Explaining the Supply-side Constraints to Export-led Growth in Selected Pacific Island Countries

Yenteshwar Ram, Biman Prasad, and Ron Duncan*

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Abstract

Over the past two decades, an integral part of some Pacific island countries (PICs') economic policy rhetoric has been export-led growth. However, despite the policy and technical support provided by many international organizations and bilateral donors, and an abundance of natural resources, their export sectors remain narrow and, with few exceptions, export industries have experienced little growth. Therefore, if these countries are to do better, it is critical to understand the supply- side constraints to export-led growth. Hence, the objective of this study was to identify and subsequently analyse the impact of supply-side constraints on export receipts for selected PICs, using Linear Programming (LP) models of export receipts. The study also provides estimates of the magnitude of the increase in export receipts that may be achieved if some of these constraints are removed. The results show the maximum export receipts that these PICs can achieve, given the supply-side constraints that they face. It is also seen that if some of the supply-side constraints are removed, the increase in exports receipts would be very promising. Finally, the paper provides some policy recommendations for the removal of some of the supply-side constraints.

1. Introduction

Economies of the Melanesian group of the Pacific Island region, namely Fiji, Papua New Guinea (PNG), the Solomon Islands and Vanuatu are relatively less developed than other island economies sharing similar economic characteristics in other parts of the globe. Over the past two decades, an integral part of their economic policy rhetoric has been export-led economic growth. However, despite the policy and technical support provided by many international organizations and bilateral donors, and an abundance of natural resources, their export sectors remain narrow and, with few exceptions, export industries have experienced little growth.

Therefore, if these countries are to have better economic performance, it is critical to understand the supply-side constraints to an expansion of exports. Hence, the objective of the study was to identify and subsequently analyse the impact of supply-side constraints on export receipts of selected Pacific island countries (PICs), using Linear Programming (LP) models of export receipts.

The study was also designed to provide estimates of the magnitude of increases in export receipts that may be achieved if some of the important constraints are removed. Such findings may help to support the implementation of more effective economic reform programs. The findings will also allow policy makers in PICs to identify and compare the supply constraints faced. This could open up the possibility of formulating solutions for joint implementation by PIC governments, which is of relevance in the context of the ongoing development of the Pacific Plan for increased regional integration of the PICs' (PIFS 2005).

The rest of the paper is structured as follows. In the next section, we provide an economic overview of the selected PICs, Fiji, Papua New Guinea, Solomon Islands, and Vanuatu. In the third section, we review past studies done on this topic. The fourth section discusses the methodology used in this study, while the fifth presents the empirical results and discusses them. The sixth section presents conclusions, including policy recommendations, and discusses possible extensions of the study.

2. An Economic Overview of the Selected Pacific Island Countries

2.1 Fiji Islands

The political crisis of 2000 saw the Fiji economy decline by 2.8 per cent in that year. This contraction was accompanied by substantial job losses and migration of skilled and professional workers; the migration is continuing, although the rate is declining. Since 2000, business confidence and private investment have picked up, but not to a point sufficient to drive sustained growth. Skills shortages affect most sectors of the economy, notably the construction industry, which is trying to keep up with the demand for tourist hotel rooms. The economy recorded reasonable growth around 4.0 per cent in the period 2001-04, driven by a resurgent tourism industry. However, real GDP growth in 2005 is forecast at only 1.7 per cent and at 2.0 per cent in 2006, with the slowdown due principally to the termination of preferential trading arrangements for sugar and garments (affecting principally garment exports to the United States), Fiji's major manufacturing and export industries.

With regards to trade, Fiji has a relatively diversified export base. However, in most years imports have exceeded exports and export growth has been poor. A number of reasons have been given for the subdued growth in exports. The substantial decline in world market prices for primary commodities in recent years, adverse weather conditions, and low productivity in the agricultural sector are some of the factors said to be limiting export growth (Narayan and Narayan 2004). Nonetheless, total exports account for around 40 per cent of GDP. The economy relies heavily on

export receipts to finance imports of almost all investment goods used in capital formation. Exports are not only the major source of foreign exchange but also an important source of employment.

Foreign exchange reserves have been low over the past three years (at the end of 2004, reserves totalled $786.2 million) compared with the levels achieved in 2000 ($898 million) and 2001 ($846 million), with the Reserve Bank of Fiji attributing the fall to strong demand for imports as economic activity increased. (Reserve Bank of Fiji (RBF) Quarterly Review- March 2005)

In pursuit of economic growth and development, Fiji has been implementing economic reforms since 1980s. Generally, these reforms have taken the following form: deregulation of the economy to bring domestic prices more closely in line with world prices; restraint in the growth of government expenditure (to ensure availability of resources for growth in the private sector); reform of the system of direct and indirect taxation (to minimise market distortions and improve incentives for risk taking and effort); a wage policy that recognizes the paramount importance of maintaining international competitiveness; and the mobilisation of all sectors of the community in support of economic expansion (in particular, increased Fijian participation in commerce and industry (Reddy *et al,* n.d.). Owing to these economic policies, major reforms have occurred in the political structure, in the trade sector, the labour and goods markets, public enterprises, the civil service, agriculture and land, the financial sector, and investment policies (Reddy *et al,* n.d.).

The past decade has seen Fiji adopt an export-oriented approach to trade relations. Import restrictions have been largely lifted in favour of export promotion, and as a result Fiji now has a more open economy, with increased volumes of exports and imports. The more open trading approach has led to increased prosperity and opportunities in the economy, creating thousands of jobs in industries such as garments; but it has also led to greater vulnerability to external shocks (The Republic of Fiji Islands Ministry of Foreign Affairs and External Trade, n.d.).

2.2 Papua New Guinea

After several years of contraction, the PNG economy grew by 2.8 per cent in 2003, and the PNG government has estimated a growth rate of 2.6 per cent in 2004 and 3 percent in 2005. Other macroeconomic indicators have also improved, with inflation rates and interest rates at very low levels. The Kina appreciated against the US dollar for most of 2004, but it has been fairly stable in recent months, trading at around 3 Kina to the US dollar. Against the Australian dollar, however, the Kina has weakened from about 2.5 Kina to the Australian dollar in January 2004 to about 2.3 Kina in July 2005 (Bank of Papua New Guinea *Quarterly Bulletin* – various issues). Despite this more positive outlook, the PNG economy is not growing at rates that yield positive per capita income growth.

