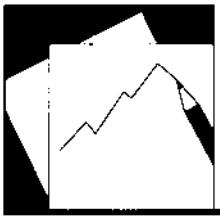
Working Paper

INTERNATIONAL MONETARY FUND

WP/07/213



IMF Working Paper

Inter-sectoral Linkages and Local Content in Extractive Industries and Beyond– The Case of São Tomé and Príncipe

Ulrich Klueh, Gonzalo Pastor, Alonso Segura, and Walter Zarate

INTERNATIONAL MONETARY FUND

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African Department

Inter-sectoral Linkages and Local Content in Extractive Industries and Beyond – The Case of São Tomé and Príncipe

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September 2007

Abstract

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This paper attempts to offer specific inputs to the debate on local content promotion in the oil industry, using the specific case of São Tomé and Príncipe as point of reference. Our approach emphasizes inter-sectoral linkages and institutional pre-conditions for local content promotion. Based on an Input-Output description of the economy, we quantify the consistency between the prospective oil sector development and the growth of other sectors of the economy. We also assess a number of sectoral policies and "niche" activities within the oil industry that would maximize the local benefits from oil exploration.

JEL Classification Numbers: C67, E01, E17, E20, E61
Keywords: Oil sector, Local content, Industrial policies, Input-Output tables

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I. INTRODUCTION

The disappointing development performance of many resource-rich economies has been a topical issue among policymakers and academic economists alike. How can countries characterized by large-scale enclave oil production develop into diversified economies? What are the pre-conditions for increasing local economic activity, and improving income opportunities and living conditions? Recent discussions of these and related questions have focused on the macroeconomic and institutional frictions that possibly arise after natural resources have become the pre-dominant export staple of the respective economies. While recognizing their importance, this paper looks at the issue of resource dependence from a different angle, emphasizing the fact that, even in a stable macroeconomic and institutional environment, resource rich countries face important challenges regarding the inter-sectoral linkages of their export staples, which call for specific policy attention to support broad-based economic growth.

These export staples are believed to offer limited forward and backward linkages into the local economy. If and to the extent to which linkages exist, their deployment and exploitation is substantially more challenging compared to other productive activities, given the organization of the respective industries and the technological complexity of operations. At the same time, the growth of the export staple will lead to a major boost to aggregate final demand which is likely to significantly affect employment and output trends in other sectors of the economy, posing challenges in terms of potential supply bottlenecks. This combination of strong demand and limited production linkages implies that policies to organize and maximize the local benefits from resource extraction have to be in place. This paper attempts to offer specific inputs to the debate on local content promotion in the oil industry, using the specific case of the small island economy of **São Tomé and Príncipe** as an example and point of reference. Our approach emphasizes inter-sectoral linkages and institutional pre-conditions for local content promotion. In particular, based on an Input-Output description of the economy, we quantify the consistency between the prospective oil sector development (with its impact on domestic absorption and exports) and the growth of other sectors of the economy. We also assess a number of sectoral policies and "niche" activities within the oil industry that would maximize the local benefits from oil exploration.

With respect to the policies of "local content promotion," the emphasis is not on supporting efforts to pick "winners" and subsidize them through a range of by and large discredited instruments, such as direct credit, subsidies, tax incentives, and so on. Rather, the paper focuses on the specific public inputs the government would have to provide to support an otherwise market-driven process. It is thus in the spirit of a series of recent contributions (e.g., Rodrik, 2004, and Hausmann and Rodrik, 2006) that argue that governments cannot simply refrain from engaging in some kind of industrial policy, but have to carefully balance structural necessities and the dangers of publicly induced distortions.

The analysis uses public information from a number of countries to identify those branches of economic activity in the oil and non-oil sectors that may develop in tandem with São Tomé and Príncipe's oil exploration. For the oil sector, data on the oil and gas business in a number of developing countries (mainly the Sub-Saharan oil majors Nigeria and Angola)

have been used to define a universe of potential areas of operation in the upstream and downstream oil industry chain. Using this information as starting point, the analysis identifies a more limited number of activities that may realistically take off in São Tomé and Príncipe, given a number of relevant economic criteria, including required capital/output ratios, scale of production, know-how/technology intensity, skilled labor intensity, location constraints, and legal and other institutional constraints. The viability of each activity is gauged using a numerical scorecard system that helps assess the acceptability of the individual project. By proposing specific rules regarding the acceptability of a project, the analysis seeks to add rigor and address any distortions on localization outcomes from Nigeria and Angola that are likely to be distorted by rent-seeking in these countries. For the non-oil sector, a number of promising economic activities are assessed using cross-country information on other small- and medium-size economies during their earlier stages of development and, in particular, publicly available Input-Output (I-O) tables for Mauritius, Fiji, and Israel.

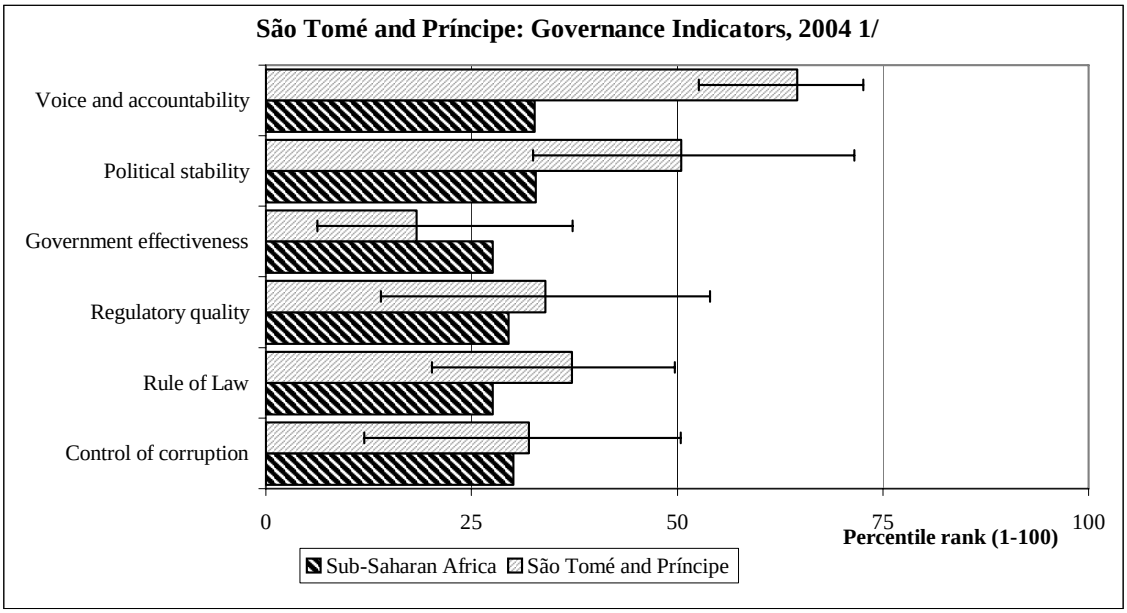
The structure of the paper is as follows. **Section II** reviews the relevant strands of the literature, and develops a framework for thinking about local content promotion. **Section III** summarizes trends in the international oil industry and policies in a number of oil exporting countries (the United Kingdom, Norway, Denmark, Australia, Brazil, Malaysia, Nigeria, Angola, and Trinidad and Tobago) to maximize the benefits from their domestic oil and gas development. The purpose of this section is to firm up our understanding of international best practices for local content promotion in the oil industry. **Section IV** brings the general policy discussion back home and sketches the current sectoral structure of the economy using an I-O table devised by the authors with data from various official sources, including a sources-and-uses national accounts table developed by the Sãotomean National Institute of Statistics for 2001 (see Appendix I for a description of methodological issues and limitations). The section also summarizes the ongoing debate in São Tomé and Príncipe on the need to maximize the domestic business opportunities from the country's oil sector development. **Section V** uses information on Angola's Sonangol and the Nigerian National Petroleum Corporation to define a universe of oil business branches from which to derive a subset of local activities which may flourish in São Tomé and Príncipe provided that the right policies are in place. It also elaborates on the prospective sector complementarities between the oil and non-oil economy. Using the I-O table developed earlier, **Section VI** quantifies changes in sectoral output that would be consistent with the prospective oil export boom in São Tomé and Príncipe. These simulations utilize the latest available medium-term macroeconomic assumptions about the timing and magnitude of prospective oil exports. **Section VII** concludes.

II. Related Literature and Conceptual Framework

If current expectations regarding oil exploration activities in São Tomé and Príncipe indeed were to materialize, the country would face a period of sharp structural transformation. What are the risks and opportunities in terms of local economic activity that arise in this context, and what kind of economic policy implications can be foreseen? A discussion of these issues requires inputs from various strands of the literature on economic development, including basic insights from studies on the resource curse phenomenon (Sachs and Warner, 2001, Auty, 1998), their relation to linkage theories of growth (Auty, 2006), the economics of local

content promotion (Veloso, 2006), and the role of industrial policy during periods of structural change (Rodrik, 2004 and Pack and Saggi, 2006, Lederman and Maloney, 2007).

