition of an export market, a better indication of changes in the composition and dynamics of South Africa's exports is revealed. If one defines an export market according to the method applied by Zahler (2011)[67], where each market is defined as a product-destination combination, as in the third series in Figure 4, one will see that the number of markets serviced by South African exporters has grown substantially over the period. The growth in the product-destination combination series is indicative of export growth along the extensive margin. It shows extensive margin growth in terms of South Africa exporting existing products to new destination markets, new products to existing destination markets and new products to new destination markets. The count of new product-destination combinations – i.e. new markets – has almost doubled over the period 1995 to 2011, which suggests that the extensive margin is a significant dimension of South Africa's export performance. The application of the product-destination combination as the unit of analysis is applied in the product variety style decomposition analysis below, which enables a deeper analysis of the composition and dynamics of South Africa's exports.

[67] Amurgo-Pacheco & Pierola (2008) and Brenton & Newfarmer (2009) apply a similar definition.

Table 4: South Africa's export structure and annual average growth rate by sector and region, 1995-2011

	Exports 1995	Exports 2011	Share structure of SA exports 1995	Share structure of SA exports 2011	Avg. annual growth rate, 1995-2011	Contribution to change 1995-2011
		Lall classification				
Total exports	19 798 047	92 737 845			9,5%	100,0%
Primary products	4 347 500	34 122 516	22,0%	36,8%	12,9%	40,8%
Total manufacturing	15 384 706	58 253 320	77,7%	62,8%	8,1%	58,8%
Commodity manufacturing exports	7 285 546	27 636 624	36,8%	29,8%	8,2%	27,9%
Non-commodity manufacturing exports	8 099 160	30 616 696	40,9%	33,0%	8,1%	30,9%
Manufacturing sub-sectors						
Resource-based	7 285 546	27 636 624	36,8%	29,8%	8,2%	27,9%
Low technology	2 646 381	4 403 531	13,4%	4,7%	3,0%	2,4%
Medium technology	4 832 854	23 826 254	24,4%	25,7%	9,8%	26,0%
High technology	619 925	2 386 911	3,1%	2,6%	8,3%	2,4%
		Regional classification				
North America	1 511 401	8 795 144	7,6%	9,5%	10,9%	10,0%
Rest of Americas	577 496	2 148 538	2,9%	2,3%	8,0%	2,2%
East Asia & Pacific	3 920 196	27 353 794	19,8%	29,5%	12,1%	32,1%
Rest of Asia	493 001	5 015 210	2,5%	5,4%	14,6%	6,2%
Europe	8472713	23428350	42,8%	25,3%	6,2%	20,5%
Middle East & North Africa	701 229	3 030 073	3,5%	3,3%	9,0%	3,2%
Sub-Saharan Africa	3 297 976	14 213 997	16,7%	15,3%	9,0%	15,0%
Other exports	824 036	8 752 741	4,2%	9,4%	14,9%	10,9%

Source: UN COMTRADE – own calculations by author.

Note: Sectors defined by Lall (2010) classification – see Appendix Table 2 for details. Under the Lall classification, the share structure does not sum to 100 percent and total exports does not exactly match its component parts because products not allocated in the Lall classification have been left out – they comprise between 0.3 and 0.4 percent of total South African exports. Regions classified according to World Bank regional classification. *Ad hoc* approach applied to countries, territories and islands not classified by the World Bank. 'Other exports' refers to exports classified as 'not elsewhere specified', which comprises trade transactions to small island territories, errors in partner assignment, or non-disclosure of partner information

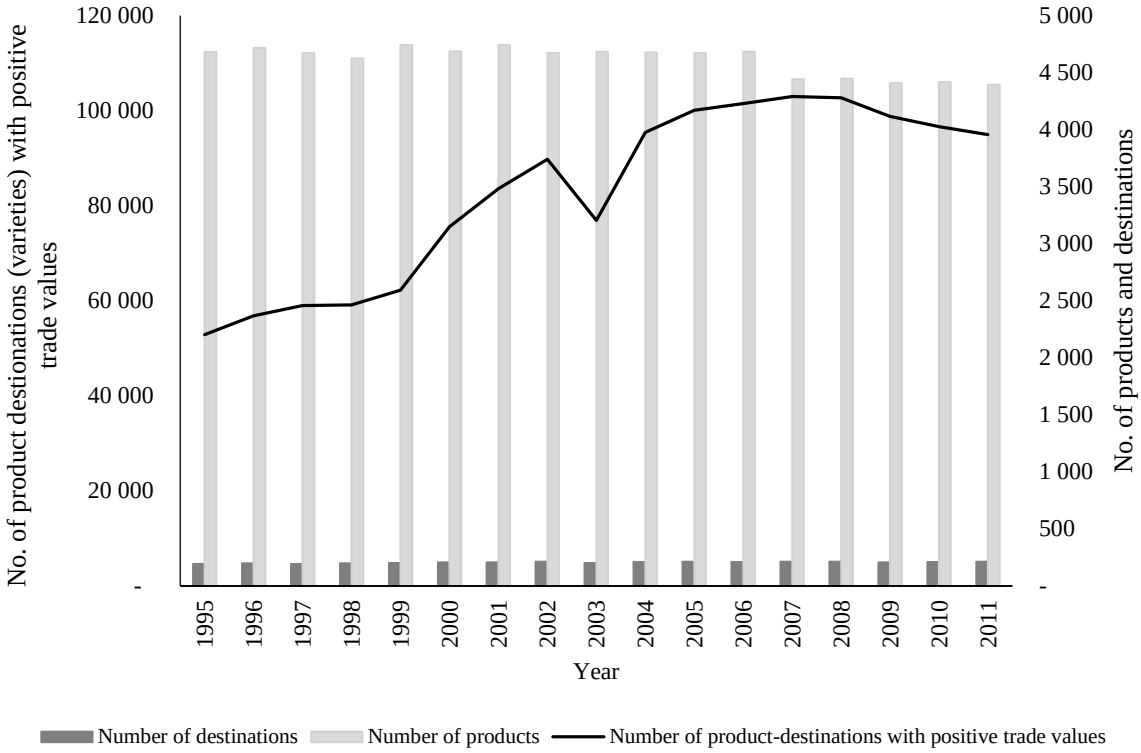

Figure 4: Extensive margin growth revealed by product-destination combination (variety) unit of analysis
Source: UN COMTRADE – own calculations by author.

PRODUCT VARIETY STYLE DECOMPOSITION ANALYSIS

DECOMPOSITION BY TIME PERIOD

As per the discussion in Section III, the decomposition analysis in this paper employs the product variety style decomposition methodology from Zahler (2011). The starting point for the decomposition analysis is to first consider the aggregate export picture shown in Table 5 and Figure 5.

Considering the full period, 1995 to 2011, it is noticeable that the extensive margin is a significant driver of South Africa's export growth. Although the intensive margin (net growth of initial year varieties) is the largest individual component of export growth, accounting for 47.54% of growth, the combination of the destination and the product extensive margins account for 52.46% of export growth. This result runs contrary to the general pattern found in the literature[68] where the intensive margin, when aggregated across developed and/or developing country samples, is the main source of export growth. However, this result is in line with the individual decomposition analyses applied by Amurgo-Pacheco & Pierola (2008) and Zahler (2011) for South Africa (see Table 3). Thus suggesting that South Africa's export growth pattern differs from the aggregate patterns observed across developing countries.

[68] See Section II.

Table 5: Decomposition of total export growth into intensive and extensive margins

	Annual export growth	(1) Export growth	(2) Growth of surviving varieties	(3) Death of initial year varieties	(4) New destination of known countries and products	(5) New destination, existing products	(6) New products, known destination	(7) New product and destination	(2)-(3) Net growth of initial year varieties (intensive)	(4)+(5) New destinations (extensive)	(6)+(7) New products (extensive)
1995-2011	9,5%	368,42%	197,80%	-22,66%	125,72%	0,17%	67,37%	0,01%	175,14%	125,90%	67,38%
Contribution to (1)			53,69%	-6,15%	34,13%	0,05%	18,29%	0,00%	47,54%	34,17%	18,29%
1995-2001	3,9%	30,92%	6,91%	-18,63%	18,91%	0,03%	23,68%	0,03%	-11,73%	18,93%	23,71%
Contribution to (1)			22,33%	-60,26%	61,15%	0,08%	76,60%	0,10%	-37,93%	61,23%	76,70%
2002-2011	15,0%	305,57%	197,44%	-13,48%	73,36%	0,01%	48,24%	0,00%	183,96%	73,37%	48,24%
Contribution to (1)			64,62%	-4,41%	24,01%	0,00%	15,79%	0,00%	60,20%	24,01%	15,79%

Source: UN COMTRADE – own calculations by author.

In terms of the two components of the extensive margin, the destination extensive margin contributes more to export growth than the product extensive margin. Over the period 1995 to 2011, the destination extensive margin has increased by 125.9%, accounting for 34.17% of export growth, while the product extensive margin has increased by 67.38%, accounting for 18.29% of export growth. This is also evident in Figure 5 where the difference between the line depicting the intensive margin plus the destination extensive margin (IM + destination EM) and the line depicting the 1995 varieties (IM) (i.e. the destination extensive margin) is greater than the difference between the line depicting total exports and the line depicting the intensive margin plus the destination extensive margin (i.e. the product extensive margin). This result is in line with the findings in the literature – see Table 2 in Section II – that, on average, find the destination extensive margin to be greater in magnitude than the product extensive margin. This ties in with the proposition by Brenton & Newfarmer (2009) that contrary to Hausmann, Hwang & Rodrik (2007), where a country exports is as, if not more, important than what a country exports.