Exports of petroleum and agricultural (coffee, copra, cocoa and palm oil), mineral (copper and gold) and timber (logs) exports contribute around 40 percent of PNG's GDP and account for 90 percent of its exports. However, the contribution of the mining and petroleum sectors to economic growth is likely to decline appreciably over the next decade as production from existing oil fields and mines declines and new large oil fields and mines are not expected to come on-stream during that time. Even if new projects such as the Highlands gas project, the Ramu nickel and cobalt project, and the Kainantu gold project proceed to development they cannot be expected to deliver sustainable, broad-based economic development because of their enclave nature(Bank of Papua New Guinea *Quarterly Bulletin*, various issues)

Similar to other Melanesian countries, PNG has a dual economy, comprising a formal, corporate-based economy and a large informal economy where subsistence farming accounts for the bulk of economic activity. The formal sector provides a narrow employment base, consisting of

workers engaged in mineral production, a relatively small manufacturing sector, public sector employees, and service industries including finance, construction, transportation and utilities. Migration to major urban centres over the past decade has contributed to urban unemployment and social problems. Papua New Guinea's social indicators are well below those of most other lower middle income countries, particularly in rural areas (Bank of Papua New Guinea *Quarterly Bulletin*, various issues).

PNG has continued to undertake economic reforms over the past five years. Significant achievements have been made in the areas of central bank independence, financial sector prudential supervision, exchange rate flexibility, labour market reforms, tariff reductions, the sale of the PNG Banking Corporation, and recent moves to partially privatise some key utilities. However, fundamental problems remain, including the management of government finances, maintaining law and order, delivering adequate levels of essential services, maintaining national infrastructure, attracting investment and linking traditional methods of agriculture production in rural areas to modern urban and overseas markets. The population continues to grow rapidly, with an increasing number of people living in poverty. These key challenges need to be addressed quickly if PNG hopes to build on the modest gains of the recent years (Bank of Papua New Guinea *Quarterly Bulletin*, various issues).

2.3 Vanuatu

After negative growth in the early 2000s, the Vanuatu economy experienced real GDP growth in 2004 of 3.2 percent, building on modest growth of 1.4 percent in 2003. Buoyant commodity prices, increased tourism, and a focus on economic and budget management have contributed to economic growth. Inflation was stable in 2004 at 0.8 percent (Reserve Bank of Vanuatu, *Quarterly Bulletin*, various issues).

In 2004, Vanuatu's exports grew by 28.2 percent to 4.2 billion vatu (A$50.2 million) although they still contribute only about 10 percent of GDP. Over 80 percent of Vanuatu's locally-produced exports are agriculture-based, led by coconut oil (31.1 percent), copra (13.5 percent), kava (13.4 percent), beef (8.7 percent) and timber (7.5 percent). The transition to cash cropping from subsistence farming is still at an early stage, although it has been growing strongly over the past two years. A resurgence in copra production, an increase in coconut oil prices, a recovery in kava exports following some lifting of European and US bans, and ongoing development in the root crop and beef sectors have all provided a basis for strong growth. In 2004, the value of coconut oil exports increased by 169 percent (to A$12.3 million), kava by 93 percent (to A$5.3 million) and copra by 58 percent (to A$5.37 million). Exports of root crops including taro, cassava and sweet potato are also growing.

Besides agriculture, the tourism sector is a major foreign exchange earner for Vanuatu and has been recognised by the government as a key sector for development, employing an estimated 1,200 people. Continuing growth in Vanuatu's tourism sector will be crucial to providing employment opportunities for Vanuatu's young and rapidly growing population (60 percent of which is under 25 years). Increasing investment in new boutique-style hotels, refurbishment of larger resorts, stronger interest in locally-owned bungalows, and interest in the backpacker market also point to further growth in this industry (RBV Quarterly Bulletins, various issues).

Overall, however, private sector investment remains subdued, although real estate development has boomed since mid 2004. Political stability and commitments by government to public sector and economic reforms is needed if investor confidence and growth are to occur. (RBV Quarterly Bulletin – various issues)

In response to the economic and political challenges facing the country, successive Vanuatu Governments have pursued a wide-ranging reform program since 1997, with assistance from the Asian Development Bank (ADB) and international aid donors, including Australia. This effort has been guided by the Comprehensive Reform Program (CRP) document, which was developed at a national summit in Vanuatu in June 1997. The CRP provides a blueprint for good governance through institutional renewal; improved service-delivery, particularly to rural areas; the development of a redefined role for the public sector and improved public sector efficiency; private sector-led growth; and improved equity between sections of the population.

Some impatience with the CRP sprang from the lack of economic growth prior to 2003, and in particular, little progress in improvements to service delivery. In a move to prioritise activities under the CRP, the Vanuatu Government developed the Prioritised Action Agenda (PAA) in 2003. The PAA is a development framework whose goal is to formulate medium-term development priorities that will guide policy stability and promote reforms. The five-year Australian-Vanuatu Joint Development Strategy, signed on 31 March 2005, is based on the PAA. Another important Vanuatu Government initiative has been the Rural Economic Development Initiative (REDI), which aims to improve service delivery in rural areas and ensure that economic development is a reality for the majority of the population residing in rural areas. REDI plans are developed and administered at the provincial level and supported at the national level. This usefully hands responsibility for development back to the grass roots. REDI plans have shown results in terms of agricultural production and an increase in the number of small-scale tourist operations starting up throughout the islands. The REDI is being supported by a range of donors, including Australia.

Vanuatu's economic reform in recent years has led to a major improvement in the management of its public sector finances, with expenditure now more carefully controlled through an accountable and transparent process. Vanuatu adopted a new fiscal format in line with the CRP, part of which was the introduction of a Value Added Tax on 1 August 1998, as well as reform of the tariff structure. A new program budgeting format was also introduced in 1998 and Vanuatu now has an integrated recurrent development budget, incorporating all expenditures funded from domestic and external sources.

The limited revenue base continues to constrain government efforts to deliver services and implement reforms, although the current government is making efforts to increase revenue through tax reform and improvements in tax collection. In recent years, revenue collection has fallen short of projections, making budget management difficult for individual departments and the Government as a whole. A change in revenue forecasting in early 2003 meant that revenue projections for the year were realistic and collections slightly exceeded expectations. Collections improved further in 2004 and predictions are that, with the current Government's reforms, 2005 will see a significant jump in revenue.

2.4 Solomon Islands

The Solomon Islands economy is estimated to have contracted by 14.3 per cent in 2000, by 9 percent in 2001, and by a further 2.4 per cent in 2002, primarily as a result of the closure of most major industries after June 2000, following severe ethnic conflict since 1999. The long road to economic recovery has, however, begun. Confidence is beginning to return to the local economy due to the improvement in the security environment (with the arrival of the Australian Government-led Regional Assistance Mission to the Solomon Islands-RAMSI) and the timely payment by government for goods and services. Local business confidence is also increasing. The Central Bank of Solomon Islands estimates that the economy grew by 5.6 per cent in 2003 and by 5.5 per cent in 2004, the fastest rates of growth since the logging boom of the early 1990s. The Central Bank

projects growth of 4 per cent in 2005 (Central Bank of Solomon Islands (CBSI), *Quarterly Bulletin*, various issues).