Existing studies of resource-rich countries comparable to São Tomé and Príncipe suggest a relatively pessimistic outlook that is currently under intense re-examination. The literature on the so called "resource curse" takes a mainly aggregate perspective and focuses on the macroeconomic barriers for growth that arise in the respective countries (Sachs and Warner, 2001). These studies suggest that the real exchange appreciations driven by natural resource booms—the so-called Dutch Disease—could have negative effects on long-term development by reducing the relative size of manufacturing and production. In a similar vein, another important body of literature suggests that natural riches produce institutional weaknesses and mismanagement of natural resource riches (e.g., Auty 1998 and 2001, Gelb, 1988). Yet, a growing number of more recent papers and country analyses show that it is possible to avoid the pitfalls of resource abundance, by pro-actively establishing a sound institutional framework and macroeconomic management (e.g., Bravo-Ortega and de Gregorio, 2007, and IMF, 2006b). In fact, the Sãotomean authorities have already created a number of institutional mechanisms, including, notably, the establishment of a oil fund for future generations, that intend to provide safeguards against these problems (for a description, see IMF, 2006a). The challenge, however, is to further strengthen governance indices in São Tomé and Príncipe so as to counter the strong political pressures for oil rent redistribution through patronage (rather than markets) that are likely to arise as the domestic oil sector takes off.



Source: World Bank Governance Indicators.
1/ Higher rank reflects better governance.

Instead of focusing on the macroeconomic and institutional risks to growth, our approach is closer to contributions that emphasize the limited forward and backward linkages in most

extractive industries (Auty, 2006). In its version inspired by export base theory, this literature suggests that large capital-intensive mining investments create inflated expectations of local benefits. This is mainly because an unusually high share of mining revenue flows abroad to service foreign capital. In addition, the fiscal linkage (taxation) dominates domestic linkages from these type of projects and revenues tend to accrue to the central, rather than to the regional governments. Moreover, since inputs to the production process in extractive industries are by and large imported, growth impulses from backward linkages are considered to be limited. In a similar way, forward linkages (which result from the processing and marketing of the staple) do rarely materialize, since the respective activities are often carried out closer to the overseas final market.

Faced with these problems, many resource-rich countries have recently taken a proactive approach to maximize the benefits from oil and gas extraction through local content requirements and judicious policies to disseminate information among potential local businesses and/or joint ventures. While the academic literature on local content starting with Grossman (1981) is of limited relevance for the problem under consideration,[2] a suitable framework for thinking about such policies can be found in recent studies on the costs and benefits of industrial policy (see Rodrik, 2004 and Rodrik and Hausmann, 2006). This literature supports some active government participation in the development of specific activities, stressing that inaction in the provision of specific public inputs can be a major impediment to product diversification, structural change, and economic development more generally. In particular, it is noted that the emergence of new productive activities is often hampered by the fact that price signals are not available ex-ante, so private agents are faced with substantial uncertainties, and information externalities.

Also, the complexity of most economic activities creates a wide range of potential coordination externalities among private agents. Hausmann and Rodrik (2006) argue that the public inputs to any production process are often highly specific and more extensive than often assumed, as they tend to require a number of coordinated policy actions. For example, the public infrastructure for certain tourism activities would not merely involve the provision of physical infrastructures with a wider range of uses (like roads and hospitals), but also targeted training and education programs (for example for hotel managers and employees), specialized legislation and regulation (zoning restrictions for construction activities, environmental protection targeted at major natural attractions, rules for the safe operation of beaches or means of tourist transportation etc.), and government entities coordinating with the private sector. Given the complexity and extensiveness of these public provisions and the need to limit the size of the public sector, the authors argue, countries are “doomed to choose”, i.e. forced to engage in some form of judicious “industrial policy, ”[3] with the

[2] The respective contributions usually look at the issue from an Industrial Organization perspective, and are set up in a context of oligopolistic competition, focusing on emerging manufacturing industries (Veloso, 2006, provides a survey of the relevant literature).

[3] Such “predicament” between providing the specific public infrastructure needs and limiting the size and influence of government (with its related distortions) is even more pronounced in small and remote economies like São Tomé and Príncipe. Recent research about these countries has often come to the conclusion that lack of scale economies, high trading costs, limited scope for diversification and other comparative disadvantages will

(continued…)

necessary institutional checks and balances to address the risks of "state capture" by powerful interest groups.

The apparent challenges of such forms of government involvement (as extensively documented in Pack and Saggi, 2006) would have to be attenuated using a set of core elements of an appropriate institutional architecture (which, in particular, include coordination and deliberation councils to provide for information exchange and social learning as well as mechanism of transparency and accountability). In this way, an appropriate framework would try to operationalize the needed balance between informed government decisions (which require a close cooperation with the private sector) with the fact that industrial policy is open to corruption and rent-seeking (which requires sufficient distance to private sector interests). The final objective of having such a framework in place would be to support a process of self-discovery, without falling into the trap many countries pursuing industrial policies have found themselves in.

What kind of general rules of operation should guide the process of identifying and promoting specific activities? From the more extensive set of principles provided by Rodrik (2004), which also include guidelines related to the organization of the process itself and the establishment of benchmarks and built-in sunset clauses, we concentrate on those three principles which are directly related to the kind of areas which should be targeted:

(1) The provision of incentives should focus on activities that allow for a diversification of the economy by generating new areas of comparative advantage.

(2) One should not merely target sectors, but activities, to take into account the potential for cross-cutting opportunities.

(3) Promoted activities should provide sufficient spillovers and demonstration effects.

Guided by these principles, the remaining parts of this paper attempt to provide inputs to the discussion on local content promotion and the government's role in fostering structural change in São Tomé and Príncipe. In particular, after reviewing international practices for local content promotion in the oil sector, we use I-O analysis to (i) quantify existing inter-sectoral linkages, (ii) identify those activities which show potential for further inquiry based on a number of economic criteria for ranking activities, and (iii) project the impact of oil-sector growth on the rest of the economy. Using I-O techniques at least partly applies principles (1) and (2) above. Cross-cutting, spillover and demonstration effects are also emphasized in section V, in which we assess the potential for complementarities between

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prevent these countries from achieving sustainable growth over the medium and long run, implying that the international community should simply accept that non-transient financial support will be necessary (see Winters and Martins, 2004; Spolaore, 2004, provides an opposing assessment). Alternatively, some countries may find it possible to identify activities in which their specific advantages are so pronounced that they could charge substantially higher prices, thus counter-balancing the cost advantage they face. However, the respective economies would have to focus their limited resources on these activities and probably combine them with a close integration and coordination with larger neighboring countries, policies that again would require an active involvement of governments.

different activities in the oil and non-oil sectors. In this way, we attempt to evaluate whether and how a sensible policy of local content protection in the oil industries can provide impulses for to economic diversification.

III. Oil-Producing Countries and the Debate on Local Content

This section summarizes trends in the international oil industry and the policies in a number of oil exporting countries (the United Kingdom, Norway, Denmark, Australia, Brazil, Malaysia, Nigeria, Angola, and Trinidad and Tobago) to maximize the benefits from their domestic oil and gas development. These benefits are meant to be achieved through an increase in the quantity of "local content" or "value added" created by indigenous companies that conduct manufacturing or services production in the oil business. As noted above, the purpose of this section is to briefly document best international practices to foster local content in the oil industry.

Oil sector trends

During the last 40 years the oil industry has undergone significant structural changes. In the early-1970s, an array of international oil companies, supplied by a large number of independent service companies, conducted oil exploration activities in onshore and relatively shallow offshore oil fields. In the early-1990s, however, the industry began developing unconventional fields onshore and moving into deeper offshore waters that required sophisticated technologies and a highly-skilled labor force. This move coincided with a process of business consolidation that led to an industry characterized by a smaller group of international players and integrated clusters of supply and services companies ready to provide customized services with extensive quality controls and at competitive prices.

To date, the offshore oil and gas supply and service industry includes many multinational firms with operations located throughout the world. The US is the world's leading supplier of goods and services with many of the company's headquarters located in Texas and Louisiana (Table 1). The capital-intensive nature of the industry lends itself to large companies because of the huge investments required to explore and develop production facilities. A study undertaken by the University of Aberdeen, Scotland, which looked at the characteristics of companies in the Aberdeen area in the 1980s (which was then considered the "oil capital" of Europe) indicated that many of the over 1,000 oil-related companies, were affiliates of large US-based businesses.[4] Yet, the study also found that most of the locally-owned companies were concentrated in non-core oil and gas activities (e.g., insurance, catering), while core oil and gas activities were predominantly undertaken by foreign affiliates.

[4] As reported in Wade Locke, 2004, page 7.