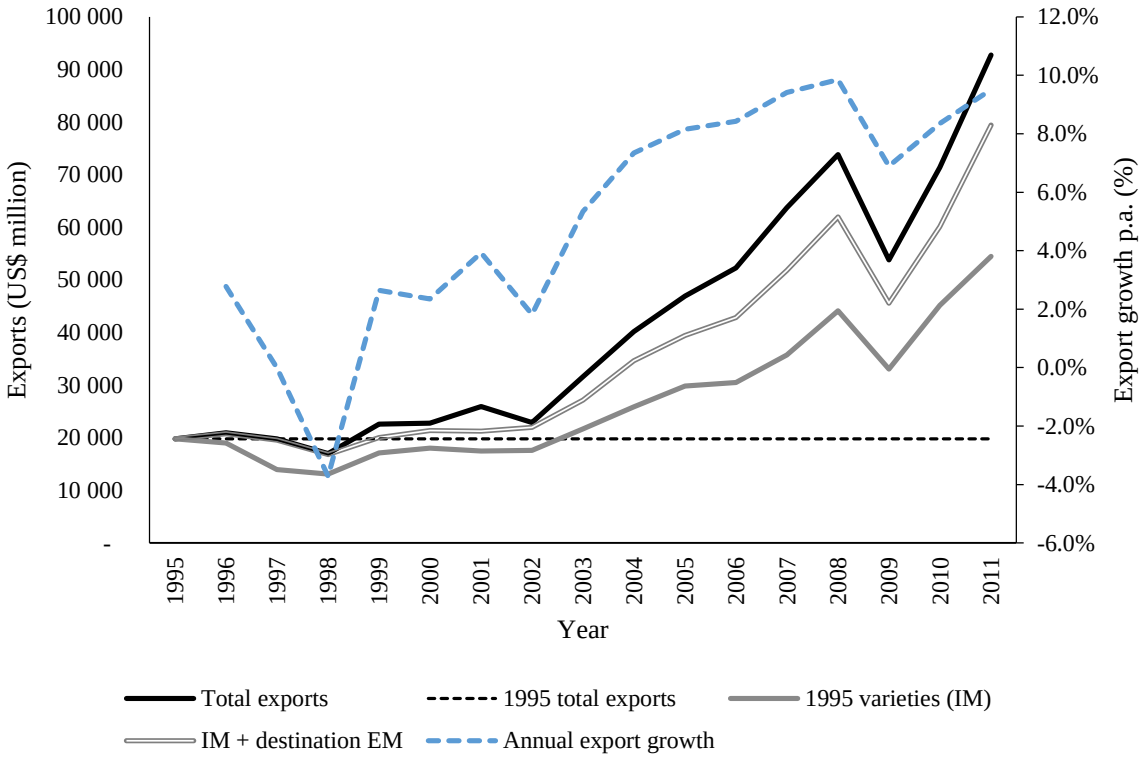

Figure 5: Decomposition of South Africa's total exports, 1995-2011
Source: UN COMTRADE – own calculations by author.

A closer inspection of the components of the extensive margin in Table 5 suggests that information or network externalities for existing markets in terms of costs of entry and potential profitability may be important in shaping export patterns. Heterogeneous firm trade theories, for example Helpman, Melitz & Rubenstein (2008), state that the ability of a firm to successfully and hence profitably enter a market depends upon the fixed and variable costs associated with that market relative to the productivity of the firm. Therefore, the more information a firm has on the fixed and variables costs associated with that market the more likely it is to enter that market relative to markets of which it has relatively little information on. The results in Table 5 indicate that the largest components of the extensive margin are 'new products to known destinations' and 'new destinations of known products and destinations' (new varieties). Conversely, the 'known products to new destinations' and 'new products to new destinations' components of the extensive margin are minimal in their

contribution to export growth. Therefore, the majority of extensive margin growth, be it from the product or destination side, is into product or destination markets in which other South African firms have already entered. The possibility of firms benefiting from information and network externalities, in terms of the costs and profitability associated with a market, may explain this pattern of extensive margin growth[69].

A final point of interest described in Table 5 and Figure 5 is that the pattern of South African export growth post-1994 can be divided into two periods. The first period, 1995 to 2001, is marked by sluggish average export growth of 3.9% per annum, whereas exports grew in the later period, 2002 to 2011, at a more rapid average annual rate of 15%. An examination of the intensive and extensive margins provides insights into what's driving export patterns over these two periods. Firstly, in Table 5 it is evident that 'death of initial year varieties' is a significant component of export growth, albeit negative, in the first period. As is evident in Figure 5 the net growth of 1995 varieties (intensive margin) fails to make a positive contribution to export growth over the entire first period. This is due to sluggish growth in surviving varieties and large-scale death of 1995 varieties. Positive additions to export growth in the first period is driven by the product (23.71%) and destination (18.93%) extensive margins. However, the extensive margin growth over this period is not enough to profoundly affect overall export growth.

A second insight is that the rapid expansion of exports in the second period, although experiencing positive contributions from the extensive margin, is driven by export growth along the intensive margin. The intensive margin grew by 183.96% over this period and accounted for 60.20% of export growth. This rapid growth of surviving varieties in a period of robust export growth is in line with findings by Brenton & Newfarmer (2009) and Besedeš & Prusa (2011) who both find that the survival and deepening of existing export relationships to be key to strong export growth. Interestingly, both Brenton & Newfarmer (2009) and Zahler (2011) find that incidences of export success are linked to the intensification of existing exports, whereas export failure is linked to high hazard rates (death of initial varieties). Their findings relate to the two periods of export growth in South Africa's case, which are to a large extent driven by export 'deaths' and the intensification of existing export relationships.

However, this does not discount the importance of the extensive margin, which still accounts for 52.46% of export growth over the entire period of analysis. This extensive margin growth provides evidence of a significant adjustment in the composition of South Africa's exports. Adjustment in the composition of exports in terms of 'what' – new products – and 'where' – new destinations. The section below, which decomposes export growth by the Lall (2010) classification, provides more insight into these compositional changes in the export portfolio.

DECOMPOSITION BY TECHNOLOGICAL-BASED PRODUCT CLASSIFICATION

The Lall (2010) classification is a technology-based product classification in which products are categorised according to their level of technological complexity. Lall (2010) uses export data at the 3-digit SITC level (revision 2) to classify exports into these categories. This paper maps the Lall classification from the 3-digit SITC level to the 6-digit HS (revision 2) level so as to categorise South Africa's product-level exports into the Lall categories. Therefore,

[69] However, one cannot discount the nature of the data employed in this paper. There is a limit to the number of classified product categories (5017) and the number of countries in the world. If a country is exporting nearly all of the products and exporting to nearly all of the destinations, there is little room for growth into entirely new product or destination markets.

South Africa's product level export patterns can be assessed using this technology based classification[70].

There are a number of reasons that motivate for the application of this classification. Firstly, Lall (2010) argues that the ability of firms in a country to seek, acquire, modify and efficiently employ technologies is an important factor in determining the structure of the country's exports. This ability is referred to as a country's "technological capability". Lall (2010) maintains that a country's technological capability is an important driver of a country's comparative advantage, competitiveness and hence its export structure. This technology-based classification is useful to this paper, which is interested in changes in the composition and structure of South Africa's exports.

Secondly, and from a policy perspective, different export structures have different implications for growth and domestic industrial development. The ability of a country to change its export structure and shift exports into technology and skill intensive products, offers better prospects for sustainable future growth. These products tend to experience higher trade growth rates, they tend to be highly income elastic, they create new demand, and they offer positive spillover effects in terms of the creation of new skills and general knowledge that can be applied to other activities (Lall 2010). Conversely, less skill- and technology-intensive products are associated with slower growing markets, limited learning potential and less scope for positive spillover effects into other activities. However, these simpler activities can enjoy rapid growth in instances where wages rise and production can be shifted easily from a high wage country to a low wage country. Nevertheless, this growth is a once-off adjustment and once the low wage advantage has been exploited, it is essential to move to technology-intensive activities that offer a sustainable growth path (Lall, 2010). In effect, this relates well to Hausmann, Hwang & Rodrik's (2007) assertion that specialising in some products will bring higher growth than specialising in others – 'what you export matters'.

Thirdly, Lall (2010) states that export structures are path-dependent and difficult to change. This is because they "are the outcome of long, cumulative processes of learning, agglomeration, institution building and business culture" (Lall, 2010). This links with the "product space" arguments put forth by Hausmann & Klinger (2008) who argue that the ability of a country to develop the capability to produce a certain product is related to its current capability in the production of other similar products for which its currently existing productive capabilities can be easily adapted. In other words, if products are trees and a country's are monkeys, a monkey's ability to jump to a new tree depends upon how close the tree it is currently in, is to the tree it wants to jump to. Thus the path-dependent nature of a country's export structure influences changes in the composition and growth of exports.

Finally, the Lall (2010) classification divides products into groups where factor endowments have varying levels of importance in the production of these products. Primary products tend to be unskilled-labour- and scale-intensive. Similarly, Resource-based manufactures tend to be simple and unskilled-labour-intensive. However, there are segments of Resource-based manufactures that employ capital-, scale- and skill-intensive technologies (Lall, 2010). In general, Low-technology manufactures in developing countries are characterised by stable, well-diffused technologies, which are typically embodied in the capital equipment. The labour skill requirements are relatively basic. Lall (2010) classifies Medium-technology manufactures as capital and intermediate products produced using skill-, scale- and capital-intensive technologies. They are characterised by complex technologies with moderately

[70] This is not the first study in South Africa to apply the Lall (2010) classification in the analysis of export structures – Edwards & Alves (2006) have employed it too.

high levels of R&D, advanced skill needs and long learning periods. High-technology manufactures incorporate advanced and fast-changing technologies with high R&D investments. Production requires sophisticated technology infrastructure and high levels of specialised skills. The factor intensity of these technology-based groups is relevant because the final section of analysis is concerned with whether there is a factor bias in South Africa's export patterns along the growth margins.