The violence associated with the ethnic conflict caused extensive damage to property, transport and communication infrastructure, schools, water supply and sanitation systems, electricity supply, government buildings, and the health sector, all of which were already significantly debilitated due to years of institutional neglect, and forced the closure of both large and small businesses. Full recovery will take a considerable length of time. The reopening of the palm oil plantation, now called Guadalancanal Palm Oil Limited and under Malaysian ownership, is an encouraging development as thousands of jobs could be created. The Gold Ridge mine is likely to reopen in 2006 following its purchase by an Australian consortium. Both projects reflect the greatly improved business environment as a result of the return of law and order. The challenge for the Solomon Islands Government will be to ensure long-term and broad-based economic growth by improving the operating environment for business and through investing in infrastructure.

Export earnings fell sharply from 1999 to 2002 as a result of the steep declines in activity in the country's few major export sectors of fisheries, gold and plantation agriculture. This decline in activity was compounded by falling commodities prices. Merchandise exports grew by almost 60 per cent in 2002, and in 2003 some key commodity prices firmed with growth in exports being driven by the agriculture (particularly copra and cocoa), forestry and fisheries sectors. However, current export levels remain below 1999 levels and are overly reliant on unsustainable levels of logging, which were said to be three times above sustainable levels in 2003.

With inadequate controls to reduce the leakage of public funds, the Solomon Islands Government budget for 2002 was significantly overspent and this continued into 2003. But with RAMSI assistance, the Solomon Islands Government has made significant gains in introducing budget discipline, controlling expenditure, enhancing revenue collection and meeting financial obligations. The Solomon Islands Government also produced realistic and credible 2004 and 2005 budgets (CBSI, *Quarterly Bulletin,* various issues).

Government domestic revenue in 2005 is estimated at SBD$550 million, which is a 50 percent increase on 2003 actual revenue due to increased tax compliance and a growing economy. Budgets are now fully financed without recourse to additional borrowing and at least 15 percent of revenue is allocated to debt service. RAMSI is now working with the Solomon Islands Government to ensure that future budgets are sustainable, reflect government policies and priorities, and are implemented through effective systems. Other priorities are to strengthen economic policy and planning processes, further strengthen revenue collection, implement a comprehensive debt management strategy, and improve the enabling environment for private sector development.

3. Literature Review

Several studies on supply-side constraints to economic growth have been published over the past decade. While most of these studies pertain to the supply-side constraints faced by developing countries in achieving their growth potential, a few have focused on the supply-side problems faced by developed countries. In the following paragraphs, we provide summaries of some of these studies.

I. In 2002, an African Caribbean Pacific (ACP) Ambassador highlighted that in order to be able to take advantage of trade preferences, ACP countries need to be able to produce competitively and get products to the market at a reasonable cost. As the experience under the Lomé Convention has demonstrated, ACP countries face major problems in producing and supplying goods competitively within an increasingly liberalised trading environment.

Some of these problems and challenges are as follows. With many ACP countries being geographically remote, by virtue of their land-locked or island status, getting products to market is not always easy and can be influenced by factors beyond the control of ACP governments. Climatic factors also play a major role. An example is the devastating setback to Mozambique's development arising from the floods in 2000. To a certain extent, these factors should make one stop and think about the uni-linear vision of development, which underpins so much of Europe's development policy. The sad reality is that things do not always go forward. Setbacks can occur regardless of the best policies pursued by governments. This needs to be taken into account in developing EU policies towards the ACP.

Moreover, there is a need for a realistic assessment of what governments can influence. Within the global economy, there are now only two major assets which government policy can have a bearing on: the stock of physical infrastructure and capital and the stock of human capital. In both of these areas, ACP countries face major constraints on their ability to produce competitively in the context of moves towards free trade with the EU. Indeed, it is these constraints, which in large part account for their status as developing countries. These constraints are: the unreliable provision of public utilities (electricity and water supply); poor public infrastructure (run-down roads and railways); weak institutional and policy frameworks (leading to fluctuating exchange rates and high inflation and interest rates); and low labour productivity (arising from poor education, health and housing provisions).

In many respects, the situation with regards to human capital, particularly in Southern Africa, has become worse in recent years as a result of the impact of the HIV/AIDS pandemic. People are living shorter lives and often dying as they reach their most productive years. This development has profound implications for labour productivity, the competitiveness of the South African economy and its ability to adjust and manage changes. This sad reality needs to be taken on board in the process of trade policy formulation and in the negotiation of future trade arrangements.

II. A 2004 report on supply-side constraints and capacity building by the United Nations Economic and Social Commission for Asia and the Pacfic (UNESCAP) also outlined the major supply-side constraints encountered by developing countries and provided a number of priority areas for ESCAP's future work to assist member countries in removing such constraints through supply-side capacity-building. According to the report, the main supply-side constraints were poor policymaking, ineffective regulatory frameworks, inefficient institutions and poor governance, inadequate energy, poor transport and information and communication technology (ICT) infrastructure, as well as a poor level of general education. The report moved on to describe the two pillars that could address the supply-side constraints faced by the member countries of UNESCAP. These were enhancing productive capacity and reducing the cost of conducting trade.

III. In a study of the economic trends in the Pacific Island Countries (PICs), Chand (2003) argued that the policy environment in the PICs has generally not been conducive to growth in production. Extensive regulatory controls on prices, exchange rates, the operation of the informal sector, etc., have impeded private investment. Government involvement in private commerce has crowded out private commerce, while drawing resources away from the provision of public services vital for the growth of the private sector. Poor property rights to land, insecurity of debt contracts, unsustainable budget deficits, and political and policy instability have all raised the risk premium on investment, resulting in an increase in the cost of investment in PICs. In addition, poor governance remains a serious problem in several of the PICs.

IV. In a report by the United Nations Conference on Trade and Development (UNCTAD) in 1998, it was stressed that supply-side constraints were the root cause of Less Developed Countries (LDCs) weak participation in international trade. The UNCTAD Board recommended that the international community should help LDCs to enhance their competitiveness through commodity diversification, improvement of their trade infrastructure, and trade-supporting services and human resource development. Moreover, it was mentioned that LDCs themselves have a responsibility, in the context of formulating and implementing sound macroeconomic policies, to overcome the problems of supply-side constraints.