Table 1. Oil and Gas Industry Suppliers by Country 1/

Country/region	Number of Companies Listed	Percent Share in Total
US	2977	49.1
UK	1038	17.1
Canada	772	12.7
Other Europe	149	2.5
Australia	146	2.4
France	124	2.0
Norway	108	1.8
Netherlands	96	1.6
Singapore	94	1.6
Other South America	61	1.0
China	54	0.9
Germany	45	0.7
Italy	40	0.7
Indonesia	38	0.6
South Africa	30	0.5
Other Asia	27	0.4
Venezuela	26	0.4
Russia	26	0.4
Other Central Asia	26	0.4
Brazil	23	0.4
Denmark	22	0.4
Mexico	21	0.3
Other Africa	21	0.3
Nigeria	18	0.3
Malaysia	18	0.3
Thailand	18	0.3
New Zealand	17	0.3
South Korea	13	0.2
Trinidad and Tobago	7	0.1
Other North America	6	0.1
Total	**6061**	**100.0**

Source: Wade Locke (2004).

1/ Includes onshore and offshore oil and gas business.

Analysis for Nigeria confirms the role of foreign companies in capturing the lion's share of the US$2.8 billion business (2002) related to upstream activities, although the number of contracts recently awarded to Nigerian-owned enterprises spurs some cautious optimism.[5] These companies appear to be breaking in into activities, such as consultancy, environmental services, hotel and catering, and information technology (Table 2). However, in terms of the total value of contracts, these indigenous companies with substantial value added creation (as opposed to mere importers of goods and services) only seize about 8.3 percent of overall upstream expenditures.

[5] INTSOK, 2003, and Shirley Neff, 2005.

Table 2. Nigeria: Allocation of Major Contracts in Oil and Gas Industry (2002)
(In number of contracts and place of value added generation (VA))

	Companies with significant VA in Nigeria		Companies with significant VA abroad		Total number of contracts
	Nigerian Owned	Foreign Owned	Nigerian Owned	Foreign Owned	
Consultancy	6	0	8	0	14
Drilling & well completion	9	5	13	33	60
Environmental services	2	0	5	3	10
Exploration	2	4	0	10	16
Other	0	0	0	3	3
Gas development	0	0	0	3	3
Hotel & catering	5	0	5	5	15
ICT	5	1	11	4	21
Procurement	8	2	65	11	86
Production facility maintenance	3	1	45	29	78
Projects/construction	6	5	13	30	54
Transportation	9	6	36	36	87
Total number of contracts	55	24	201	167	447
Memo item:					
Dollar value of contracts (in billion dollars)	0.2	0.5	0.2	1.9	2.8
(percent distribution)	8.3	17.2	8.1	67.9	100.0

Source: INTSOK (2003).

Policies to foster local content

The quest for increasing the economic benefits from the domestic oil and gas industry is not new and traces back to the exploration of the North Sea in Europe and the establishment of state-owned companies in many countries around the world (Appendix II)**.** The 1970's UK model of monitoring local content by the Offshore Supplies Office and the introduction of reporting and auditing procedures for monitoring purchases made by oil companies was a landmark in this area. The international experience also suggests that local content policies have ranged from a very cautious, yet very participatory approach taken by Norway—which leveraged on its industry's initial conditions when oil was discovered and relied heavily on state intervention to foster the local industry and ownership through a state-owned oil company, Statoil—to the Australian model in which the government specifically stated in its regulations that no local content policy was in place, at least in the industry's early development years. Brazil's Petrobras and Malaysia's Petronas are also among large state-run oil companies with important presence in their domestic oil sector (supported by a strict implementation of local content policies and pro-active technology transfer), as well as in important operations overseas.

Public information confirms that external and internal factors have played a catalytic role on the local authorities' stance regarding local content policies. For example, the UK's government's engagement with international oil companies in the early 1970s was triggered by the first oil shock, as well as by the growing realization that British firms were not capturing a significant amount of work supplying goods and services to an expanding North Sea oil industry. Another more recent example is Nigeria, which, after many years of oil

exploration, seems to have missed important opportunities for industrial oil sector development. A renewed interest to address the problem was launched in 1999 under a new administration and has been further strengthened in recent years against the background of high international oil and gas prices.[6] Trinidad and Tobago is another recent example, in which the authorities have proactively engaged the business community in a broad based effort of workers training, small-enterprise capacity building and technology development for the gas industry. A key policy objective has been to cement Trinidad and Tobago's position as an important gas supplier to the North American market.

If some lessons were to be drawn on the principles to foster local content in the oil industry, a review of the international experience suggests that policy considerations should include (see also Box 1):

- ***Accountability:*** Refers to the creation of a dedicated and independent government authority responsible for monitoring local content in oil industry and securing that local vendors are guaranteed the *opportunity* to apply and compete for contracts. International examples include the UK's Offshore Supplies Office (OSO) and Norway's Goods and Service Office (GSO), with their qualified accounting personnel knowledgeable of industry practices.

- ***Adequate metric/definition*****:** Includes the development of an unambiguous definition of what constitutes local content. Monitoring of employment and value added gains, as well as project expenditure impacts on the local economy (including tax payments) are good proxies for assessing local content at the different phases/stages of the projects.

- ***Efficiency considerations:*** Local content assessments and targets need to take into account technological considerations. Technical/capacity constraints define the level of economic benefits that can be captured within a particular region at a particular point in time. Policymakers must realize that, at any point in time, there may be some areas of operation beyond the technical reach of local vendors.

- ***Information dissemination***: Recommends the establishment of a public outreach and analysis office to (i) develop a registry of competent and qualified local vendors, (ii) advice locals on potentials for joint ventures and other mechanisms of cooperation with foreign companies, and (iii) support plans for local capacity building, training, and R&D.

- ***Acknowledgement of spin-off benefits:*** Includes monitoring and public dissemination of complementarities between the oil industry and the rest of the economy. Examples include spillover effects from oil into agriculture (e.g., fertilizers production) and hospitality industry (e.g., hotels and entertainment).

[6] A first step has been the establishment of an official goal of 45 percent local content by 2006 and 70 percent by 2010 in the oil and gas industry. Significant task specific directives on local content have also been issued. This include: (i) an expansion of the existing requirement for seismic data processing projects to be sourced in the country, (ii) a requirement that all front end engineering and design work for upstream projects be conducted in country, and (iii) a requirement that floating production, storage and offloading integration work takes place in the country by end-2006 (as reported by INTSOK, 2003).

Box 1. Policies to Foster Local Content: International Comparison at a Glance

Economic criteria	The United Kingdom	Norway	Denmark	Australia	Brazil	Malaysia	Nigeria	Angola	Trinidad and Tobago
Accountability	**1970s**: establishment of the Offshore Supplies Office (OSO).	**1965**: Norwegian Petroleum Law enacted; emphasis on joint ventures, gvt. equity participation &local content. **1970s**: establishment of state oil company Statoil & Nirsk Hydro. **1972**: establishment of Goods & Services Office (GSO).	No local preference or purchasing policy in place, yet a single company (DUC) was provided exclusive license of North Sea oil exploration.	Australia has no local content policy in place, yet operators are encouraged to use local suppliers & manufacturers. **1984**: the Industrial Supplies Office (ISO) is established to act as facilitator for project developers & local industry. **2001**: the Australian Industry Participation Framework states gvt. policies to support local content in large investment projects.	**1953**: Petrobras is created and granted exploration & production licenses throughout Brazil. **mid-1990s**: Petrobras' monopoly is eliminated and the National Petroleum Agency (ANP) is established to regulate petroleum activities in Brazil and ensure local benefits of oil projects in a context of competitive leasing system of oil blocs.	**1974:** the state oil company, Petronas, is established. Petronas has been key vehicle to foster local content; it set registries of licensed oil & gas local companies.	**Since 1999:** gvt. has taken action to increase local content in domestic oil & gas industry. Local Business Development/Global Procurement Unit was established. **1997**: establishment of the Onne Oil & Gas Free Zone.	**1976:** the state oil company, Sonangol, is established. Sonangol made exclusive concessionaire for oil exploration in Angola; allowed to enter into associations w/foreign companies on oil exploration, development, & production	**2004:** gvt. adopted the Local Content and Local Participation Framework Policy for the energy sector, along its entire value added chain.
Metric/Definition	**1960s**: discretionary licensing of oil blocs. **1970s**: OSO monitoring of direction of trade of oil companies (value of contracts w/impact on local employment & valued added creation in manufacturing & sub-contracting). **1990s**: Entry into EU refocus on development of export markets.	**1972**: Article 54 of Royal Decree of 1972 directed gvt. to support local companies provided they were competitive in prices, quality, schedule & service. **1990s**: Article 54 was rendered invalid as Norway accessed the EU; emphasis changed to support intl. expansion of local oil industry.	The Danish Energy Administration does not calculate capture rates or levels of local content in industry.		ANP specifies detailed local content percentages on the purchase of goods and services for exploration & development of on-shore and off-shore operations.	Petronas' monitoring of local companies defined by (i) local equity participation; (ii) employment creation & use of local inputs Production Sharing Contracts (PSCs) with Petronas' participation include recommendations on the purchase of goods & services locally to maximum extent possible.	Local Business Development/Global Procurement Unit monitors (i) awarding of contracts to local firms; (ii) farming out of oil fields to Nigerian oil companies; (iii) technology transfer initiatives; (iv) local content development fairs/events.	Since mid-1990s, Sonangol underwent restructuring & became holding with autonomous subsidiaries. Sonangol has currently pivotal role in the supply & service sector of the local oil industry.	Local content is defined in terms of ownership, control, decision-making, and preferential access to financing. International companies are required to commit to contracting local firms. Education & training of workers is critical element under policy framework.
Efficiency Considerations	OSO focused on ensuring a competitive domestic industry through range of programs offered to local contractors.	Initial conditions were favorable. When oil was discovered (1960s), Norway had considerable industrial technical capacity. Statoil was pivotal on technology transfer and personnel training.	Large platforms & structures usually supplied by European companies; Danish suppliers strong in services and suppliers of medium-size structures & equipment	Reports from the US Department of Commerce on Australia's Oil & Gas Field Equipment Market are optimistic on local content shares in projects.	**1970s:** Petrobras used numerous foreign contractors in early years of off-shore development. In the 1980s the focus was on development of domestic technology using licensing agreements w/intl. suppliers.	Malaysia has developed a considerable supply industry that currently competes for projects around the world.	In cooperation with international oil companies the gvt. is trying to meet efficiency oil producing standards & local content targets on the use of local technology.	Numerous Production Sharing Arrangements w/participation of world oil majors and Sonangol are currently in place.	Gvt. has engaged business community in supporting broad based job training efforts, small business capacity building & technology development.
Information Dissemination	OSO was an independent agency set up expressly to help domestic firms in oil sector.	GSO was an independent agency set up expressly to help domestic firms in oil sector.			The local oil sector was kept closed for decades; Brazilian labor & companies were hedged while developing skills &capabilities.		Local content initiatives are widely known.	Sonangol has established in its webpage a resource link on opportunities for local suppliers.	Gvt. has established database on projects' status and opportunities for local suppliers.
Acknowledgement of spin-off effects into non-oil economy	Limited.	Govt. actively focused on in-country research & technology development in general.			Petrobras has an aggressive investment program in oil production, but also high-tech. refineries, pipelines, etc.		Limited.	Sonangol's business interests are in oil & non-oil economy.	Gvt. strategy is also focused on the development of opportunities in the non-oil economy.