In Table 6 South Africa's export growth over the period 1995 to 2011 is decomposed into the intensive and extensive margins by Lall (2010) classification. The top part presents the intensive and extensive margin shares of export growth across each of the Lall categories. This gives an idea what is driving export growth in each of the Lall categories. The bottom part shows the sources of total export growth – what is driving total export growth.

Export growth in the primary product category is the main contributor to growth along both the product and destination extensive margins. As mentioned above, exports in this sector have grown at 12.9% per annum – the fastest of all Lall categories – contributed 40.8% of total export growth – the largest contributor – and of all the Lall categories, comprise the greatest share of exports in 2011 – 36.8%. Approximately 75% of the export growth in primary products is a result of extensive margin growth, which is the highest across all Lall categories. The destination and product extensive margins account for 38.1% and 36.9% of export growth in primary products, respectively. Furthermore, the destination and product extensive margins account for 46% and 83% of total growth in each of these margins, respectively. Therefore, the primary product category is a significant contributor to export growth in South Africa and the main driver of export growth along the extensive margin.

However, closer inspection reveals that growth in primary product exports across the intensive, destination extensive and product extensive margins is concentrated in terms of what is exported and where it is exported. The smallest component of export growth in primary products is the intensive margin (25%). Nevertheless, this still accounts for a substantial share of total export growth (10.2%). Peering behind the results presented in Table 6 one finds that 8 of the 675 primary products exported by South Africa[71] account for 92.8% of the intensive margin growth in primary products. The main intensive margin export is "Bituminous coal, not agglomerated"[72], which accounts for 67.1% of growth along this margin. The other key products are aluminium-based products[73] and agricultural products[74], which account for 14.5% and 11.3% of intensive margin growth, respectively. The destination – the 'where' – of this intensified export growth is concentrated in 16 countries[75], which account for 80.6% of the intensive margin growth in primary products. The majority of the exports of the aluminium-based products and the agricultural products mentioned above, goes to developed countries[76]. However, the export of "Bituminous coal, not agglomerated" is more concentrated in developing countries, in particular, China and India, which account for 61.6% of intensive margin growth in this product.

[71] As per the 6-digit HS classification.
[72] Product code – 270112.
[73] "Aluminium unwrought, not alloyed" (760110) and "Plate, sheet or strip, aluminium alloy, rect or." (760612)
[74] "Fresh grapes" (080610), "Oranges, fresh or dried" (080510), "Maize (excl. seed)" (100590), "Other nuts, fresh or dried, nes" (080290) and "Non-conifferous wood in chips or particles" (440122).
[75] This is 16 of the 144 countries South Africa has continued to export primary products to over the period 1995 to 2011.
[76] Japan, United States of America, United Kingdom, Republic of Korea, Netherlands, Israel, Hong Kong (China), UAE and Italy

Table 6: The margins of South Africa's export growth by Lall (2010) classification

Lall (2010) classification	(1) Export growth	(2) Growth of surviving varieties	(3) Death of initial year varieties	(4) New destination of known countries and products	(5) New destination, existing products	(6) New products, known destination	(7) New product and destination	(2)-(3) Net growth of initial year varieties (intensive)	(4)+(5) New destinations (extensive)	(6)+(7) New products (extensive)
Intensive and extensive margin share of export growth within Lall (2010) classification grouping										
Primary products		28,7%	-3,8%	38,1%	0,0%	36,9%	0,0%	25,0%	38,1%	36,9%
Resource-based manufactures		72,4%	-6,6%	25,0%	0,0%	9,2%	0,0%	65,8%	25,0%	9,2%
Low tech manufactures		84,0%	-51,5%	67,1%	0,2%	0,1%	0,0%	32,5%	67,3%	0,1%
Medium tech manufactures		70,3%	-5,1%	33,5%	0,0%	1,3%	0,0%	65,2%	33,5%	1,3%
High tech manufactures		54,5%	-6,5%	51,5%	0,4%	0,0%	0,0%	48,1%	51,9%	0,0%
Intensive and extensive margin share of total export growth by Lall (2010) classification grouping										
Primary products	40,8%	11,7%	-1,5%	15,5%	0,0%	15,1%	0,0%	10,2%	15,6%	15,1%
Resource-based manufactures	27,9%	20,2%	-1,9%	7,0%	0,0%	2,6%	0,0%	18,3%	7,0%	2,6%
Low tech manufactures	2,4%	2,0%	-1,2%	1,6%	0,0%	0,0%	0,0%	0,8%	1,6%	0,0%
Medium tech manufactures	26,0%	18,3%	-1,3%	8,7%	0,0%	0,3%	0,0%	17,0%	8,7%	0,3%
High tech manufactures	2,4%	1,3%	-0,2%	1,2%	0,0%	0,0%	0,0%	1,2%	1,3%	0,0%
Total	**100,00%**	**53,7%**	**-6,2%**	**34,1%**	**0,0%**	**18,3%**	**0,0%**	**47,5%**	**34,2%**	**18,3%**

Source: UN COMTRADE – own calculations by author.

Notes: The top panel provides the estimates for the contribution of each margin to export growth within each Lall (2010) classification category. The bottom panel provides the estimates for the contribution of each margin by each Lall (2010) classification category to total export growth. Contributions to total export growth do not sum to 100 percent because products not allocated in the Lall (2010) classification have been left out – they comprise between 0.3 and 0.4 percent of total South African exports.

The destination component of the extensive margin for primary products must be interpreted with some caution. It is the largest component of primary product export growth (38.1%) and the main driver of total export growth along the destination extensive margin (15.6%). However, the magnitude of growth along this margin is likely to be biased by a data classification issue concerning the export of "Gold in other semi manufactured forms" (710813). This product accounts for 61.1% of destination extensive margin growth in primary products and 27.8% of destination extensive margin growth across all products. In 1995, the details of the destination countries for exports of this product are recorded. However, in 2011, the details of the destination countries are omitted and instead grouped under the partner country classification 'unspecified". The implication is that the decomposition technique captures all of this products export growth as destination extensive margin growth because details of the destinations in the final period are not provided and thus the partner country classification 'unspecified' is treated as a new destination. Therefore, it is likely that the export growth of this product would be distributed across the intensive margin (continued export of this product in existing export relationships) and the destination extensive margin (exports of this products to new destinations). However, the nature of this distribution is unknown and thus destination extensive margin growth in primary products must be interpreted with some caution.

Nevertheless, a similar pattern of concentrated export growth in primary products along the intensive margin is evident in the remaining export growth along the destination extensive margin. A closer look at the data show that 31 primary products[77] account for 86.0% of the remaining destination extensive margin growth. These are products that South Africa has exported in the initial period (1995 – known products) and are being exported in the final period (2011) to a new destination for that specific product but not for South African exports in general. The data show that the destination extensive margin is less concentrated in terms of products and destinations when compared to the intensive margin. This is to be expected since the extensive margin by definition is implying diversification (even though the pattern of the diversification is concentrated).

Export growth in primary products along the product extensive margin is almost exclusively driven by the export of platinum and 'platinum group' metals[78]. Closer inspection of the data reveal that 8 new primary products account for 15.1% of total export growth. This export growth is concentrated across 7 destinations (95.5%) with these destinations being primarily developed countries (93.4%). This growth of primary products along the product extensive margin represents the majority of growth along this margin (82.5%) and thus is almost entirely driven by the discovery of platinum in South Africa.

Resource-based manufactured products are second to primary products in terms of contribution to total export growth over the period and share of exports in 2011 (see Table 4). Table 6 shows that growth in exports of resource-based manufactured products is driven by growth along the intensive margin (65.8%) and that this growth accounts for 18.3% of total

[77] The main primary products are "Bituminous coal, not agglomerated" **(**270112**),** "Aluminium unwrought, not alloyed" (760110), "Plate, sheet or strip, aluminium alloy, rect or." (760612), "Waste & scrap of gold, incl. mtl clad w gold, excl. sweepings" (711210), "Plates, sheet, strip and foil, nickel, not alloy" (750610), "Tubes and pipe, aluminium alloy" (760820), "Oranges, fresh or dried" (080510), "Maize (excl. seed)" (100590), "Greasy, shorn wool, not carded or combed" (510111) and "Petroleum oils and oils obtained from bituminous minerals" (270900).

[78] 'Platinum group' metals refer to metals found in platinum ores. In addition to platinum ("Platinum in other semi manufactured forms" (711019); "Platinum unwrought or in powder form" (711011)), South Africa, is exporting a large amount of palladium ("Palladium unwrought or in powder form" (711021); "Palladium in other semi manufactured forms" (711029)"), rhodium ("Rhodium unwrought or in powder form" (711031); "Rhodium in other semi manufactured forms" (711039)"), ruthenium, osmium and iridium ("Iridium, osmium and ruthenium unwrought or in powder form" (711041); "Iridium, osmium and ruthenium in other semi manufactured forms" (711049)").

export growth in South Africa – the largest margin by Lall category. A closer examination of the data finds that 88.5% of this growth is concentrated in 15 resource-based manufactured products. These resource-based manufactured products are mostly mineral-based products. The two dominant products are "Agglomerated iron ores and concentrates" (260112) and "Chromium ores and concentrates" (261000), which account for 46.0% and 8.6% of intensive margin growth in resource-based manufactures, respectively. This export growth is also concentrated in terms of destination market, with close to half of these exports being shipped to China[79].