V. In a study by the Pan-African Productivity Association (2000) on the supply-side constraints that hamper African enterprises from taking advantage of emerging export market opportunities, it was pointed out that Africa has experienced periods of economic development during the past century, but this has clearly not been sufficient to put it on a par with the developed world. The standard of living of Africans increased initially, but for the past 40 years there has been a steady decline. Many factors have contributed to this situation, but low productivity spawned by wrong economic policies and systems lies at the root of the decline. A number of countries have recently started moving away from these systems but it will take many years for them to catch up.

Many factors were said to impair the productivity performance of firms. Economic policy is only one of these. Others are linked to financial factors, lack of foreign direct investment, shortage of high quality human resources that should be delivered by good education and training structures, infrastructure inadequacies, and the basic values of workers. Entrepreneurial and management skills are also scarce. Where these skills are available, the success of the organizations is both dramatic and lasting.

The Pan-African Productivity Association (2000) study recommended that much should and can be done to ensure a more competitive and contributing Africa. At the core is the development of national productivity movements. The notion of productivity improvement should be inculcated in the minds of workers and managers. A change in values should be led by heads of State who must understand that political and social success depends on economic success, which in turn depends on international competitiveness through productivity. The establishment of productivity centres in itself will not bring about the change required; it will merely create a focal point for guiding the change. Eventually, managers and workers, teachers and labourers will have to be wealth creators rather than wealth seekers.

The report argues that Africa is plagued with unemployment and it is natural that those who have work will do anything to remain employed. For this reason, the underlying philosophy in Africa's productivity improvement endeavours should be to create more wealth with the same or more resources, and not to produce the same with less resources. A throughput growth philosophy is called for with guarantees of no job losses due to higher productivity. Such a philosophy must be supported by wealth-sharing policies.

VI. Finally, D' Acunto *et al* (2004) endeavoured to model and test the role of demand and supply-side factors in explaining economic growth in 20 Italian administrative regions. This exercise was performed by means of a two-stage econometric approach. In the first stage, estimates for the elasticity of manufacturing output to exports were obtained using regional time-series data from 1963 through to 1996, using the cointegration test advocated by Pesaran *et al* (2001). A significant, long-run relationship between these variables indicated the existence of a demand-constrained growth regime.

The authors then carried out test to see whether the regional dispersion of supply-side factors had an impact on the regional dispersion of demand-constrained regimes. In other words, a list of supply-side variables was utilised to explain the cross-section dispersion of the causal relationship between exports and manufacturing output. In this case, estimation was carried out by means of a cross-section dummy variable procedure, in which the dependent variable took a value equal to one for regions characterised by demand-constrained growth regimes, and zero otherwise.

The empirical results supported the authors' expectations of strong regional differences. Generally, it was discovered that the more southerly the region, the less likely it exhibited export-led growth or a demand-constrained growth regime and the more likely it was to show signs of a supply-constrained growth regime. Thus, it was confirmed that the regional distribution of demand-constrained regimes was a useful tool for analyzing Italy's regional economic development in the post-World War II period. As for the explanation of these regional differences in growth regimes, the second stage analysis revealed that dominant roles were played by social capital, the state of technology, the average size of establishments in manufacturing, and competition and efficiency in the banking sector. Also influential was the size of regional manufacturing. However, no role was found for labour market rigidities.

The results were useful in defining the conditions under which export-led growth could operate. From a policy standpoint, the results suggested that labour market reforms geared to bringing regional wage differentials more closely in line with regional productivity differentials should not engender drastic changes in the development process of the Southern Italian regions. More importantly, the results highlighted that greater priority should be given to policies designed to encourage innovation and the diffusion of new technologies, development of social capital, and the fostering of efficiency in the financial sector.

4. Methodology

To address the research question, this study employs the Linear Programming (LP) approach. A LP problem is a special case of a *Mathematical Programming* problem. Under the LP approach, a mathematical programme identifies an extreme; that is, a minimum or a maximum point of a function $f(x_1, x_2, ...x_n)$, which satisfies a set of constraints, e.g., $g(x_1, x_2, ...x_n) \geq b$. The LP approach entails a specialisation of mathematical programming to the case where both function f (called the objective function) and the problem constraints are linear.

From an applications perspective, the LP technique is best described as an optimisation tool, which can allow for the rationalisation of many economic, social and technological objectives pursued by policymakers. A distinct advantage for the applicability of the LP methodology in various contexts is the computational ease of the resulting analytical models. With the advent of modern computing technology, the LP methodology translates to the existence of effective and efficient algorithm procedures that are able to provide systematic and fast solutions to the analytical models. For instance, the Simplex algorithm procedure (developed by Dantzig 1947) provides a powerful computational tool that is able to provide fast solutions to very large-scale applications,

sometimes including hundreds of thousands of variables. We used this algorithmic procedure via the LINGO software.

For this study, the general form of the LP problem is as follows. The objective function is an exports receipts function of the form:

$$\max f(X_1, X_2, \ldots X_n) = c_1 X_1 + c_2 X_2 + \ldots + c_n X_n$$

Where: $c_1, c_2, \ldots, c_n$ is the average export price[1] for each of the export commodities of the selected PICs (known as objective function coefficients) and $X_1, X_2, \ldots, X_n$ are the export volumes for each of the export commodities (known as control or decision variables, the values of which are to be derived).

The objective function is subject to a set of supply-side constraints on the export volumes of each of the export products in the objective function. These supply-side constraints take the following general form:

$$a_{i1}X_1 + a_{i2}X_2 + \ldots + a_{in} X_n \ (\geq, =, \leq) \ b_i, \text{ for } i = 1,\ldots,n$$

Where: $a_{i1}, a_{i2}, \ldots, a_{in}$ are the technological coefficients of the problem formulation; and b_i is the right-hand side vector of constraints.

In the models solved, we relax some of the supply-side constraints and assess the impact on export receipts. This part of the analysis should provide insights for policymakers in the PICs, as it should inform them of the magnitude of increases in export receipts that can be achieved if some of the supply-side constraints are eliminated.

5. Empirical Results

5.1 Fiji's Islands[2]

Using the LP approach, the objective function specified for Fiji[3] was as follows:

$$ER = 758.4X_1 + 101.7X_2 + 3455.5X_3 + 1024.8X_4 + 589.3X_5$$

Where: ER is the total export receipts from the commodities under study
   X_1 is the export volume for sugar (in metric tones)
   X_2 is the export volume for molasses (in metric tonnes)
   X_3 is the export volume for canned fish (in metric tonnes)
   X_4 is the export volume for coconut oil (in metric tonnes)
   X_5 is the export volume for gold (in metric tonnes)
   758.4 is the 11-year (1994-2004) average export price for sugar (in $F)
   101.7 is the 11-year (1994-2004) average export price for molasses (in $F)

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[1] In this case, average export prices were used since they are more representative of the entire sample data and hence provide a relatively reliable approximation of export prices that countries have faced over the sample period and are likely to face in the coming years. Use of single year values (e.g. current prices) may not provide policymakers with an accurate picture of the prices that they can expect for their commodities in the future, as current prices will obviously fluctuate over the coming years depending on the social, political and economic factors prevailing in a particularly country at a particular point in time.