Sources: Appendix II, Alvesson et. al. (2003), INTSOK (2003), Neff (2005), and Wade Locke (2004).

IV. SÃO TOMÉ AND PRÍNCIPE: INITIAL CONDITIONS AND OIL POLICY DEBATE

This section seeks to translate the international policy debate about punctuated and judicious industrial policies—including local content promotion in the oil sector—into São Tomé and Príncipe's reality. To this end, this section describes the current sectoral structure of the economy using an I-O table devised by the authors and elaborates on the ongoing debate about local content policies supporting the prospective oil sector development in São Tomé and Príncipe. Subsequent Sections V and VI put forward a number of economic criteria aimed at helping policymakers decide over alternative investment opportunities in the oil sector business, and calibrate the economic effect of the prospective oil boom using our I-O matrix.

The Sãotomean economy today

São Tomé and Príncipe is a small island country located in the Gulf of Guinea some 400 kilometers to the west of Gabon, with a total population is estimated at about 160,000 inhabitants in 2005, and a per capita income of about US$400, making it one of the smallest economies in Africa. Although nearly two-thirds of the population live in rural areas a growing proportion is concentrated in and around the capital, São Tomé, which has an estimated population of 55,400, while only about 7,000 people are permanent residents of Príncipe.

While the relative importance of different productive activities existing in the country–most of them in infant stages–has been the subject of a number of recent assessments (see, for example, Earth Institute, 2005, and World Bank, 2006), information on the nature and importance of inter-sectoral linkages in São Tomé and Príncipe has not been assessed so far. As noted above, this information is crucial to evaluate the impact of alternative policy prescriptions with respect to local content strategies. Regrettably, statistical information on the country's sectoral structure is limited, both in quality and in quantity. However, combining different sources of information and using an iterative process, we developed a stylized Input–Output representation of the economy. More specifically, our starting point was a sources-and-uses national accounts table containing information on the allocation of supplies to various intermediate or final uses for the year 2001. To estimate the production technology of the economy, we complemented this information with data on technical coefficients for other developing economies which were used as reference for deriving an I–O description of the economy, a matrix of technical coefficients, and estimates of backward, forward, and overall inter-sectoral linkages (Tables 3-4). the resulting calculations allow for a broad characterization of the role of the various sectors in the Sãotomean economy:

- Manufacturing ranks first among economic sectors in the economy in terms of its backward and forward linkages. With an estimated backward linkage of 0.91, the sector's (domestic and imported) input requirement per unit of output is the highest in the economy. The sector also plays a leading role in terms of supplying its output to the rest of the economy (i.e., its forward linkages), particularly for final and intermediate consumption in the construction, agricultural, and services sectors.

- By contrast, the agricultural sector (including forestry and fishery) has a rather low backward linkage (0.26, with insignificant imported input requirements), although it is a top contributor in terms of value added to the economy. The current institutional arrangements—based extensively in self financing of seeding and harvesting of small plots, with almost nonexistent taxes on agricultural products—yield in a situation in which most of the agricultural output represents value added to the economy and goes to satisfy final demand (i.e., consumption, change in inventories, and exports).

- Commerce and services (mainly hotels and restaurants) reports a sizeable backward linkage (0.819), thus suggesting that growth this sector is particularly beneficial to the economy on account of intermediate input demand its generates.

- The construction and transport sectors are also important contributors in terms of value added to the economy, albeit recording rather small backward linkages (0.26, on average) reflecting intermediate input demand from the manufacturing sector.

- The matrix of technical coefficients further exposes the links between manufacturing and agriculture. Manufacturing uses agricultural inputs to the extent of an input coefficient of 0.042 per unit of gross output. In tandem, agriculture uses manufacturing inputs with a technical coefficient of 0.031. This suggests that manufacturing is as much dependent of agriculture, as agriculture is on manufacturing. Farm products sold to the manufacturing sector include mainly cacao for fermentation, drying and exporting. In conducting these tasks, the agricultural sector uses substantial amount of inputs from the transportation sector to deliver its output to the processing centers clustered in the manufacturing sector.

- The public administration sector (including education and health) plays an important role in terms of value added to the economy and its inter-sectoral linkages assessed by the Leontief inverse matrix (Table 3, penultimate column). On the one hand, most of the public administration's value added represents wages and salaries paid to public employees in the defense, public health and education services, and other social and recreational affairs and services undertaken by the government. On the other hand, after commerce and services, the public administration has the largest estimated inter-sectoral linkage. The inverted Leontief matrix shows that 1 dobra increase of final demand by the public administration (i.e., public consumption and/or public investment) leads to a 1.97 dobra increase in aggregate output of the economy, given the estimated I-O technical coefficients.[7] This highlights the key role of government spending on the economy today, warranted by the internal and external imbalances that an unduly expansionary fiscal stance could generate.

[7] The standard analysis is based on the I-O identity: $(I - A) X = Y$, where X is the proposed vector of gross output figures, A is the Leontief matrix of technical coefficients, I is the identity matrix, and Y is the vector of final demand. Final demand is the sum of consumption, investment, government expenditure, and exports; imports are assumed to be included as part of gross output (X). When assessing the vector of gross outputs required to produce a proposed vector of final outputs, we rewrite the formula to: $X= (I-A)^{-1} Y$. For details, see Dorfman, Samuelson, and Solow, 1958.

- By contrast, the mining sector—including the oil industry—has neither important value added contributions to the economy nor a significantly large inter-sectoral linkage effect. The inverted Leontief matrix shows that 1 dobra increase in mining sector final demand leads to only 1.2 dobra increase in aggregate output of the economy (Table 3, penultimate column). This suggests that, even today, the Sãotomean authorities face the challenge of how to better integrate this sector with the rest of the local economy.

Table 3
Intersectoral Linkages and their Rankings, 2001

	SECTOR	FORWARD LINKAGE		BACKWARD LINKAGE				GROSS		TOTAL INTER	
		INTERMEDIATE DEMAND	FINAL DEMAND	DOMESTIC INPUTS	IMPORTED INPUTS	TOTAL INTERMEDIATE PURCHASES	Rank	VALUE ADDED	Rank	SECTORAL LINKAGE	Rank
1	Agriculture, forestry & fishing	0.1693	0.8307	0.2418	0.0196	0.2617		0.7383	2	1.3953	
2	Mining	0.8920	0.1080	0.1227	0.3848	0.5075		0.4925		1.2041	
3	Manufacturing	0.2555	0.7445	0.3650	0.4685	0.9108	1	0.0892		1.5117	
4	Energy & water	0.5263	0.4737	0.2673	0.0000	0.2673		0.7327	3	1.4068	
5	Construction	0.1767	0.8233	0.2849	0.0000	0.2849		0.7151		1.4241	
6	Commerce & Services 1/	0.6265	0.3735	0.7277	0.0911	0.8188	2	0.1812		2.1234	1
7	Transport & Communication	0.7481	0.2519	0.1710	0.0755	0.2465		0.7535	1	1.2354	
8	Public administration	0.2178	0.7822	0.5955	0.2178	0.8133	3	0.1867		1.9704	2
9	Education & health	0.5213	0.4787	0.2232	0.0867	0.3099		0.6901		1.3418	
10	Other services	0.2607	0.7393	0.4205	0.0002	0.4207		0.5793		1.6528	3

Source: I-O Table devised by the authors.
1/ Includes tourist industry (hotels and restaurants).