The destination and product extensive margins account for a smaller share of export growth in resource-based manufactures – 25% and 9.2%, respectively. However, they still account for 7.0% and 2.6% of total export growth, respectively. Although relatively small, the product extensive margin for resource-based manufactures is the second largest source of total export growth along the product extensive margin. As is the case with the product extensive margin for primary products, export growth along this margin for resource-based manufactures is concentrated in a few products. "Petroleum oils, etc, (excl. crude)/ preparations thereof, nes" (271000), "Niobium, tantalum and vanadium ores and concent" (261590) and "Precious metal ores and concentrates" (261690) account for 76.0%, 13.6% and 9.2% of this growth, respectively. The petroleum product is typically exported to Sub-Saharan African countries while the two mineral-based products are mainly exported to developed markets. The destination extensive margin is much less concentrated in terms of what products are exported and where they are exported to. Three-quarters of growth along this margin is accounted for by 45 products exported to a large number of destinations.

The export pattern displayed in Table 4 and Table 6 would be looked upon unfavourably by the likes of Hausmann, Hwang & Rodrik (2007), Prebisch (1950) and Sach & Warner (1995; 2001). Table 6 reveals that 69% of South Africa's export growth is a result of increased exports of natural resource intensive products – primary products and resource-based manufactures. In particular, growth along the product extensive margin – the margin indicating a shift toward new products – is concentrated in platinum, 'platinum group' products and petroleum. If Hausmann et al. (2007) are correct in saying that 'what you export matters' and that a country is better off exporting 'rich country products' (products associated with higher levels of productivity and technology), then the prominence of these natural resource intensive products does not present a favourable picture for South Africa's future economic development. The importance of natural resource intensive products in the composition and growth of South Africa's export over the period would also concern the likes of Prebisch (1950) and Sach & Warner (1995; 2001) due to terms of trade and 'natural resource curse' considerations, respectively.

However, Hausmann et al. (2007) would express a more favourable response to the performance of medium technology product exports in South Africa. Medium-technology products constitute South Africa's largest and fastest growing 'pure manufacturing' sector as well as the only one of these sectors to increase its share of exports over the period. Growth in medium-technology product exports is driven by the intensification of existing trade relationships – the intensive margin accounts for 65.2% of this growth. Table 6 shows that intensive margin growth in medium-technology products is the second largest source of export growth in South Africa (behind intensive margin growth of resource-based manufactures). The most sizeable medium-technology products are automobiles, filtering and purifying equipment, pumps and iron related manufactures – 22 of these products account for 80.7% of the intensive margin growth. Upon closer inspection, it is interesting to

[79] In particular, 32.7% of this growth is due to exports of "Agglomerated iron ores and concentrates" (260112) to China.

see that the range of destinations for medium technology-products is more extensive than that for primary and resource-based manufactured products. In particular, a substantial percentage of these products are exported to Sub-Saharan African countries[80].

The size of the destination and product extensive margins relative to the intensive margin for medium-technology manufactures suggests that there has been little 'discovery' and rather geographic dispersion of established products. The product extensive margin is relatively unimportant – only accounting for 0.3% of export growth in medium-technology products. The destination extensive margin accounts for 33.5% of the growth in medium-technology exports and 8.7% of total export growth. The growth of medium-technology products along the destination extensive margin is essentially the growth of medium-technology products that were exported in 1995 but which have now been entered into new destination markets. This aligns with the 'product life cycle' description offered by Brenton & Newfarmer (2009) where following the "discovery phase", firms enter into the "rapid growth phase" where they exploit existing and new destination markets. It is also interesting to note that there is a greater level of dispersion of export growth across medium-technology products when compared to primary products and resource-based manufactures.

Exports performance in low-technology products can be described as slow (at 3.0% per annum, it is the slowest growing product group), declining (share of exports since 1995 has fallen from 13.4% to 4.7%) and minimal (accounts for 2.4% of export growth over the period). Table 6 shows that there has been virtually no product 'discovery' in low-technology products (0.1% of growth due to product extensive margin). However, much of the adjustment of low-technology product exports has been along the intensive (32.5%) and destination extensive margins (67.3%). A closer look at intensive margin growth shows that a large number of export relationships in low-technology products have 'died' over the period 1995 to 2011 – this accounts for declining growth of 51.5%[81]. It could be suggested that much of this decline may be a result of the rapid growth of low-technology Chinese exports. Table 6 may provide a clue to the response of South African firms – an intensification of existing relationships that survived (84.0% of growth) and the creation of new export relationships by moving to new destination markets (67.3% of growth). Nevertheless, low-technology products represent a declining sector in the South African economy. This is worrying in light of a large surplus of low-skilled labour in South Africa, since the production of these products and are typically low-skill-intensive.

In addition, from the perspective of Hausmann, Hwang & Rodrik (2007), the relative insignificance of high-technology product exports is also concerning. The expectation that this product grouping would be characterised by greater product discovery – even if it is merely the imitation of products already innovated by developed countries – would not be unrealistic. In fact, these are the type of products that Hausmann et al. (2007) would prescribe for developing economies seeking to industrialise and grow. The product extensive margin for high-technology products is practically zero[82]. As with low-technology product exports much of the adjustment is taking place along the intensive margin and the destination extensive margin. This suggests producers of high-technology products are trying to expand exports by intensifying existing trade relationships and expanding to new destination markets.

The next section explores whether there is a factor bias to export growth along the different margins of growth.

[80] This may provide some initial insight into possible inter-industry trade patterns along the lines of Heckscher-Ohlin.
[81] In fact, none of the other Lall (2010) categories have experienced such significant decline in exports due to "dying" export relationships.
[82] There are 4 new high-technology products being exported by South Africa. However, they represent negligible share of export growth.

REVEALED FACTOR INTENSITY AND EXPORT GROWTH MARGINS

This section uses regression analysis to determine whether there is a factor bias to export growth along the intensive and extenisve margins of growth. The regressions are estimated using ordinary least squares (OLS). Three cross-sectional regressions are estimated – one for each of the three measures of the dependent variable – across two samples – total exports and 'pure' manufacturing exports[83]. The three dependent variable measures are:

- Value of exports for product j in the final period (2011)
- Value of net intensive margin growth in product j between 1995 and 2011
- Value of net extensive margin growth in product j in the final period (2011)[84]

As mentioned in Section III, export values are measured using 6-digit HS product level data from UN COMTRADE. The independent variables are revealed factor intensity measures constructed by UNCTAD (Shirotori, Tumurchudur & Cadot, 2010). Each 6-digit HS product has a revealed factor intensity measure for human capital, physical capital and natural resources. Therefore, the regressions should provide an indication on whether there is a bias to export growth along the intensive and extensive margins in terms of these factors.

The three regressions can be represented by the following equations:

$$ln\left(X_j^{t_1}\right) = \beta_0 + \beta_1 ln(rhci)_j + \beta_1 ln(rci)_j + \beta_1 ln(rnri)_j + \varepsilon_j$$

Where$X_j^{t_1}$ is the value of exports for product j in the final period, t_1. $rhci$, rci, and $rnri$ are the revealed human capital index, revealed physical capital index and the revealed natural resource index, respectively. ε_j represents the error term.

$$ln\left(X_{jIM}^{t_0 \wedge t_1}\right) = \beta_0 + \beta_1 ln(rhci)_j + \beta_1 ln(rci)_j + \beta_1 ln(rnri)_j + \varepsilon_j$$

Where $X_{jIM}^{t_0 \wedge t_1} = X_{jSURV}^{t_1} - X_{jSURV}^{t_0}$, which is the value of intensive margin growth for varieties within product category j between the initial period, t_0, and the final period, t_1[85]. This regression is weighted using the initial period (1995) export value for each product as the weight[86].

$$ln\left(X_{jEM}^{t_1}\right) = \beta_0 + \beta_1 ln(rhci)_j + \beta_1 ln(rci)_j + \beta_1 ln(rnri)_j + \varepsilon_j$$

Where $X_{jEM}^{t_1}$ is value of net extensive margin[87] growth of varieties within product category j in the final period, t_1. The extensive margin dependent variable is normalised[88] so as to account for product category size effects.

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[83] 'Pure' manufacturing comprises products classified as low-technology, medium-technology and high-technology according to the Lall (2010) classification.

[84] The intensive and extensive margin growth variables measure net growth in a product category because the unit of analysis applied in this paper is the product-destination combination or 'variety'. Therefore, within a product category there may be product-destination combinations that continue over the entire period of analysis (intensive margin growth), or cease to exist after the initial period (intensive margin death), or new product-destination combinations arise (extensive margin). Each dependent variable measures the net growth of each margin within a product category.

[85] In this case the intensive margin is measured as the sum of exports values for surviving varieties within a product category in period t_1 less the value of surviving varieties within that same product category in period t_0. The sum of 'dying' varieties is not included in the calculation of the intensive margin.

[86] This controls for the size of trade for each product.

[87] Extensive margin growth is the sum of destination and product extensive margin growth.

[88] The z-score method for standardising a variable is applied.

The dependent and explanatory variables across the three regressions are transformed into their natural log form so as to counter the effect of outliers.

Table 7 presents the results of these regressions. The estimates in columns (1), (2) and (3) are for the regressions using the entire sample of exported products while those in columns, (4), (5) and (6) are for the regressions using the sample of manufactured products.