[2] Data on Fiji's export values, volumes and prices were provided by the Fiji Islands Bureau of Statistics.

[3] Note that we were not able to include all the export commodities in the objective function as data on export volumes for some commodities (e.g. garments, textiles, footwear, fruits and vegetables, and mineral water) were not available.

3455.5 is the 11-year (1994-2004) average export price for canned fish (in $F)
1024.8 is the 11-year (1994-2004) average export price for coconut oil (in $F)
589.3 is the 11-year (1994-2004) average export price for gold (in $F)

The above-mentioned objective function was then subject to the following constraints:

$$230000 \leq X_1 \leq 472000$$
$$96000 \leq X_2 \leq 189000$$
$$600 \leq X_3 \leq 9800$$
$$3200 \leq X_4 \leq 7900$$
$$112600 \leq X_5 \leq 150700$$
$$X_1 + X_2 + X_3 + X_4 + X_5 \leq 808,000$$

The first constraint equation restrains sugar export volumes to be within 230000 and 472000 tonnes, whilst the second constraint equation limits molasses export volumes to be within 96000 and 189000 tonnes. The third constraint equation restricts canned fish export volumes to be within 600 and 9800 tonnes, whereas the fourth constraint equation limits coconut oil export volumes to be within 3200 and 7900 tonnes. The fifth equation restraints gold export volumes to be within 112600 and 150700 tonnes. These constraints were put in place as the data on export volumes of the various commodities over the past decade showed that export volumes have been within these ranges. The last constraint equation limits the total export volumes for the five commodities to be less than or equal to 808,000 tonnes. This constraint was put in place because export data over the past decade showed that the total export volume for these five commodities has been less than or equal to 808,000 tonnes. These constraint equations can be regarded as proxies for the various supply-side constraints affecting the export volumes of the five commodities.

The main supply-side factors thought to have caused sugar and molasses export volumes to be within the above-mentioned ranges include the non-renewal of expiring land leases, transportation difficulties, mill inefficiencies, and the high levels of cane burning, which reduces sugar content and quality (Republic of Fiji Islands Supplement to the 2003 Budget Address).

The key supply-side constraints believed to have limited canned fish export volumes to be within the above-mentioned range include the lack of air cargo and wharf space, as well as the increasing incidence of illegal fishing by foreign vessels in Fiji waters (RBF *Quarterly Review*, various issues). Common factors believed to have caused coconut oil exports to be within the above-mentioned range include natural disasters and pests, which have imposed severe damage on copra output from which coconut oil is produced (RBF, *Quarterly Review*, various issues).

Gold export volumes have been within the above-mentioned range due mainly to supply-side factors that include the poor quality of gold ore extracted from the mine, as well as the limited extraction capacity of the mine (RBF, *Quarterly Review*, various issues).

Subject to these constraints, the above-mentioned objective function was then solved to obtain values for X_1, X_2, X_3, X_4 and X_5 that would maximize export receipts. It was found that the values of X_1, X_2, X_3, X_4 and X_5 that would maximise export receipts were 472000, 167600, 9800, 7900 and 150700 tonnes, respectively. With these X values, the maximum export receipts that could be obtained would be F$505.8 million.

Hypothetical relaxation of the constraint equations was carried out to see the magnitude of the increase in export receipts that could be achieved. The assumed changes were as follows:
- The upper limits of the first five equations were increased by 5 percent; and

- The right-hand side value of the sixth equation was also increased by 5 percent (to incorporate the increases that were made in the preceding five equations).

When the objective function was solved again subject to the relaxed set of constraints, it was found that the maximum export receipts that could be achieved was F$520.7 million, an increase of F$14.9 million or around 3 percent, when compared with the previous case.

5.2 Papua New Guinea

The objective function specified for PNG was:

$ER = 2363X_1 + 3574X_2 + 1863X_3 + 450X_4 + 876X_5 + 673X_6 + 1355X_7 + 133X_8 + 6301X_9 + 58X_{10} + 3144X_{11} + 19351X_{12}$

Where: ER is the total export receipts from the twelve commodities under study
   X_1 is the export volume for Cocoa (in metric tones)
   X_2 is the export volume for Coffee (in metric tonnes)
   X_3 is the export volume for Tea (in metric tonnes)
   X_4 is the export volume for Copra (in metric tonnes)
   X_5 is the export volume for Copra Oil (in metric tonnes)
   X_6 is the export volume for Palm Oil (in metric tonnes)
   X_7 is the export volume for Rubber (in metric tonnes)
   X_8 is the export volume for Logs (in metric tonnes)
   X_9 is the export volume for Marine Products (in metric tonnes)
   X_{10} is the export volume for Crude Oil (in metric tonnes)
   X_{11} is the export volume for Copper (in metric tonnes)
   X_{12} is the export volume for Gold (in metric tonnes)

   2363 is the 21-year (1984-2004) average export price for Cocoa (in Kina)
   3574 is the 21-year (1984-2004) average export price for Coffee (in Kina)
   1863 is the 21-year (1984-2004) average export price for Tea (in Kina)
   450 is the 21-year (1984-2004) average export price for Copra (in Kina)
   876 is the 21-year (1984-2004) average export price for Copra Oil (in Kina)
   673 is the 21-year (1984-2004) average export price for Palm Oil (in Kina)
   1355 is the 21-year (1984-2004) average export price for Rubber (in Kina)
   133 is the 21-year (1984-2004) average export price for Logs (in Kina)
   6301 is the 21-year (1984-2004) average export price for Marine Products (in Kina)
   58 is the 21-year (1984-2004) average export price for Crude Oil (in Kina)
   3144 is the 21-year (1984-2004) average export price for Copper (in Kina)
   19351 is the 21-year (1984-2004) average export price for Gold (in Kina)

The above-mentioned objective function was solved subject to the following constraints:

$26000 \leq X_1 \leq 46600$
$40300 \leq X_2 \leq 85000$
$3400 \leq X_3 \leq 9300$
$8400 \leq X_4 \leq 103500$
$15800 \leq X_5 \leq 53200$
$97300 \leq X_6 \leq 339000$
$2300 \leq X_7 \leq 5400$
$990000 \leq X_8 \leq 2943900$
$1000 \leq X_9 \leq 17800$

$$1984720 \leq X_{10} \leq 6254161$$
$$77800 \leq X_{11} \leq 230600$$
$$19400 \leq X_{12} \leq 72800$$
$$X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 + X_9 + X_{10} + X_{11} + X_{12} \leq 10161261$$