Table 4: Input-Output Technical Coefficients - 2001

		1	2	3	4	5	6	7	8	9	10
1	Agriculture, forestry & fishing	0.0288	0.0000	0.0417	0.0000	0.0083	0.0859	0.0045	0.0000	0.0000	0.0000
2	Mining	0.0000	0.0000	0.0000	0.0000	0.0277	0.0000	0.0000	0.0000	0.0000	0.0000
3	Manufacturing	0.0308	0.0421	0.1241	0.0591	0.1071	0.2667	0.0190	0.0000	0.0559	0.1101
4	Energy & water	0.0016	0.0428	0.0066	0.0742	0.0129	0.0380	0.0023	0.0220	0.0358	0.0930
5	Construction	0.0000	0.0000	0.0077	0.0000	0.0433	0.0692	0.0080	0.1410	0.0000	0.0000
6	Commerce & Services 1/	0.0935	0.0378	0.0150	0.0519	0.0358	0.1278	0.0168	0.0482	0.0438	0.0309
7	Transport & Communication	0.0861	0.0000	0.1605	0.0684	0.0498	0.1218	0.1140	0.1372	0.0356	0.0000
8	Public administration	0.0000	0.0000	0.0043	0.0000	0.0000	0.0000	0.0000	0.1960	0.0000	0.0000
9	Education & health	0.0010	0.0000	0.0044	0.0137	0.0000	0.0118	0.0043	0.0126	0.0521	0.0587
10	Other services	0.0000	0.0000	0.0007	0.0000	0.0000	0.0066	0.0021	0.0386	0.0000	0.1278

Source: I-O Table devised by the authors.
1/ Includes tourist industry (hotels and restaurants).

The local content debate in São Tomé and Príncipe

With this structure of the economy as the starting point, the discussion over the domestic benefits from oil exploration is the crucial medium–term issue for the Sãotomean authorities, particularly as relations with Nigeria develop in the context of the potentially very profitable Joint Development Zone (JDZ, see Box 2). The view is that, given the rather small size of the Sãotomean economy, a small fraction of the overall business in the JDZ could have a big impact on the islands' economy. However, the Sãotomean authorities realize that an increased local content (i) needs to go hand-in-hand with increasing the efficiency of spending within the sector and the economy in general and (ii) should be seen as a way to integrate JDA's budget with the local economy. The former requires rigorous cost-benefit

analysis to maximize rent channeling through market efficiency considerations and minimize its flow through patronage channels, the latter a proactive stance by the Sãotomean representatives at the JDZ's Joint Ministerial Council to effectively influence spending decisions within the joint exploration area. Also, the newly-established National Petroleum Agency (ANP) needs to develop into a center of technical excellence for advising the Sãotomean government on oil sector exploration and development policies. Formulation of the legal framework underpinning the country's local content policy and establishing the public bodies accountable for the implementation of such a policy is also a task ahead.

Box 2. Joint Development Zone (JDZ) : Institutional Framework and Oil Extraction Potential

In 1998, São Tomé and Príncipe filed a territorial claim with the United Nations to establish an Exclusive Economic Zone (EEZ), based on the median line principle stipulated under the UN Convention on Law of the Sea (UNCLOS). Nigeria contested the claim, arguing that the northern part of the proposed EEZ was within Nigeria's own EEZ. The area in dispute covered 34,548 square kilometers.

In February 2001, Nigeria and São Tomé and Príncipe signed a treaty for joint development of petroleum and other resources in the maritime areas contained in the areas they both claimed, which now constitute the JDZ. Although the countries did not renounce their claims to the zone, the treaty called for joint exploitation of natural resources for a period of 45 years, unless otherwise agreed after a review in the thirtieth year. The treaty can be extended by mutual agreement after the initial term.

The treaty grants Nigeria 60 percent and São Tomé and Príncipe 40 percent of the benefits and obligations arising from development activities carried out in the JDZ. The Joint Development Authority (JDA), based in Abuja, was created to manage exploitation of the resources in the JDZ. The JDA responds to the Joint Ministerial Council (JMC), composed of two to four ministers or officials of equivalent rank from each country. The JMC is the ultimate decision-making body for the JDZ. JDA and JMC decisions are made by consensus. In the JMC deadlocks, the disputes are referred for resolution to the heads of state of the two countries.

At the time of the drafting of this paper, exploration drilling in the Obo-1 well, located in Block 1 in the JDZ, was still ongoing and no commercial findings had yet been made, therefore, estimates on potential oil wealth contained in Section VI are subject to substantial uncertainty and margin of error. Against this background, these estimates could be considered conservative, as it is assumed the discovery of only one commercially-exploitable block in the JDZ (out of five blocks already auctioned), with 500 million equivalent barrels of oil in reserves (roughly equivalent to that of an average-sized block in the Gulf of Guinea). This would yield an average production of 70,000 barrels per day, starting around 2012, during the 20 year lifespan of the well (although with a production profile consistent with deep-seawater wells, peaking in the third year of production and gradually declining thereafter). The oil price is assumed at US$30 per barrel, in constant 2006 U.S. dollars.

Given the small size of the Sãotomean economy, even such limited oil wealth would imply a share of oil–to – total GDP above 80 percent during the peak years of production, and above 50 percent on average during the twenty–year production period assuming non–oil GDP growth rates of around 7 percent per year and constant US dollar government spending in perpetuity. The latter is consistent with the application of Friedman's permanent income hypothesis (PIH) type spending rule contained in the Oil Revenue Management Law (ORML), at a level equivalent to 130 percent of 2006 GDP.[1]

1/ See Segura, 2006.

In this regard, information obtained from the Sãotomean authorities is reassuring as it confirms the government's intention—in the context of the JDZ and the EEZ—to deal in earnest with the issue of local content development in the oil industry with due regard to best principles.[8] The JDZ's draft local content policy targets the inclusion of local content clauses in the bids submissions and subsequent Production Sharing Contracts being negotiated with actual and prospective oil companies developing the JDZ. Ongoing steps toward the implementation of a such a policy include: (i) designation of JDA dedicated officers for the monitoring of local content implementation (*accountability principle)* and (ii) the establishing of a register of all local indigenous companies which are to benefit from the local content program (*information dissemination principle*). The latter also includes policies to avoid predatory pricing of contracts by international oil companies in the upstream sector and "gold plating," i.e., the use of unnecessary high specifications and standards by oil companies aimed at excluding local suppliers (*adequate metric/definition principle*).

In addition, the JDA is working closely with the international oil companies toward ensuring long term cooperation and active participation of the international companies in the development of local content activities in Nigeria and STP (*efficiency considerations principle*). The JDZ's draft local content policy guidelines also note the need to maximize potential complementarities between the oil and the non-oil economy in Nigeria and São Tomé and Príncipe (*spin-off benefits principle*).

Discussions on the pros and contras of establishing a national oil company (NOC) in São Tomé and Príncipe are also ongoing. The benefits from having a NOC include, inter alia, state participation in the sector and influence in the commercialization of the natural resource; state access to know-how of oil sector operations; possible across-the-board participation by national companies in the oil sector; and possible enhanced emphasis on value added spillovers into the oil and nonoil economy. Limitations from having a NOC include the state's limited ability to handle risks in an industry with important fluctuations in prices; the state's tight budget constraint to finance competing investments in the oil and nonoil sectors of the national economy; low productivity/efficiency and high operating costs at least in the early years of NOCs' involvement in the sector; delays in the accrual of oil tax revenues while the NOC is being developed to become an active partner in the local oil business; and, most important, the international evidence suggesting that many NOCs are run badly from a financial and economic point of view.

V. Potential for Oil Sector Development in São Tomé and Príncipe and Complementarities with the Non-oil Economy

This section uses public information on the oil and gas industry in Africa's oil majors, Nigeria and Angola, to define a universe of potential areas of operation in the upstream and downstream value chain and derive a subset of economic activities that may develop in São Tomé and Príncipe as its oil sector takes off. It puts forward a number of economic criteria

[8] See Øystein Kristiansen, 2005 and the Nigeria-São Tomé and Príncipe Joint Development Authority, *Local Content Policy for the Joint Development Zone*, n.d.

aimed at helping decision-makers who must choose among productive investment opportunities. In addition, through a scoreboard ranking system we develop a rigorous way to evaluate available opportunities for São Tomé and Príncipe. The section closes with an assessment of the complementarities between the oil and non-oil economy.