Table 7: Results for OLS regression

	Total Exports			Manufacturing exports		
	(1)	(2)	(3)	(4)	(5)	(6)
Variables	Final year exports	Intensive margin	Extensive margin	Final year exports	Intensive margin	Extensive margin
ln_rhci	1.435***	-0.073	-0.181	2.464***	5.844***	0.206
	[0.459]	[2.523]	[0.231]	[0.591]	[1.764]	[0.182]
ln_rci	-0.176	0.153	0.024	-0.029	-1.099***	-0.040
	[0.143]	[0.740]	[0.059]	[0.187]	[0.369]	[0.062]
ln_rnri	1.403***	1.042***	0.097**	1.815***	0.981**	0.265***
	[0.130]	[0.266]	[0.045]	[0.180]	[0.413]	[0.077]
Constant	-6.744***	-10.344**	-0.702*	13.991***	-8.023*	-2.186***
	[1.407]	[4.661]	[0.397]	[1.735]	[4.598]	[0.672]
Observations	4,392	3,749	4,330	2,766	2,429	2,721
R-squared	0.041	0.054	0.002	0.082	0.166	0.008

Notes: Robust standard errors in brackets. *** p<0.01, ** p<0.05, * p<0.1. The regressions for 'Intensive margin' are weighted by the value of exports for each product in the initial year. The Huber and White robust estimator of variance is applied in the regressions.

The estimates for final year exports, columns (1) and (4), indicate that the export value of a product is positively determined by the human capital intensity and natural resource intensity embodied in the production of that product. The coefficient for the human capital intensity is significant at the 1% level and suggests that a 1% increase in the human capital intensity embodied in the production of a product results in a 1.4% increase in the value of exports of that product. Similarly, with the natural resource intensity variable, which suggests that a 1% increase in the natural resource intensity embodied in the production of a product results in a 1.4% increase in the value of exports of that product. The coefficients (significant at the 1% level) for the manufacturing sample show that these positive effects not only hold, but are larger for the manufacturing sample. The estimates in columns (1) and (4) have negative coefficients for the revealed physical capital intensity variable, suggesting that the greater the capital intensity embodied in an exported product the lower the value of that exported product. However, these coefficients are not significant.[89]

A key result from columns (2) and (5) is that in products where export relationships survive[90], the higher the natural resource intensity embodied in the production of the product, the greater the level of intensive margin growth for that product. This relationship hold across

[89] These results, although not significant, run counter to the findings in Alleyne & Subramanian (2001), who find that through its trade pattern, South Africa is revealed to be capital abundant and thus adopt capital-intensive production techniques. Nevertheless, Alleyne & Subramanian (2001) implement the factor content and the commodity composition approaches to test the factor intensity of trade. The dependent variable in these approaches is net exports over total trade, which is different to the dependent variable applied in this instance – the value of exports.

[90] Product-destination combinations (or varieties) within a product category that survive over the period.

the sample for exports of all products, column (2), and exports of manufactured products, column (5), with the effect being slightly smaller for the latter. The coefficients for revealed human capital intensity and revealed physical capital intensity in the intensive margin regression for total exports, column (2), are not statistically significant.

However, the statistically significant coefficients for the revealed human capital intensity and revealed physical capital intensity variable in column (5) suggest that these factor intensities influence the intensive margin growth of manufactured exports. A 1% increase in the human capital intensity embodied in the production of a manufactured product implies that surviving export relationships in that product experience 5.8% higher growth. However, a 1% increase in the physical capital intensity embodied in the production of a manufactured product implies that surviving export relationships in that product experience 1.1% lower growth.

Finally, the results in columns (3) and (6) imply that when new markets are entered and new export relationships are created (extensive margin), the relationships that involve products that are more natural resource intensive experience higher levels of export growth. Surprisingly, the positive effect is greater in manufacturing product exports than with total product exports. The coefficients controlling for the human capital intensity and the physical capital intensity are not statistically significant across both samples. This implies that the human and physical capital intensity embodied in a product does not influence the level of extensive margin growth of that product.

V. CONCLUSION

The key objective of this paper is to acquire a deeper understanding of the dimensions, composition and dynamics of South Africa's export flows. This is achieved by examining the extent to which the intensive and extensive margins of growth are driving export patterns. Further investigation into the extensive margin explores whether the destination entry into new product markets – the 'what' – and entry into new destination markets – the 'where' – are driving the extensive margin. Finally, this paper tests whether there is a factor bias to these margins of export growth.

The analysis of aggregate trade flows indicates that South Africa's export performance is dependent on its abundance of natural resources. Primary product and resource-based manufacturing exports account for two-thirds of South Africa's exports in 2011 and just over two-thirds of export growth between 1995 and 2011. The other main export category is medium-technology manufactured products, which is the main driver of 'pure manufacturing' exports in South Africa. In terms of where South African firms are exporting to, it is very much a story of a shift toward the 'east' whilst a declining, yet still significant, importance of Europe. Other major export destinations are located in the North American and Sub-Saharan African regions.

The product-variety style decomposition analysis in Section IV describes the sources of South Africa's export growth in terms of growth margins. Contrary to the literature, which finds that in developing countries, on average, the intensive margin accounts for a greater share of export growth than the extensive margin[91], in South Africa the extensive margin drives export growth. However, the relative importance of the extensive margin must be interpreted with some qualifications. Firstly, from a data perspective, the destination component of the extensive margin may be over-estimated and the intensive margin under-estimated – the magnitudes of which are impossible to determine. This issue arises as a result of the destination details for exports of the product "Gold in other semi manufactured forms" (710813) being classified as 'unspecified' in 2011. The relative magnitude of this products export value implies that a more accurate classification of its growth may significantly alter the intensive and destination extensive margin shares of growth. Secondly, from an economic development perspective along the lines of Hausmann, Hwang & Rodrik (2007), the high concentration of export growth in resource-based products as opposed to technology-intensive manufacturing products is not necessarily a favourable growth pattern.

Nevertheless, expansion into new export markets – extensive margin growth – is still revealed to an important driver of export growth in South Africa. The results indicate that expansion into new destination markets accounts for a greater share of export growth than expansion into new product markets. This ties in with Brenton & Newfarmer (2009) who say that Hausmann et al. (2007) overstate the importance of the product extensive margin – 'what' a country exports – and do not place enough emphasis on another (possibly a more important source of export growth) the destination extensive margin – 'where' a country exports. The finding that the destination extensive margin accounts for a greater share of export growth than the product extensive margin is also consistent with the literature.

An interesting dynamic of South Africa's export growth is evident when one examines the path of this growth over time. There are two distinct periods of export growth since 1995. The first period, 1995 to 2001, is characterised by minimal export growth, which is largely due to a declining intensive margin driven by the death of 1995 export relationships. The

[91] See Section II for discussion on the relevant literature.

extensive margin keeps export growth positive over this period. The second period, 2002 to 2011, is characterised by relatively rapid export growth driven by both the intensive and extensive margins with the former accounting for 60.20% and the latter 39.80% of this growth, respectively. Export growth performance in these two periods align with the findings of Brenton & Newfarmer (2009), Besedeš & Prusa (2011) and Zahler (2011). They find that incidences of export success are linked to the survival and intensification of existing export relationships, whereas export failure is linked to high hazard rates (death of initial varieties).

The results for the product-variety style decomposition by Lall (2010) classification reiterates the resource dependency of South Africa's export structure. Primary product and resource-based manufacturing products account for 68.7% of export growth between 1995 and 2011. Three-quarters of total extensive margin growth is accounted for by exports of products from these two Lall categories. Closer inspection of the products and destinations that comprise the export relationships driving export growth in these two Lall categories, shows that this export growth is concentrated in a small number of product categories to a small number of destinations[92]. Most striking is the findings that export growth along the product extensive margin is almost solely driven by the discovery of platinum and the export of platinum and 'platinum group' products to developed countries.

As mentioned earlier the prominence of resources-based exports in the composition and growth of South Africa's exports would concern the likes of Hausmann et al (2007). Hausmann et al. (2007) would argue that the 'discovery' of technology-intensive products and hence moving away from 'poor country goods' towards 'rich country goods' is a key factor in the economic development process. Export 'discovery' in the South African case is almost entirely concentrated in resource-based products. The likes of Hausmann et al (2007) and Hausmann & Klinger (2008) would argue that this resource dominated export structure may partially explain South Africa's relatively sluggish economic performance over the period. Similarly, studies by Prebisch (1950) and Sachs & Warner (1995; 2001) would also provide a cautionary tale concerning a resource dominated export structure.

The focus of Hausmann et al (2007) on 'rich country goods', Prebisch (1950) on the terms of trade constraints imposed by natural resource exports, and Sachs & Warner (1995; 2001) on the 'natural resource curse" all focus 'what' a country is exporting. However, Lederman & Maloney (2009; 2012) finds empirical and case study evidence suggesting that natural resource exports are not necessarily a 'curse' but possibly a 'blessing'. They emphasise the importance of 'how' a country exports – the processes, the technology, the linkages with other sectors, the externalities, and the Research and Development embodied in the production of these exports - as being critical to export and economic performance. However, they also caution that the 'resource curse' should in fact be termed the 'concentration curse' and that should invoke concern for South Africa's current export structure, which is very concentrated in resource-based products. From a policy perspective, facilitating the 'resource blessing' is of key importance.

Exports growth in 'pure manufacturing is driven by exports of medium-technology products. An interesting dynamic is present in this grouping of exports. Growth is driven along the intensive and extensive margins. This aligns with the 'product cycle' framework found in Brenton & Newfarmer (2009). Following the first phase – the 'discovery of an export product – the product moves into a 'rapid growth' phase where exports are intensified in existing export relationships (intensive margin) and expanded into new destination markets (destination extensive margin). This pattern is evident in both the growth of resource-based

[92] It could be argued that these product-country level findings may align with the firm level findings such as those by BJRS (2007) who find that a disproportionately small number of firms account for a disproportionately large amount of exports.

and medium-technology manufactured products where the intensive and destination extensive margins are key to growth of these products. This suggests that the destination extensive margin – the 'where – plays an important part in the evolution of export patterns over time.