The first constraint equation restricts cocoa export volumes to be within 26000 and 46600 tonnes, whilst the second equation limits coffee export volumes to be within 40300 and 85000 tonnes. The third constraint equation limits tea export volumes to be within 3400 and 9300 tonnes, while the fourth equation restricts copra export volumes to be within 8400 and 103500 tonnes. The fifth equation constrains export volumes of copra oil to be within 15800 and 53200 tonnes, whereas the sixth equation limits palm oil export volumes to be within 97300 and 339000 tonnes. The seventh equation limits export volumes of rubber to be within 2300 and 5400 tonnes, while the eighth equation restricts log export volumes to be within 990000 and 2943900 tonnes. The nineth equation restricts exports volumes of marine products to be within 1000 and 17800 tonnes, while the tenth equation limits crude oil export volumes to be within 1984720 and 6254161 tonnes. The eleventh equation constrains export volumes of copper to be within 77800 and 230600 tonnes, while the twelveth equation limits gold export volumes to be between 19400 and 72800 tonnes. These constraints are in line with the export volume data for each of these commodities over the past two decades. The constraint equations can be regarded as proxies for the various supply-side constraints affecting the export volumes of the twelve commodities.

The last constraint equation limits the total export volumes for the twelve commodities to be less than or equal to 10,161,261 tonnes. This constraint was imposed because export data over the past two decades showed that the total export volume for these eight commodities has been less than or equal to this tonnage.

In PNG's case, the key supply-side factors that have caused export volumes of the various agricultural commodities to be within the above-mentioned ranges include deteriorating infrastructure, particularly roads, due to the inefficient allocation of development expenditure, especially for feeder roads, which are under the authority of Provincial administrations. Additionally, farmers typically do not have much access to credit since they cannot use their land as collateral due to the traditional land tenure system. This practice has undermined the use of more efficient large-scale farming practices. The relatively high cost of plantation labour also presents a supply-side problem (IMF Staff Report on the 2004 Article IV Consultation on PNG).

With regards to the export volume of logs, the main supply-side factors that have caused export volumes to be within the above-mentioned range include the unsustainable and environmentally destructive logging practices stemming from poor governance and uncertain property rights to land (IMF Staff Report on the 2004 Article IV Consultation on PNG.).

As far as marine products are concerned, the main supply-side factor that has caused export volumes to be within the ranges given above is the high cost of transporting these products to export markets, especially in Asia (IMF Staff Report on the 2004 Article IV Consultation on PNG).

With regards to the production of gold, copper and crude oil, the main problem faced is the geographical isolation of these resources, which give rise to high extraction cost in addition to the usual capital-intensive nature of mining activity. Foreign companies have financed all of the major mining projects, and there are few downstream linkages, since most mines operate as isolated enclaves. With the violence and collapse of the large copper mine in Bougainville in the early 1990s and the frequent changes in the government's equity and tax policies towards mining, new exploration activity has been significantly reduced. Deteriorating law and order and governance problems, crumbling infrastructure, overdue land reform, and low profitability have hampered the

prospects for any large-scale investment activity. Consequently, few projects are expected to be initiated in the years ahead, and fiscal revenues are expected to decline (IMF Staff Report on the 2004 Article IV Consultation on PNG).

Subject to these constraints, the above-mentioned objective function was solved to obtain values for $X_1, X_2, X_3, X_4, X_5, X_6, X_7, X_8, X_9, X_{10}, X_{11}$ and X_{12} that would maximize export receipts. It was found that the values of X_1 to X_{12} that would maximise export receipts were 46600, 85000, 9300, 103500, 53200, 339000, 5400, 2943900, 17800, 6254161, 230600 and 72800 tonnes, respectively. With these X values, the maximum export receipts that could be obtained would be about 3.8 billion kina.

Hypothetical relaxation of the constraint equations was carried out to see the magnitude of the increases in export receipts that could be achieved as a result. The assumptions made were as follows:
- The upper limits of the first 11 equations were increased by 5 percent; and
- The right-hand side value of the twelfth equation was also increased by 5 percent (to incorporate the increases that were made in the preceding 11 equations).

When the objective function was again solved, subject to the relaxed set of constraints, it was found that the maximum export receipts that could be achieved was 4.0 billion kina, an increase of 0.2 billion kina or about 5 percent, when compared with the previous case.

5.3 Vanuatu's [4]

The objective function specified for Vanuatu was:

ER = $44517X_1 + 154755X_2 + 301202X_3 + 63166X_4 + 944191X_5 + 45368X_6$

Where: ER is the total export receipts from the six commodities studied
    X_1 is the export volume for copra (in metric tones)
    X_2 is the export volume for cocoa (in metric tonnes)
    X_3 is the export volume for beef (in metric tonnes)
    X_4 is the export volume for timber (in metric tonnes)
    X_5 is the export volume for kava (in metric tonnes)
    X_6 is the export volume for coconut oil (in metric tonnes)

    44517 is the 9-year (1996-2004) average export price for copra (in vatu)
    154755 is the 9-year (1996-2004) average export price for cocoa (in vatu)
    301202 is the 9-year (1996-2004) average export price for beef (in vatu)
    63166 is the 9-year (1996-2004) average export price for timber (in vatu)
    944191 is the 9-year (1996-2004) average export price for kava (in vatu)
    45368 is the 9-year (1996-2004) average export price for coconut oil (in vatu)

The above-mentioned objective function was solved subject to the following constraints:

    $2500 \leq X_1 \leq 47200$
    $200 \leq X_2 \leq 1600$
    $400 \leq X_3 \leq 1900$
    $3700 \leq X_4 \leq 13500$

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[4] Data on Vanuatu's export values, volumes and prices were provided by the Reserve Bank of Vanuatu.

$100 \leq X_5 \leq 1200$
$5300 \leq X_6 \leq 17100$
$X_1 + X_2 + X_3 + X_4 + X_5 + X_6 \leq 64000$

The first constraint equation restrains copra export volumes to be within 2500 and 47200 tonnes, whilst the second equation limits cocoa export volumes to be within 200 and 1600 tonnes. The third constraint equation limits beef export volumes to be within 400 and 1900 tonnes, while the fourth equation restrains timber export volumes to be within 3700 and 13500 tonnes. The fifth equation constrains kava export volumes to be within 100 and 1200 tonnes whereas the sixth equation limits coconut oil export volumes to be within 5300 and 17100 tonnes. These constraints are consistent with export volume data for each of these commodities over the past decade. The constraint equations can be regarded as proxies for the various supply-side constraints affecting the export volumes of the six commodities.