Zeroing on local content options for São Tomé and Príncipe

Using the United Nations' International Standard Industrial Classification System (ISIC), activities are classified in 13 major technology areas within the standard framework for primary, secondary, and tertiary sectors of economic activity (Table 5).[9] In general, the data show that Nigerian and Angolan firms have some considerable (and growing) presence in all three sectors of economic activity. Their universe of business activities range from the building of structures in the primary sector, to the provision of design/engineering and data management services in the secondary sector, to sea and costal transportation of oil and derivates in the tertiary sector. Nigeria's level of competence within the oil industry could be critical for the exploration and development of the JDZ, as the winning oil consortia for exploration and development of Blocks 2-4 include several Nigerian firms with significant local interests. [10]

A subset of activities which appear to be candidates for development in São Tomé and Príncipe was derived within the technology universe defined by Nigeria and Angola. The viability of each activity in the islands was analyzed using a scorecard system, in which individual businesses are rated according to seven economic criteria which are considered fundamental is assessing the feasibility of a particular activity branch. Table 6 describes the criteria used to populate the scorecard, and indicates the economic rationale on which they are based. To score a specific activity, the authors used various sources of information, including industry reports about up- and downstream oil sector activities and their technological characteristics, information from various reports on the Saotomean economy (e.g. from World Bank 2006 and Earth Institute, 2005) and information provided by the Saotomean authorities during various IMF missions to the country. While it is clear that such an approach is judgmental by nature, the authors tried to limit potential biases by first rating each activity independently from each other, before aggregating the information and jointly eliminating any remaining discrepancies.

For each criterion, a specific activity could either be assigned a score of -1 (local conditions do not support establishment of activity), 0 (local conditions are neutral with respect to establishment), and 1 (local conditions are favorable for establishment). After individual scores have been assigned, a cumulative score for each activity branch is calculated. The cumulative score is then used to identify those activities which have the highest development potential in São Tomé and Príncipe. As a guiding rule, cumulative scores ranging from -6 to -3 signal very strong reasons for not establishing the activity, scores from -2 to +1 would

[9] See Paul A. Armknecht et. al., 2006, for a similar activity classification of the oil sector in Kazakhstan.

[10] See Segura, 2006.

mean that the activity would involve substantial risks, but may be established after improvements of the physical and institutional infrastructure, and scores equal to or above +2, would imply a substantial development potential.

The use of specific rules to gauge the acceptability of a project seeks to add rigor and address the distortions on localization outcomes from Nigeria and Angola that are likely to be influenced by rent-seeking in these countries. For example, it is widely recognized that Sonangol's simultaneous role as a developer and a regulator (concessionaire) of the domestic oil industry generates conflicts of interests. Problems reportedly exist in the area of preferential treatment of Sonangol's subsidiaries and joint ventures in the procurement of goods and services to oil companies operating in Angola. This situation could have substantial revenue implications (i.e., reduced government profit oil and/or petroleum income tax) given the cost-raising effect of preferential procurement practices, on top of the economy-wide welfare costs from rent cycling through patronage channels.

The results from the analysis show that out of 13 oil business activities currently operated by Nigerian and Angolan firms with substantive local content, about a third of them may have a chance for developing in São Tomé and Príncipe. These promising areas for local content development include:

- Building and maintenance of equipment for storage and distribution of oil and derivates,
- Data processing and storing of seismic data,
- Air transportation services related to the oil industry,
- Technical/professional development of staff, and
- Sectoral logistical support (including provision of financial intermediation services and procurement).

The international experience confirms the challenges and potential gains for São Tomé in the area of equipment building and maintenance for storage and distribution of oil and derivates. Employment data on the Angolan oil sector indicate a robust and permanent demand for unskilled and technical local labor in this upstream activity area, although the more specialized tasks are generally carried on by expatriates (Table 7). Works in this area include structural engineering, as well as civil and infrastructure engineering and supervision. Joint ventures could also cover more specialized areas such as electrical, instrumentation and controls, and mechanical engineering for the oil, gas and process industries. The international evidence suggests that location constraints are major determinants of the country's relative comparative advantage in this technology area.

Table 5. Universe of Oil and Gas Sector Activities

Activity	Nigeria: Status of Technology Area	Angola: Local Company Name
	I. Primary Sector	
Crude petroleum extraction: well building & development	Medium high. Good local expertise for onshore and shallow water drilling. Deep water operations dominated by foreign companies	Sonamer (deep-water drilling activities); Sonastolt (technical support of oil drilling companies)
Services incidental to oil, excluding surveying: control systems & exploration of mature fields; EOR/IOR	Medium. International contractors use local fabricators for assembly of less sensitive parts	Petromar (building and maintenance of equipment for production, storage & distribution of oil & derivates)
Transportation of crude, refined oil and petroleum products via pipelines	Low. Large volume of imports from Far East; need to develop vibrant inspection, repair & maintenance local industry.	Sonasurf (supply of vessels to oil industry)
Sea water transportation of crude oil	Medium high. Local and foreign companies active in marine transportation services for swamp and offshore operations	Sonangol Shipping; ; Sonasing (treatment and oil storage for export)
	II. Secondary Sector	
Manufacturing of refined petroleum products	N.A.	Luanda Refinery
Manufacturing of tankers, suction piles, subsea templates	Medium	N.A.
Manufacturing of floating or submersible drilling or production platforms	Medium	Sonamet (production of structures: platforms & oil transportation systems)
Design engineering-related scientific and technical consulting services	Medium. Critical for influencing the choice and decisions for specific fields development	TECHNIP and Wapo Angola (engineering services)
Data acquisition & processing	Medium high	Sonawest (database processing and storing of seismic data)
	III. Tertiary sector	
Oil trading services	Medium high	Sonangol USA; Sonangol Ltd.
Air transportation related to oil industry	Low	Sonair
Transport and freight insurance services	Low	N. A.
Financial intermediation services, R&D, and other business services	Medium high	Banco Africano Investimentos; Sonadiets; ESSA (professional development and training)

Source: Table 1 in Appendix III.

Table 6. Criteria Applied for Rating of Technologies

Criterion	Description of the criterion
Capital/output ratio	This indicator seeks to measure the value of fixed assets divided by the value of production at a sectoral level. The higher this ratio, the lower the potential for development of such activity, given the relative scarcity of capital in São Tomé and Príncipe.
Production scale	Classifies the activities based on (i) the production scale needed to reach profitability, (ii) the relative size of sunk/start-up costs involved, or (iii) any other factor that could act as a barrier to entry to the sector. The larger any of these factors, the lower the potential for development of the activity in São Tomé and Príncipe.
Know-how technology intensity	Identifies those activities that involve a large degree of private knowledge due to high specialization or intensive use of patents. As know-how intensity increases, the potential for development of the activity decreases.
Skilled labor intensity	Classifies activities based on the degree of specialized or skilled labor involved. Skilled labor intense activities would have limited potential in São Tomé and Príncipe.
Location constraints	Refers to the geographic or location characteristics of the country that could favor the development of certain activities.
Physical infrastructure requirements	Classifies activities based on their reliance in physical infrastructure for development. In some cases, the nature of infrastructure could be industry-specific.
Legal and other institutional requirements	Identifies the need of specific legal, regulatory or other institutional bodies that need to be in place in order to enable the development of an activity.

The development of in-house data processing and storing of seismic data capabilities is another area for possible local development. This development strategy would be consistent with current industry practices to outsource the collection of seismic and other geological data to specialized firms, while the subsequent data interpretation and modeling is done *in-house* by the oil operators in the context of defining the firms' exploration and development strategies.

Table 7. Angola: Employment by Nationality & Profession in Oil Sector, 2002
(In number of people)

	I. Upstream Activities		II. Downstream Activities	
	Angolan Nationals	Other Nationalities	Angolan Nationals	Other Nationalities
Technicians	*5373*	*1147*	*570*	*15*
Operators	1877	487	361	5
Mechanics	563	138	119	4
Electritians 1/	434	154	90	6
Construction	476	20	0	0
Smelters	2023	348	0	0
Engineers	*695*	*783*	*86*	*6*
Operators	78	275	62	3
Mechanics	62	77	11	1
Electritians	97	81	13	2
Engineering	171	94	0	0
Geologists	187	111	0	0
Others	100	145	0	0
Finance & Administration	*1631*	*183*	*336*	*183*
Other	*3427*	*394*	*932*	*16*
Grant Total	11126	2507	1924	220

Source: IPEDEX (2002) as reported in Pereira da Costa Barroso Mangueira (2004).
1/ Includes also instrumentalists.

Servicing of offshore rigs and the business-related passenger traffic between São Tomé and the African continent should provide an active demand for charter planes and helicopters, as well as pilots and support teams. Preliminary official estimates of potential air traffic connected to the industry confirm the scope for local sector development of this area.

The remaining two areas for local development refer to the provision of technical support activities, including services on training, financial intermediation, and procurement. The setting of training facilities for technical staff working in the Joint Development Zone would be an effective way to spread know-how between Nigeria and São Tomé and Príncipe, while giving an important boost to the non-oil economy of the islands. The provision of financial intermediation services is also like to develop in tandem with the growth of the economy. In the area of procurement, it is expected that some local importing businesses would take off in the context of servicing the offshore rigs.