The resource dependency of South Africa's export patterns is confirmed by the regression analysis in Section IV. The regressions in Table 7 show that the natural resource intensity of a product is a significant determinant of export patterns – the value of exports in 2011, intensive margin growth and extensive margin growth – in the South African context. It is also interesting to see that the human capital intensity of an export product is positively related to the intensive margin of export growth in manufactured products. This is worrying in light of the surplus of unskilled labour in the South African economy. However, it is of concern that the physical capital intensity of an exported product does not significantly determine South African export patterns. This runs contrary to Alleyne & Subramanian (2001) who find that the factor intensity of South Africa's net exports reveal it to be capital abundant.

In light of this last concern, more nuanced econometric analysis into the relationship between the factor intensity of exported products and the growth margins is an interesting avenue to take this paper forward. In addition, extending the variety style decomposition analysis to a multiple country analysis so as to allow for a cross-country comparative perspective would be interesting. Another avenue along which to take this study forward is to further explore export patterns along the 'product lifecycle' framework by Brenton & Newfarmer (2009). The current variety style decomposition analysis provides insight into the 'discovery' (product extensive margin), 'rapid growth' (intensive and destination extensive margins) and 'declining' (death of product destination varieties) phases but not the 'maturation' phase. The 'maturation' phase is where firms maintain market share in the face of increasing competition by improving quality and productivity. Analysis of export growth along the price margin may provide insight into this phase of the 'product lifecycle' framework.

REFERENCES:

AGOSIN, M.R. 2007. Export diversification and growth in emerging economies. *Working Paper 233*. Departmento de Economía, Universidad de Chile, Santiago.

ALLEYNE, T. & SUBRAMANIAN, A. 2001. What does South Africa's pattern of trade say about its labour market? *IMF Working Paper WP/01/148*.

AL-MARHUBI, F. 2000. Export diversification and growth: an empirical investigation. *Applied Economic Letters*. 7(9): 559-562. http://dx.doi.org/10.1080/13504850050059005

AMITI, M. & FREUND, C. 2010. The anatomy of China's export growth. In China's Growing Role in World Trade. Feenstra, R.C. & Wei, S. Eds. Chicago: University of Chicago Press. 35-36.

AMURGO-PACHECO, A. & PIÉROLA, M.D. 2008. Patterns of export diversification in developing countries: intensive and extensive margins. *Policy Research Working Paper 4473*. The World Bank.

ANDERSON, J.E. & VAN WINCOOP, E. 2003. Gravity with gravitas: a solution to the border puzzle. The *American Economic Review*. 93(1): 170-192. Available: http://www.jstor.org/stable/3132167 [2012, January 10]

BALDWIN, R.E. 1969. The case against infant-industry tariff protection. *Journal of Political Economy*. 77(3): 295-305. Available: http://www.jstor.org/stable/1828905 [2013, June 14]

BALDWIN, R.E. & DI NINO, V. 2006. Euros and zeros: the common currency effect on trade in new goods. *NBER Working Paper 12673*. http://www.nber.org/papers/w/12673

BALDWIN, R. & HARRIGAN, J. 2011. Zeros, quality, and space: trade theory and trade evidence. *American Economic Journal: Microeconomics*. 3(2): 60-88. doi:10.1257/mic.3.2.60

BASTOS, P. & SILVA, J. 2010. The quality of a firm's exports: where you export matters. *Journal of International Economics*. 82(2): 99-111. doi:10.1016/j.jinteco.2010.07.001

BELL, T., FARRELL, G. & CASSIM, R. 2002. Competitiveness, international trade and finance in a minerals-rich economy: The case of South Africa. In *Finance and competitiveness in developing countries*. Fanelli, J.M. & Medhora, R., Eds. USA: Routledge. 181-221.

BERNARD, A.B., JENSEN, J.B., REDDING, S.J. & SCHOTT, P.K. 2007. Firms in international trade. The Journal of Economic Perspectives. 21(3):105-130. Available: http://www.jstor.org/stable/30033737 [2010, May 6]

BERNARD, A.B., JENSEN, J.B., REDDING, S.J. & SCHOTT, P.K. 2009. Trade, product turnover and quality: The margins of US trade. *American Economic Review*. 99(2): 487-493

BERNARD, A.B., REDDING, S.J. & SCHOTT, P.K. 2007. Comparative advantage and heterogeneous firms. *Review of Economic Studies*. 74: 31-66.

BESEDEŠ, T. & PRUSA, T.J. 2011. The role of extensive and intensive margins and export growth. Journal of Development Economics. 96(2011):371—379. doi:10.1016./j.jdeveco.2010.08.013

BINGZHAN, S. 2011. Extensive margin, quantity and price in China's export growth. China Economic Review. 22(2011):233-243. doi:10:1016/j.chieco.2011.01.007

BRENTON, P. & NEWFARMER, R. 2009. Watching more than the discovery channel to diversify exports. In *Breaking into New Markets: Emerging Lessons for Export*

Diversification. Newfarmer, R., Shaw, W. & Walkenhorst, P. Eds. Washinton, DC: The International Bank for Reconstruction and Development/ The World Bank. 111-124.

BRENTON, P., NEWFARMER, R., SHAW, W. & WALKENHORST, P. 2009. Breaking into new markets: overview. In *Breaking into New Markets: Emerging Lessons for Export Diversification*. Newfarmer, R., Shaw, W. & Walkenhorst, P. Eds. Washinton, DC: The International Bank for Reconstruction and Development/ The World Bank. 1-35.

BRODA, C. & WEINSTEIN, D.E. 2006. Globalisation and the gains from variety. *The Quarterly Journal of Economics*. 121(2): 541-585. Doi:10.1162/qjec.2006.121.2.541.

CADOT, O., CARRÉRE, C. & STRAUSS-KAHN, 2011. Export diversification: what's behind the hump? *The Review of Economics and Statistics*. 93(2): 590-605.

CHANEY, T. 2008. Distorted gravity: the intensive and extensive margins of international trade. *American Economic Review*. 98(4): 1707-1721. http://www.aeaweb.org/article.php?doi=10.1257/aer.98.4.1707

CUDDINGTON, J.T., LUDEMA, R. & JAYASURIYA, S.A. 2007. Prebisch-Singer redux. In *Natural Resources. Neither Curse nor Destiny*. D. Lederman & W.F. Maloney, Eds. Washinton, DC: The International Bank for Reconstruction and Development/ The World Bank. doi:10.1596/978-0-8213-6545-8

DEBAERE, P. & MOSTASHARI, S. 2010. Do tariffs matter for the extensive margin of international trade? An empirical analysis. *Journal of International Economics*. 81(2): 163-169. doi:10.1016/j.jinteco.2010.03.005

DEPARTMENT OF TRADE AND INDUSTRY (DTI). 2007. *A National Industrial Policy Framework*. Pretoria: Department of Trade and Industry.

DISDIER, A. & HEAD, K. 2008. The puzzling persistence of the distance effect on bilateral trade. *The Review of Economics and Statistics*. 90(1): 37-48.

EATON, J., KORTUM, S. & KRAMARZ, F. 2004. Dissecting trade: firms, industries, and export destinations. *The American Economic Review*. 94(2): 150-154. Available: http://www.jstor.org/stable/3592873 [2012, May 6].

EATON, J., ESLAVA, M., KUGLER, M. & TYBOUT, J. Export dynamics in Columbia: Firm-level evidence. *NBER Working Paper 13531*. http://www.nber.org/papers/w/13531

EATON, J., KORTUM, S. & KRAMARZ, F. 2011. An anatomy of international trade: evidence from French firms. *Econometrica*. 79(5): 1453-1498. doi:103982/ECTA8318

ECONOMIC DEVELOPMENT DEPARTMENT (EDD). 2010. *The New Growth Path: The Framework*. Pretoria: Economic Development Department.

EDWARDS, L. 2005. Has South Africa liberalised its trade? *South African Journal of Economics*. 73(4): 754-775.

EDWARDS, L. & ALVES, P. 2006 South Africa's export performance: determinants of export supply. *South Africa Journal of Economics*. 74(3): 473-500.

EDWARDS, L. & LAWRENCE, R. 2008. South African trade policy matters. *Economics of Transition*. 16(4):585-608.

EDWARDS, L., RANKIN, N.A. & SCHOER, V. 2008. South African exporting firms: What we do know and what should we know? *Journal of Development Perspectives*. 4(1): 67-92.

EVENETT, S.J. & VENABLES, A.J. Export growth in developing countries: Market entry and bilateral trade flows. Mimeo, http://www.alexandria.unisg.ch/Publikationen/22177

FEENSTRA, R.C. & KEY, H.L. 2007. Trade liberalisation and export variety: a comparison of Mexico and China. *The World Economy*. 30(1): 5-21.

FELBERMAYR, G.J. & KOHLER, W. 2006. Exploring the intensive and extensive margins of world trade. *Review of World Economics*. 142(4): 642-674. doi:10:1007/s10290-006-0087-3

FLAM, H. & NORDSTRÖM, H. 2011. Gravity estimation of the intensive and extensive margins of trade: an alternative procedure with alternative data. *CESIFO Working Paper No. 3387*.

FLATTERS, F. & STERN, M. 2008. Trade and industrial policy in South Africa. *Annual Forum 2008* – South Africa's economic miracle – has the emperor lost his clothes? Development Network Africa.

FRANKEL, J.A. & ROMER, D. 1999. Does trade cause growth? *The American Economic Review*. 89(3): 379-399. Available: http://www.jstor.org/stable/117025 [2013, August 14].