The last constraint equation limits the total export volumes for the six commodities to be less than or equal to 64000 tonnes. This constraint was put in place because export data over the past decade showed that the total export volume for these six commodities has been less than or equal to 64000.

In Vanuatu's case, the key supply-side factors that have caused export volumes of the various commodities to be within the above-mentioned ranges include the lack of proper infrastructure (particularly good storage facilities, which lowers the quality of output for export purposes), the high cost of credit faced by exporters of all the commodities (which limits their plans to expand production capacity), the high costs involved in transporting their products to export markets, lack of mills and factories that can convert primary products into processed outputs (this is one of the main constraints faced by the timber industry), and a labour force with very limited education and training (making them unproductive). Vanuatu also suffers from a lack of trade facilitation schemes, which could assist the country in boosting their export levels (RBV, *Quarterly Review*, various issues).

Subject to these constraints, the objective function was solved to obtain values for X_1, X_2, X_3, X_4, X_5 and X_6 that would maximize export receipts. These values were 28700, 1600, 1900, 13500, 1200 and 17100 tonnes, respectively. With these X values, the maximum export receipts that could be obtained would be 4.9 billion vatu.

Hypothetical relaxation of the constraint equations was imposed to see the magnitude of the increase in export receipts that could be achieved as a result. The following assumptions were made:
- The upper limits of the first six equations were increased by 5 percent; and
- The right-hand side value of the seventh equation was also increased by 5 percent (to incorporate the increases that were imposed in the preceding six equations).

When the objective function was solved subject to the relaxed set of constraints, it was found that the maximum export receipts that could now be achieved would be 5.2 billion vatus, an increase of 0.3 billion vatus or about 6 percent.

5.4 The Solomon Islands Case[5]

The objective function specified for the Solomon Islands was:

$$ER = 3413X_1 + 325881X_2 + 2616X_3 + 2101X_4 + 1052X_5 + 5395X_6 + 15847X_7 + 41773X_8$$

Where: ER is the total export receipts from the 8 commodities under study
X_1 is the export volume for fish (in metric tones)
X_2 is the export volume for timber (in metric tonnes)
X_3 is the export volume for copra (in metric tonnes)
X_4 is the export volume for coconut oil (in metric tonnes)
X_5 is the export volume for palm products (in metric tonnes)
X_6 is the export volume for cocoa (in metric tonnes)
X_7 is the export volume for marine shells (in metric tonnes)
X_8 is the export volume for gold (in metric tonnes)
3413 is the 20-year (1985-2004) average export price for fish (in SBD$)
325881 is the 20-year (1985-2004) average export price for timber (in SBD$)
2616 is the 20-year (1985-2004) average export price for copra (in SBD$)
2101 is the 20-year (1985-2004) average export price for coconut oil (in SBD$)
1052 is the 20-year (1985-2004) average export price for palm products (in SBD$)
5395 is the 20-year (1985-2004) average export price for cocoa (in SBD$)
15847 is the 20-year (1985-2004) average export price for marine shells (in SBD$)
41773 is the 20-year (1985-2004) average export price for gold (in SBD$)

The above-mentioned objective function was solved subject to the following constraints:

$$5300 \leq X_1 \leq 50000$$
$$300 \leq X_2 \leq 1000$$
$$600 \leq X_3 \leq 30000$$
$$50 \leq X_4 \leq 7300$$
$$0 \leq X_5 \leq 37000$$
$$2400 \leq X_6 \leq 4500$$
$$26 \leq X_7 \leq 400$$
$$0.02 \leq X_8 \leq 1.4$$
$$X_1 + X_2 + X_3 + X_4 + X_5 + X_6 + X_7 + X_8 \leq 94400$$

The first constraint equation restricts fish export volumes to be within 5300 and 50000 tonnes, whilst the second equation limits timber export volumes to be within 300 and 1000 tonnes. The third constraint equation limits copra export volumes to be within 600 and 30000 tonnes, while the fourth equation restricts coconut oil export volumes to be within 50 and 7300 tonnes. The fifth equation constrains export volumes of palm products to be within 0 and 37000 tonnes, whereas the sixth equation limits cocoa export volumes to be within 2400 and 4500 tonnes. The seventh equation limits export volumes of marine shell to be within 26 and 400 tonnes, while the eighth equation restricts gold export volumes to be within 0.02 and 1.4 tonnes. These constraints are in line with the export volume data for each of these commodities over the past two decades. The constraint equations can be regarded as proxies for the various supply-side constraints affecting the export volumes of the eight commodities.

The last constraint equation limits the total export volumes for the eight commodities to be less than or equal to 94400 tonnes. This constraint was imposed because export data over the past

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[5] Data on Solomon Islands export values, volumes and prices were provided by the Central Bank of Solomon Islands.

two decades showed that the total export volume for these eight commodities has been less than or equal to 94400 tonnes.

In the Solomon Islands case, the key supply-side factors that have caused export volumes of the various agricultural commodities to be within the above-mentioned ranges include high transportation costs, lack of financial services and technical assistance (to help improve the quality of their products and become more productive), and the difficulty in acquiring land, most of which is communally owned and lacks titles (IMF Staff Report on the 2004 Article IV Consultation on the Solomon Islands).

With regards to timber, the main supply-side factors that have caused export volumes to be within the above-mentioned range include the poor governance of this sector, as well as unsustainable forestry practices. Another constraint faced by this industry is the uncertainty in the ownership of the land, which foreign operators exploit by compensating individuals rather than the collective body of owners (IMF Staff Report on the 2004 Article IV Consultation on the Solomon Islands).

As far as fish and marine shells are concerned, the main supply-side factor that has caused export volumes to be within the ranges give above is the high cost of transporting these products to export markets, especially in Asia (IMF Staff Report on the 2004 Article IV Consultation on the Solomon Islands).

With regards to the production of gold, the main constraint facing mining operations is the uncertain legal status of land. Mining companies cannot buy land, and the profit-share arrangements with landowners are often challenged by other claimants to the land. Moreover, the ethnic conflict experienced by the country from 1999 through to 2003 lowered the production capacity of the mines. The nation's main gold mine, Gold Ridge mine, was closed at the height of conflict in 2000, and its infrastructure and assets were severely damaged (IMF Staff Report on the 2004 Article IV Consultation on the Solomon Islands).

As far as manufactured products (coconut oil, palm oil and canned fish) are concerned, the main constraint faced includes the uncertain security situation in the country, which has meant very little foreign direct investment and little domestic investment in this sector. Lack of technical and entrepreneurial skills in those who are involved in this sector has also constrained supply to a large extent (IMF Staff Report on the 2004 Article IV Consultation on the Solomon Islands).