Assessing complementarities with the non-oil economy

For several reasons, the development potential for and impact of specific oil-sector activities in STP cannot be assessed without reference to the non-oil sectors. As a small and relatively poor island economy, the country faces a number of comparative disadvantages. In particular, scale economies prevent some activities from being profitable at the current level of income and infrastructure. This section reviews the latent complementarities between the oil industry, tourism, and agricultural sector, and financial services, which need to be assessed within an overall framework that addresses the concerns about "oil enclaves" found in many oil-exporting countries, but promotes an efficient allocation of resources in the non-oil economy. Moreover, in the case of tourism, coordinated policy efforts ought to preserve the islands' ecological and geographic potential.

The emergence of oil production has the potential to boost some activities in such a way that makes some reach the critical threshold to break through. The reasons for such a potential are at least fourfold. First, and most importantly, some economic activities could provide inputs to the oil-related-industry itself, which in turn will be characterized by synergies to other local economic activities. For example, providing housing and other services to foreign oil sector employees has developed into a sizeable sector in many oil-producing countries. While these activities are only partly sustainable, as oil is an exhaustible resource, they might enable the emerging local tourism sector to reach a critical level, and develop infrastructures strongly needed to support high-level activity. Second, the emergence of demand linkages can have sizeable effects in small economies like São Tomé and Príncipe, if properly developed. These demand linkages, in particular, may become relevant for some locally-produced food items. Third, revenues from oil production can enable a country to carry out well-targeted productivity-enhancing investments that will make existing comparative advantages, for example in selected agricultural and food processing activities, more pronounced. Finally, there might be opportunities for cross-cutting exercises with respect to the policies needed to foster specific oil and non-oil activities, for example in the areas of training and education, public R&D, the provision of venture capital vehicles, or the activation of nationals abroad as part of the labor force. Based on these considerations, the following are areas of potential development:

Tourism and related recreational activities have long been a priority issue on the development agenda for São Tomé and Príncipe, and the analysis in section II suggests that sizeable backward linkage materialize as a result of further developing the existing potential , which remains largely untapped. Most importantly, the exact nature of a tourism strategy has yet to be defined (Potter, 2005), and integrated with the likely emergence of the oil sector. Strengthening demand linkages from the presence of foreign oil workers and other professional visitors to the country will require an attractive and safe environment, resembling in many ways the one needed for sustainable tourism. Also, a number of activities that typically develop in tandem with the oil sector (like, for example, the training of employees) could, if attracted to the island, create additional demand for hotel and other capacities, thus allowing them to reach a critical threshold. Finally, and perhaps most importantly, existing bottlenecks that so far have restrained the growth of the sector could potentially be attenuated by the emergence of the oil sector. Tourism is currently hold back by a lack of transport infrastructure (both between the island and the rest of the world and

locally), health risks through malaria, lack of sanitation, and health care infrastructures, inappropriate governance and regulation of the sector itself, and related sectors, and skill shortages (Earth Institute, 2005, and World Bank, 2006). Not only would all these areas need to be addressed anyway when the oil sector takes off. The international experience shows that some of the problems are quite naturally addressed in the process of establishing the oil sector, in particular when it comes to the international connectedness of the country through air and sea transport, and the necessity to provide foreign employees with a safe environment. To take advantage of these complementarities, the government would have to develop a strategy that pays special attention to the preservation of the natural riches the island currently offers. The specific public inputs required to develop tourism would thus include a strong legal framework of environmental protection, geographical restrictions for certain activities, and the provision of targeted physical and health infrastructures, issues also emphasized in Potter (2005). In this respect, it is worth noting that the emergence of the oil industry may also involve substantial risks to the development of tourism activities, that would have to be addressed in a similar way.

International trans-shipment and entrepôt services. In this area, São Tomé and Príncipe could exploit one of its few geographic advantages. It is located within two hours flight from 12 countries in West Africa, many of which are also involved in oil and gas production. Consequently, the Earth Institute, 2005, notes that "São Tomé and Príncipe could aim to provide not only port services, but also education and health services (e.g. a quality regional university and a quality regional hospital) for the entire region" and that "…over time, free-port services can develop from services that require unskilled labor such as warehousing and sorting, to services that employ more skilled labor such as processing, quality controls, customs clearance and all kinds of clerical and logistic services." All of these activities would harmonize well with some of the local content policies described in section IV. As with tourism, they would require the provision of a high-quality living environment, and effective trans-national transportation means.

Agriculture and fisheries. A sustainable development of tourism and entrepôt activities would also strengthen direct backward and forward linkages with agriculture, fisheries and food processing. The data presented in section II suggests that current backward linkages are not pronounced, although the sector is a top contributor in terms of value added. The existing low linkages largely reflect inefficient small-scale labor-intensive production of basic staples and cocoa exports. As suggested by other studies on the inter-sectoral linkages of tourism and services more generally (see Cai, Leung, and Mak, 2005) this is not necessarily so. For example, if the oil boom generates labor scarcity, that may allow consolidation of farms into larger scale agri-business activity that may yield higher linkages.[11] Quite likely, the same holds true for artisan fisheries, which could diversify away from merely fishing for local markets to providing boat trips for visitors (including oil executives), as well as food processing, in particular for some items that have a strong relation to the local culture, like

[11] A illustrative comparison is the estimated backward linkage for agriculture and food processing in another island economy like Fiji, which is almost four times the estimated backward linkage for agriculture in São Tomé and Priícipe (see K. L. Sharma).

artisan chocolate. At the same time, and as emphasized by Potter (2005) much of the infrastructure that would be required for the development of eco-friendly tourism activities could also benefit producers of local food items.

To conclude, there seem to exist important complementarities between the oil sector, tourism and agricultural sectors, as well as in the services sectors more generally. To exploit the resulting opportunities, an integrated strategy of local content promotion has to be based on a detailed assessment of remaining obstacles to develop these activities, and a quantification of likely spillovers between the identified non-oil sectors, as well as spillovers from and to local content activities in the oil sector. In final analysis, however, the activity mix (between the oil and non-oil sectors) would be less important than the efficiency with which an activity builds the human, financial, and social capital stock. The I-O data provided in section II as well as the projected size and inter-linkages of different sectors derived in the next section. can serve as an important input to such an exercise.

VI. I-O Forecast with the Oil Sector Development

In this section we translate alternative assumptions about final demand in the context of the prospective oil sector boom into output requirements from the various sectors of the economy. Our approach comprises two steps. First, we project the medium-term growth of real GDP and the respective components of final demand (i.e., private and public consumption, investment, and oil and non-oil exports) using mainly the latest available medium-term macroeconomic projections about the timing and magnitude of the prospective oil shock (Box 3). Second, the projected final demand is then multiplied by the inverse Leontief matrix to derive the levels of sectoral output that would be consistent with such macroeconomic projections for final demand. This is the standard I-O identity: $X= (I-A)^{-1} Y$.

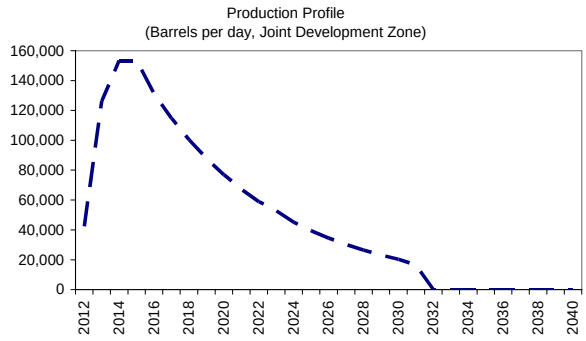
Before discussing results, we should point out some of the limitations of our approach. Mainly because of the lack of I-O data on comparable countries with large oil sectors, we have to work with a constant parameter model. Assuming a linearly evolving technology space is obviously only an imperfect way of projecting the future economic structure, in particular given the dimensions of the expected structural change. However, as explained more thoroughly in the appendix, we believe it is a valid first approximation and starting point for future work. Moreover, using the current parameterization of the inverse Leontief matrix has some benefits. In particular, it allows gauging expected trends given the current structure and unchanged policies, and can thus help to identify potential bottlenecks, aberrations, and policy priorities.

In spite of their limitations, the results from our analysis are rather suggestive, in particular in terms of the projected growth rates in total output stemming from raising oil exports and investment in the secondary and tertiary sectors. The projected sectoral output growth is consistent with the industry linkages underlying the Input-Output analysis sketched in Section IV. Our projections show that sectors such as energy and water, construction, commerce and services will grow at annual average rates of about 10 percent during the period leading to 2021, supported by the projected oil shock.

Box 3. São Tomé and Príncipe: Medium-term Projections--Basic Assumptions

As indicated in Box 2, the medium-term macro projections assume the discovery of only one commercially-exploitable block in the JDZ, with 500 million equivalent barrels of oil in reserves (roughly equivalent to that of an average-sized block in the Gulf of Guinea), of which 40 percent of total receipts would accrue to São Tomé and Príncipe in line with the agreement establishing the Joint Development Zone with Nigeria .