GÓMEZ-HERRERA, E. 2012. Comparing alternative methods to estimate gravity models of bilateral trade. *Empirical Economics*. 43(1): 1-25. doi:10.1007/s00181-012-0576-2

HALLAK, J.C. & SCHOTT, P.K. 2011. Estimating cross-country differences in product quality. *Quarterly Journal of Economics*. 126(1):417-474. doi:10.1093/qje/qjq003

HARRISON, A. & RODRIQUEZ-CLARE, A. 2010. Trade, foreign investment, and industrial policy for developing countries. In *Handbook of Development Economics, Vol. 5*. D. Rodrik & M. Rosenzweig, Eds. The Netherlands: North Holland. 4039-4214.

HAUSMANN, R. & RODRIK, D. 2003. Economic development as self-discovery. *Journal of Development Economics*. 72(2): 603-633. doi:10.1016/S0304-3878(03)00124-X

HAUSMANN, R., PRITCHETT, L. & RODRIK, D. 2005. Growth accelerations. Journal of *Economic Growth*. 10(4):303-329. Available: http://www.jstor.org/stable/40216082 [2013, March 4]

HAUSMANN, R., HWANG, J. & RODRIK, D. 2007. What you export matters. *Journal of Economic Growth*. 12: 1-25. doi10.1007/s10887-006-9009-4

HAUSMANN, R. & KLINGER, B. 2008. South Africa's export predicament. *Economics of Transition*. 16(4): 609-637.

HAUSMANN, R. 2008. Final Recommendations of the International Panel on the Accelerated and Shared Growth Initiative for South Africa (ASGISA). *CID Working Paper No. 161*.

HELPMAN, E., MELITZ, M. & RUBENSTEIN, Y. 2008. Estimating trade flows: Trading partners and trading volumes. *Quarterly Journal of Economics*. 122(2): 441-487.

HERZER, D. & NOWAK-LEHNMANN, F.D. 2006. What does export diversification doe for growth? An econometric analysis. *Applied Economics*. 38(15): 1825-1838. http://dx.doi.org/10.1080/00036840500426983

HESSE, H. 2009. Export diversification and economic growth. In *Breaking into New Markets: Emerging Lessons for Export Diversification*. R. Newfarmer, W. Shaw, & P. Walkenhorst, Eds. Washinton, DC: The International Bank for Reconstruction and Development/ The World Bank. 55-80.

HIDALGO, C.A., KLINGER, B., BARABASI, A.L. & HAUSMANN, R. The product space conditions the development of nations. *Science, New Series*. 317(5837): 482-487. Available: http://www.jstor.org/stable/20037448 [2013, June 14]

HUMMELS, D. & KLENOW, P.J. 2005. The variety and quality of a nation's exports. *The American Economic Review*. 95(3):704-723. Available: http://www.jstor.org/stable/4132736 [2010, September 13]

IMBS, J. & WACZIARG, R. 2003. Stages of diversification. The American Economic Review. 93(1): 63-86. Available: http://www.jstor.org/stable/3132162 [2013, June 24]

KHANDELWAL, A. 2010. The long and short (of) quality ladders. *The Review of Economic Studies*. 77(4): 1450-1476. doi:10.1111/j.1467-937X.2010.00602.x

KLINGER, B. & LEDERMAN, D. 2009. Diversification, innovation, and imitation of the global technological frontier. In *Breaking into New Markets: Emerging Lessons for Export Diversification*. R. Newfarmer, W. Shaw, & P. Walkenhorst, Eds. Washinton, DC: The International Bank for Reconstruction and Development/ The World Bank. 101-110.

KRISHNA, P. & MALONEY, W.F. 2011. Export quality dynamics. *World Bank Policy Research Working Paper No. 5701*.

KRUGMAN, P. 1980. Scale economies, product differentiation, and the pattern of trade. *The American Economic Review*. 70(5): 950-959.

LALL, S., WEISS, J. & ZHANG, J. 2006. The "sophistication" of exports: a new trade measure. *World Development*. 34(2): 222-237. doi:10.1016/j.wordldev.2005.09.002

LALL, S. 2010. The technological structure and performance of developing country manufactured exports, 1985-98. *Oxford Development Studies*. 28(3): 337-369. doi:10.1080/713688318

LAWLESS, M. 2010. Deconstructing gravity: trade costs and extensive and intensive margins. *Canadian Journal of Economics*. 43(4): 1149-1172.

LEAMER, E.E. 1980. The Leontief paradox, reconsidered. Journal of Political Economy. 88(3): 495-503. Available: http://www.jstor.org/stable/1831928 [2012, June 7]

LEDERMAN, D. & MALONEY, W.F. 2007. Neither curse nor destiny: introduction to natural resources and development. In *Natural Resources. Neither Curse nor Destiny*. D. Lederman & W.F. Maloney, Eds. Washington, DC: The International Bank for Reconstruction and Development/ The World Bank. doi:10.1596/978-0-8213-6545-8

LEDERMAN, D. & MALONEY, W.F. 2009. Trade structure and growth. *Breaking into New Markets: Emerging Lessons for Export Diversification*. R. Newfarmer, W. Shaw, & P. Walkenhorst, Eds. Washinton, DC: The International Bank for Reconstruction and Development/ The World Bank. 39-54.

LEDERMAN, D. & MALONEY, W.F. 2012. Does what you export matter? In search of empirical guidance for industrial policies. Washinton, DC: The International Bank for Reconstruction and Development/ The World Bank. doi:10.1596/978-0-8213-8491-6

LERNER, A.P. 1952. Factor prices and international trade. Economica. 19(73): 1-15. Available: http://www.jstor.org/stable/2549912 [2010, April 11]

MELITZ, M.J. 2003. The impact of intra-industry reallocations and aggregate industry productivity. Econometrica. 71(6):1695-1725. Available: http://www.jstor.org/stable/1555536 [2010, May 27]

NATIONAL PLANNING COMMISION (NPC). 2011. *National Development Plan: Vision for 2030*. Pretoria: National Planning Commission.

NAUDÉ, W. & ROSSOUW, R. 2011. Export diversification and economic performance: evidence from Brazil, China, India and South Africa. *Economic Change and Restructuring*. 44(1-2): 99-134. doi:10.1007/s10644-010-9080-1

PACK, H. & SAGGI, K. 2006. Is there a case for industrial policy? *The World Bank Research Observer*. 21(2): 267-297. doi:10.1093/wbro/lkl001

PETERSSON, L. 2005. Export diversification and intra-industry trade in South Africa. *South African Journal of Economics*. 73(4): 785-802.

PREBISCH, R. 1950. The economic development of Latin America and its principal problems. *Economic Commission for Latin America.* United Nations Department of Economic Affairs Publication: New York.

RODRIQUES, F. & RODRIK, D. 2001. Trade policy and economic growth: a sceptic's guide to the cross-national evidence. In *NBER Macroeconomics Annual 2000, Volume 15*. Bernanke, B.S. & Rogoff, K. Eds. MIT Press. 261-338. http://www.nber.org/chapters/c11058

SACHS, J. & WARNER, A. 1995. Natural resource abundance and economic growth. *NBER Working Paper 5398*. http://www.nber.org/papers/w/5398

SACHS, J. & WARNER, A. 2001. Natural resources and economic development: the curse of natural resources. European Economic Review. 45(4-6): 827-838.

SANTOS SILVA, J.M. & Tenreyro, S. 2006. The log of gravity. *The Review of Economics and Statistics*. 88(4): 641-658.

SCHOTT, P.K. 2003. One size fits all? Heckscher-Ohlin specialisation in global production. The *American Economic Review*. 99(3): 686-708. Available: http://www.jstor.org/stable/3132112 [2010, October 18]

SCHOTT, P.K. 2004. Across-product versus within-product specialisation in international trade. Quarterly Journal of Economics. 119(2): 647-678. Available: http://qje.oxfordjournals.org/ [2012, May 23]

SCHOTT, P.K. 2008. The relative sophistication of Chinese exports. *Economic Policy*. 23(53): 5-49. doi:10.1111/j.1468-0327.2007.00195.x

SHEPHERD, B. 2010. Geographical diversification of developing country exports. *World Development*. 38(9):1217-1228. doi:10.1016/j.worlddev.2010.02.005

SHIROTORI, M., TUMURCHUDUR, B. & CADOT, O. 2010. Revealed factor intensity indices at the product level. *Policy Issues in International Trade and Commodities. Study Series No. 44*. New York and Geneva: UNCTAD.

SINGER, H.W. 1950. The distribution of gains between investing and borrowing countries. The American Economic Review. 40(2): 473-485. Available: http://www.jstor.org/stable/1818065 [2013, June 10]

SMET, K. 2007. Stuck in the middle? The structure of trade between South Africa and its major trading partners. *Working Paper No. 115*. Vienna University of Economics & B.A.

THE PRESIDENCY. 2006. *Accelerated and Shared Growth Initiative for South Africa: A Summary*. Pretoria: The Presidency

TREFLER, D. & ZHU, S. C. 2010. The structure of factor content predictions. Journal of International Economics. 82(2): 195-207. doi:10.1016/jinteco.2010.07.006

WACZIARG, R. 2001. Measuring the dynamic gains from trade. *The World Bank Economic Review*. 15(3): 393-429. doi:10.1093/wber/15.3.393

WACZIARG, R. & WELCH, K.H. 2008. Trade liberalisation and growth: new evidence. *The World Bank Economic Review*. 22(2): 187-231. doi:10.1093/wber/lhn007

WINTERS, L.A. 2004. Trade liberalisation and economic performance: an overview. The Economic Journal. 114(493): F4-F21. doi:10.1111/j.0013-0133.2004.00185.x

ZAHLER, A. 2011. Essays on export dynamics. Ph.D. Thesis. Harvard University.

APPENDIX

REVEALED FACTOR INTENSITY (RFI) DATA[93]

The RFI indices database is constructed by UNCTAD (Shirotori, Tumurchudur & Cadot, 2010). The RFI indices estimate the 'revealed' factor intensities of traded products applying a similar methodology to that used by Hausmann, Hwang & Rodrik (2007) when constructing the 'revealed' technology content of trade products – the PRODY index.