Subject to these constraints, the above-mentioned objective function was solved to obtain values for $X_1, X_2, X_3, X_4, X_5, X_6, X_7$ and X_8 that would maximize export receipts. It was found that the values of $X_1, X_2, X_3, X_4, X_5, X_6, X_7$ and X_8 that would maximise export receipts were 50000, 1000, 30000, 7300, 1198.60, 4500, 400 and 1.4 tonnes, respectively. With these X values, the maximum export receipts that could be obtained would be $SBD622.3 million.

Hypothetical relaxation of the constraint equations was carried out to see the magnitude of the increases in export receipts that could be achieved as a result of these relaxations. The assumptions made were as follows:
- The upper limits of the first 8 equations were increased by 5 percent; and
- The right-hand side value of the ninth equation was also increased by 5 percent (to incorporate the increases that were made in the preceding eight equations).

When the objective function was solved subject to the relaxed set of constraints, it was found that the maximum export receipts that could now be achieved was SBD$664.3 million, an increase of SBD$42 million or about 7 percent, when compared with the previous case.

6. Conclusions and Policy Recommendations

This paper has detailed the wide spectrum of supply-side constraints that Fiji, , Papua New Guinea, Vanuatu and the Solomon Islands are believed to face in fostering export-led growth. Generally, these include limited and poorly-maintained physical infrastructure, lack of well-defined property rights to land, the absence of a skilled and experienced workforce, natural disasters, man-made disasters (coups, ethnic conflicts, violent crimes, etc), the high cost of conducting trade including geographical isolation, poor trade facilitation, and limited access to trade finance.

Given these constraints, the results obtained using the LP approach showed the maximum export receipts that these four PICs can achieve under present circumstances. It was also shown (through the relaxations of the constraint equations) that if some of these constraints are removed, the increase in export receipts that could be achieved would be substantial.

The issue that arises is how some of these constraints can be removed so that these PICs can realize increases in their export receipts. In the following paragraphs, we provide some policy recommendations, which, if properly formulated and implemented, can help remove some of the above-mentioned supply-side constraints.

The problem of limited physical infrastructure can be addressed by attracting foreign direct investments (FDIs) in these facilities. However, these FDIs can only be attracted if these PICs create a stable macroeconomic and legal environment and have transparent and efficient institutions.

With regards to the problem of insecure tenure and access to land and lack of well-defined property rights, the governments of the relevant PICs should engage in rigorous dialogue with all the relevant stakeholders so that they can arrive at agreed solutions to these problems. At present the insecure land tenure inhibits production efficiency in agriculture. The exports of agricultural products have been declining in these countries and unless efficiency is improved there is little chance that exports will rise.

The problem of the absence of a well-educated and trained workforce can be addressed if business development service providers can act as vehicles for providing short-term professional and vocational training to enhance the capacity of the workers in all sectors of the economy. FDIs can be a very important source of strengthening the skills of the workforce through exposure to new technologies and management methods. However, none of these can totally substitute for deficiencies in the educational and training system of an economy. In the case of Fiji, the emigration of skilled labour has been a major concern and constraint to effective investment in the export sector. Consultations with the private sector regarding their educational needs when developing educational and training curricula are one way to start a process to overcome this obstacle. The provision of job attachments for students completing their tertiary education would also help address this problem.

The creation of proactive, resourceful and disciplined security forces can help address the problem of man-made disasters in these PICs. A security force with such qualities has the potential to track the occurrence of man-made disasters before they take place and to act swiftly in order prevent these events. It would also have the capacity to respond quickly to man-made disasters in order to minimise, if not eliminate, their impact on the resources (both human and non-human) of the country. However, security forces will only be able to attain the above-mentioned qualities if they are provided with all the modern resources that they need to combat crime and are given appropriate pay and working conditions. An effective partnership between the government, the private sector, and the general public can help ensure that these pre-conditions are met.

Natural disasters in the Pacific Islands are also a major constraint to the development of the export sector. The majority of the PICs are vulnerable to a range of natural hazards such as cyclones, volcanic eruptions, earthquakes, floods, tsunamis, landslides and droughts. Evidence suggests that natural hazards have a considerable economic impact on development in the Pacific. Vanuatu and Papua New Guinea are especially prone to earthquakes and these have caused major damage to infrastructure (Prasad, *et al*, 2005).

The costs of conducting trade can be broken down into the following components: information and contracting costs; financing costs; transport costs; and administrative and procedural costs (UNESCAP Report on Addressing Supply-side Constraints and Capacity Building, 2004). Reducing information and contracting costs would require policies that create a healthy level of competition in the telecommunication sector and improve access to information and communication technology (ICT). The development of trade promotion organizations, in partnership with chambers of commerce and other private sector associations, can also help to reduce the costs associated with identifying and reaching foreign markets. Reviewing contract laws and regulations may also be required.

In addition, reducing export financing costs would involve the development of a national or regional trade finance infrastructure able to provide access to a wide array of specialized trade finance and risk management services such as export credit insurance, hedging, and forfeiting. A stable macroeconomic and legal environment and effective and trusted monetary and financial sector regulatory authorities are prerequisites to the development of a comprehensive private sector banking system and the emergence of non-bank financial institutions. The establishment of specialized trade finance institutions such as export-import banks and export credit agencies can then be considered to further enhance access to trade finance tools and instruments.

With regards to transportation costs, an improvement of the transport infrastructure may help to reduce transport costs by up to 60 per cent, while policies regulating market power in shipping and liberalizing port services may also lead to a reduction in transport costs by up to 30 per cent (Evenett and Venables 2002).

The issue of the lack of trade facilitation in these PICs can be addressed by the establishment of a national or regional trade facilitation advisory committee composed of representatives of public and private organizations to identify trade facilitation bottlenecks and recommend changes. The government agency responsible for trade facilitation could head this advisory committee.

Finally, the problem of the lack of access to trade finance can be addressed if the relevant PICs create an environment where contracts are easily enforceable, issues of collateral and security are managed effectively and financial institutions function efficiently and are able to offer a range of financial instruments to the various export industries. Another important measure is to improve the reliability of financial information provided by export businesses by adopting user-friendly accounting and reporting requirements.

The study is limited by testing the impact of supply-side constraints on exports in aggregate. Time limitations prevented development of a means of testing for the importance of individual constraints such as insecurity of land tenure, lack of access to credit, poor and limited infrastructure, etc. Development of effective tests of this nature would lead to LP solutions that would generate shadow prices for the constraints and thereby give policy makers an indication of the importance of each constraint. It is believed that it is possible to carry out such tests by developing proxies for the impact of the constraints on export supply. It is intended to carry out this work in the next stage of the research.

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