Shirotori et al (2010) construct the indices as follows: First, they collected the raw data on national factor endowments of physical capital, human capital and natural resource endowments for countries of which the data was available.

Using aggregate investment data from the Penn World Table (PWT) and the perpetual inventory method approach of Easterly & Levine (2001), the authors construct capital stock levels for countries. They then estimate the annual stock of workers per country indirectly by inferring this estimate from real GDP per worker, GDP per capita and population data from the PWT. They are then able to construct a series of real capital stock per worker for 137 countries over the period 1961 to 2007.

Human capital stock data is measured using a proxy. The authors use Barro & Lee's (2010) yearly data on average years of schooling as the proxy. The dataset from Barro & Lee (2010) only gives values for every five years. However, the authors use a technique of interpolation to obtain yearly measures of human capital for 147 countries from 1950 to 2010.

The natural resource endowment is constructed using data on arable land taken from the World Bank's World Development Indicators (WDI). The authors construct a yearly series of arable land per worker, measured as arable land hectares per person (presented as 1000 hectares per person), which covers 205 countries for the period 1961 to 2007.

Second, using the raw data on national factor endowments, the authors calculated a 'revealed' factor intensity for each product at a disaggregated level of product classification – they use both the Standard International Trade Classification (SITC) 5-digit and the Harmonised System 6-digit. The notion behind the RFI indices is that a product exported predominantly by countries that are richly endowed with physical capital is 'revealed' to be intensive in physical capital. The RFI for each traded product is calculated as a weighted average of the factor abundance of the countries exporting the product. The weight is a variant of Balassa's revealed comparative advantage (RCA) indices. This is the methodology employed by Hausmann, Hwang & Rodrik (2007) when constructing the 'revealed' technology content of trade products – the PRODY index. The rationale for using a variant of RCA indices as opposed to straight export shares is to ensure that country size does not distort the ranking of products.

The revealed capital intensity of product j is calculated as

[93] More detail on the RFI indices dataset can be found in Shirotori, Tumurchudur & Cadot (2010).

$$k_j = \sum_i \omega_j^i \frac{K^i}{L^i}$$

where K^i is country i's capital stock, L^i is its labour force, and the weights are given by

$$\omega_j^i = \frac{X_j^i / X^i}{\sum_i (X_j^i / X^i)}$$

where X_j^i is country i's exports of product j, $X^i = \sum_j X_j^i$ is country i's aggregate exports and $\sum_i (X_j^i / X^i)$ is the sum of product shares across countries. ω_j^i is a variant of Balassa's RCA for country i in product j and is adjusted, as per Hausmann et al. (2007), to sum to one:

$$\sum_i \omega_j^i = \sum_i \frac{X_j^i / X^i}{\sum_i (X_j^i / X^i)} = \frac{1}{\sum_i (X_j^i / X^i)} \sum_i (X_j^i / X^i) = 1$$

Similarly, the revealed human capital intensity index is given by

$$h_j = \sum_i \omega_j^i h^i$$

where h^i is the average years of schooling achieved by the average person. The revealed land intensity index is calculated using arable land per person,

$$l_j = \sum_i \omega_j^i l^i$$

where l^i is the arable land (in hectares) per person.

There are two issues of concern with the RFI indices. Firstly, the weighted average RFI indices are sensitive to the country coverage in the endowments database. The authors state that there is a trade-off between RFI estimations with a large sample size and one which is smaller but without any missing values. The authors thus propose two versions of the RFI dataset: firstly, a 'wide' one, based on the widest annual country coverage, and secondly, a 'consistent' one, based on a balanced panel of data. Secondly, the authors are careful to weed out the effect of subsidies and trade distortions, which are prevalent in agriculture. The authors use the World Bank's new Agricultural Distortions database (Anderson et al., 2008) to eliminate observations where RCAs were obviously driven by policy. Without this correction, there would be high 'revealed' human capital intensities for agricultural products whose exports are subsidised by rich countries.

The dataset can be downloaded at http://r0.unctad.org/ditc/tab/research.shtm

Appendix Table 1: Trade decomposition studies

STUDIES[1]	DATA AND SAMPLE	UNIT[5]	INTENSIVE MARGIN	EXTENSIVE MARGIN	
				PRODUCT	DESTINATION
PRODUCT LEVEL					
Hummels & Klenow (2005)[2]	Exports from 126 countries to 76 importing countries 1995 (cross-sectional) HS6 (approx. 5000 products)	p	Compares nominal shipments of country j relative to nominal shipments to country k (rest of world). IM further decomposed into price and quantity indices.	Weighted (weight measured by export values) count of the number of products exported from j to k at one point in time.[6]	
Evenett & Venables (2002)[3]	Exports of 23 developing countries 1970-1997 (growth) 3-digit (approx. 200 products)	p-c	Decomposition by product line: Export growth from continuing products - reduction in growth due to product deaths + increase in growth due to new products. For continuing product lines, decomposition by trading partner: growth to same partners - reduction in growth due to loss of trading partner + increase in growth due to new trading partner		
Amurgo-Pacheco & Pierola (2008)	Exports of 24 developed & developing countries 1990-2005 (growth) HS6 (approx.. 5000 products)	p-c	Old products to old markets	New products to old markets + new products to new markets	Old products to new markets
HMR (2008)	Bilateral trade flows for 183 countries 1970-1997	c	Trade volume per exporter	Number of destinations	
Brenton & Newfarmer (2009)	Exports of 99 developing countries to 102 developed and developing countries 1995-2004 (growth) SITC 5-digit (approx. 3078 products)	p-c	Increase in old products to old markets - decrease in old products to old markets - extinction of old products to old markets	New products to new markets + new products to old markets	Old products to new markets
Amiti & Freund (2010)	Exports from China 1992-2005 (growth) HS6 (approx. 5000 products)	p	Growth in products exported in both periods	Increase in growth due new products - reduction in growth due to disappearing products	
Bingzhan (2011)[4]	Exports from China 2001-2007 (growth) HS6 (approx. 5000 products)	p	Growth in products exported in both periods. IM further decomposed into price and quantity indices.	Increase in growth due new products - reduction in growth due to disappearing products	
Besedeš & Prusa (2011)	Export for 46 countries to 181 countries 1975-2003 (growth) SITC 4-digit manufacturing (approx. 380 products)	p-c	Survival and deepening of existing trade relationships	Failure and entry of product-destination relationships.	
Zahler (2011)	Bilateral trade for 112 countries 1984-2000 (growth) SITC 4-digit (772-909 products)	p-c	Old products to old markets – death of old varieties	New product to known destination + new product to new destination	New variety of known destination and known product + known product to new destination
FIRM LEVEL					
EEKT (2007)	Columbian firms' exports 1996-2005 (growth) HS6 (approx. 5000 products)	f	Growth in continuing firms	Entry of firms – exit of firms	

STUDIES[1]	DATA AND SAMPLE	UNIT[5]	INTENSIVE MARGIN	EXTENSIVE MARGIN	
				PRODUCT	DESTINATION
BJRS (2009)	US firms' exports 1993-2003 (growth) HS10 (approx. 10000 products)	f-p-c	Growth in value firm's trade per product per country	Net growth in the number of products trade + net growth in the number of export destinations	

Note: 1. The table provides a sample of the most cited studies in the trade decomposition literature and should not be considered as an exhaustive list of studies. 2. Hummels & Klenow (2005) adopt a cross-sectional analysis where they decompose the world market ratio of a country's exports into three margins: extensive margin, quantity and price. 3. Evenett & Venables (2002) do not mention the terms intensive margin and extensive margin. However, one can interpret their methodology and results to get an idea of the values of these two margins. 4. Bingzhan (2011) employs a similar methodology to Hummels & Klenow (2005) but instead to decomposing trade shares across countries, he decomposes growth rates. 5. The units of analysis are defined as: p – product; c – country; p-c – product-country; f – firm; f-p-c – firm-product-country. 6. Hummels & Klenow (2005) define the extensive margin differently to the other studies. They define the extensive margin as more products (weighted) compared to growth in export value due to the export of new products, new destinations or new product-destination combinations.

Appendix Table 2: Technological classification of exports

LALL TECHNOLOGY CLASSIFICATION	EXAMPLES
PRIMARY PRODUCTS (PP)	Fresh fruit, meat, rice, cocoa, tea, coffee, wood, coal, crude petroleum, gas
MANUFACTURED PRODUCTS	
Resource based manufactures	
RB1: Agro/forest based products	Prepared meats/fruits, beverages, wood products, vegetable oils
RB2: Other resource based products	Ore concentrates, petroleum/rubber products, cement, cut gems, glass
Low technology manufactures	
LT1: 'Fashion cluster'	Textile fabrics, clothing, headgear, footwear, leather manufactures, travel goods
LT2: Other low technology	Pottery, simple metal parts/structures, furniture, jewellery, toys, plastic products
Medium technology manufactures	
MT1: Automotive products	Passenger vehicles and parts, commercial vehicles, motorcycles and parts
MT2: Process industries	Synthetic fibres, chemicals and paints, fertilisers, plastics, iron, pipes/tubes
MT3: Engineering industries	Engines, motors, industrial machinery, pumps, switchgear, ships, watches
High technology manufactures	
HT1: Electronics and electrical products	Office/data processing/telecommunications equip, TVs, transistors, turbines, power generating equipment
HT2: Other high technology	Pharmaceuticals, aerospace, optical/measuring instruments, cameras
OTHER TRANSACTIONS	
other	Electricity, cinema film, printed matter, 'special' transactions, gold, art, coins, pets

Source: Lall (2010)