Since production would follow the pattern of deep-seawater wells, the impact of the oil shock (relative to the overall and the non-oil economy) would depend on the timing assumed for the analysis. We calibrate the shock at around the year 2021, which based on current assumptions, could be considered a representative year during São Tome's anticipated oil era. First, around that year, oil production, while already declining, would be at about the average production for the lifespan of the well, 70,000 barrels per day. Second, this year would mark the midlife of the oil well (assumed at 20 years, starting in 2012). It is important to note that should the shock be assessed for an earlier date than 2021, the impact of the oil export boom would be considerably larger than currently estimated (both due to the larger oil production and the smaller size of the non-oil economy).



Source: Fund staff estimates.

Moreover, in calibrating the impact of the oil shock, we assume concurrent increases in oil exports and domestic investment. Public consumption and non-oil exports are assumed to lag the growth of other components of final demand. In the former case, this is due to the application of a Permanent Income Hypothesis (PIH) spending rule, which smoothes the use of oil proceed by the government while accumulating resources at a Permanent Fund for Future Generations. In the latter case, a conservative assumption of non-oil export growth is consistent with at least some mild effect of Dutch Disease that may emerge.

Across sectors of the economy, the projected final demand for our representative year (2021) assumes an increased share in total expenditure by the secondary and tertiary sectors, away from agriculture, forestry and fishing, as the economy reaches a higher stage of development.

The specific results from our quantitative analysis, besides providing an estimate for the substantial boost in final demand through increases in exports and investment, are the following:

Table 8. Composition of Final Demand Shock, 2001-2021
(Average growth rates, in percent)

Private consumption	7.1
Public consumption	6.5
Investment	8.7
Exports	18.5
Of which: non-oil	6.6
Total final demand	10.7

- By 2021, output from oil and mining alone (at constant 2001 dobras) would be more than twice the output of all sectors of the economy in 2001. This compares with the sector's rather insignificant share in total output today. During the peak years of oil production (2014-15), the relative size of the oil economy would be even higher.

Table 9. Actual and Forecasted Sectoral Output, 2001-2021
(In billions of 2001 dobras)

SECTORS	Sectoral Output 2001	Sectoral Output 2021	Average growth rate
1 Agriculture, forestry & fishing	261,586	568,370	4.0
2 Oil and Mining	7,035	3,944,723	37.2
3 Manufacturing	578,506	2,420,181	7.4
4 Energy & water	43,703	383,038	11.5
5 Construction	226,708	1,507,935	9.9
6 Commerce & Services	111,894	674,396	9.4
7 Transport & Communication	251,736	1,166,920	8.0
8 Public administration	113,602	413,930	6.7
9 Education & health	21,132	114,434	8.8
10 Other services	45,405	183,181	7.2
Economy's total output	1,661,305	11,377,109	10.1

- Consistent with the I-O technical coefficients for 2001, the oil shock would lead to a re-composition of total output in the economy.[12] Our projections show the oil and mining sector becoming the predominant sector of the economy, but with other secondary (energy and water, construction) and tertiary sectors (commerce and services, including tourism) also increasing their shares in total output at the expense of the agricultural sector and the manufacturing sector, in the margin.

[12] With the economy undergoing such a structural transformation with the arrival of the oil era, it would be expected that the underlying inter-sectoral linkages in the economy also change. However, in the absence of reliable cross country information against which to benchmark those transformations, we decided to rely on the 2001 I-O matrix for the calibration of the results in this section. Further work could be done in exploring what the impact in the economy would be not only from a change in final demand, but also by deriving a modified I-O matrix.

Table 10. Actual and Forecasted Sectoral Output, 2001-2021 1/

(In percent of total output)

	SECTORS	2001	2021	
			With Oil	Without oil 2/
1	Agriculture, forestry & fishing	15.7	5.0	7.6
2	Oil and mining	0.4	34.7	...
3	Manufacturing 3/	34.8	21.3	32.6
4	Energy & water	2.6	3.4	5.2
5	Construction	13.6	13.3	20.3
6	Commerce & services	6.7	5.9	9.1
7	Transport & communication	15.2	10.3	15.7
8	Public administration	6.8	3.6	5.6
9	Education & health	1.3	1.0	1.5
10	Other services	2.7	1.6	2.5
	TOTAL	100.0	100.0	100.0

1/ Total output includes imports of goods and services.

2/ Rescaled to exclude oil and mining sector for comparison purposes with pre-oil era.

3/ Figure for 2001 includes commodity imports equivalent to 16 percent of total output.

- The I-O projections point at the complementarities/consistencies between the shock to final demand stemming from the oil boom and the growth of the non-oil economy. Indeed, the I-O inter-sectoral linkages show that secondary sectors currently suffering from a significant infrastructure gap (electricity and water, construction), as well as some services sectors (commerce and services, education and health), would need to experience very high rates of growth during the period leading to 2021 to be consistent with the projected vector of final demand. By contrast, primary sectors, with the lower level of inter-sectoral linkages, and which are probably overrepresented at this stage of development, would lag the growth of other sectors of the economy.

- The public administration's share in total output would decrease (6.8 to 5.6 percent excluding oil) over the period of analysis. As noted in section IV, above, government's output (value added) includes mainly compensation to employees. At the same time, the government's contribution to final demand (including purchases of a wide range of domestic and imported consumption and investment goods and services) would remain moderately strong, growing at an average rate of 6.7 percent during the period 2001-2021. This compares with final demand growth rates of 9.6 percent and 9.0 percent for education and health, and services, respectively. The application of the PIH type rule on the use of oil revenue caps the government's ability to accrue a larger share of total output and final demand than assumed in the projection.

- The share of agriculture (including forestry and fishing) in total output would decline over the medium-term. While some expected transformation of the current institutional arrangements–from unorganized small plots into cooperatives of production with some degree of agro industry activities–may lead to a recovery of the sector after years of stagnation, the share of agriculture in total output would be broadly halved, from 15.7 percent in 2001 to 7.6 (excluding oil) in 2021. The low inter-sectoral linkages of this sector help explain this result.

- Manufacturing would experience a somewhat marginal decrease in its share in total output (34.8 to 32.6 percent, excluding oil) on account of the authorities' efforts to counter economy-wide Dutch-disease effects, while seeking to maximize local content in the upstream and downstream industry. This marginal decrease in the sector's share in total output nonetheless implies an average annual growth rate of 7.4 percent during 2001-21.

- Output from secondary sector activities currently facing severe gaps of infrastructure and/or the provision of services would be the fastest growing. Accordingly, electricity and water would double their share in total output (2.6 to 5.2 percent excluding oil), construction will also increase its output share by almost half (13.6 to 20.3 percent excluding oil).

- Output from commerce and services (including tourism) is projected to increase rapidly over the medium-term. These sector's expansion would be very important to the economy given their large backward linkages and labor intensive nature.

VII. CONCLUDING REMARKS

This paper has sought to provide inputs to the ongoing policy debate in São Tomé and Príncipe about ways to maximize the local benefits from the prospective development of the oil sector. While we offer a number of policy conclusions (see below), an important implication of our analysis is that the optimal policy response to the prospective oil boom may involve some form of judicious government involvement in the promotion of local content to support oil rents channeling into the economy through market efficiency considerations and minimize its flow through patronage challenges:

– The international experience reviewed in section III confirms that many oil-exporting countries have taken a proactive approach toward local content development over the last forty years. There have been successful experiences like the North Sea oil development, in which firms from the UK and other Nordic countries gradually accrued a solid presence in the upstream and downstream oil industry over the years, overall guided by efficiency considerations. Unfortunately, this has not always been the case, with countries like Nigeria, for example, still thriving to profit substantially from the development of their domestic oil and gas exploration.

- The challenge at all times has thus been to strike a balance between market signals and some pro-active industrial policy. This view is not only supported by the international experience, but also by recent theories of structural change and growth promotion (Section II).

- The necessity of some pro-active stance is especially pronounced in the specific case of São Tomé and Príncipe. Faced with a very large and experienced partner, defining and defending the country's share of locally relevant Joint Development Zone activity is a formidable task, which requires decisions at the JDZ's Joint Ministerial Council that explicitly recognize such a goal, but, at the same time, minimize oil rent channeling through patronage channels (Section IV).

Besides the need of a clearly defined government role in promoting specific economic activities related to the oil sector's development, the policy implications of this paper are threefold:

First, in reviewing the international experience, we identified a number of best practices for supporting local content in the oil industry. In general, these practices/principles are based on a transparent set of rules regarding the monitoring of a—narrowly defined—local content concept and the provision of information to the market through designated and highly professional government bodies about investment opportunities within the oil sector and spin-off effects from oil sector development into other sectors of the economy. Monitoring of employment and value added gains, as well as project expenditure impacts on the local economy (including tax payments) are good proxies for assessing local content at the different stages of oil projects. For the case of São Tomé and Príncipe, a reassuring development is that these best practices are currently being extensively discussed in the context of the exploration of the Joint Development Zone with Nigeria, and São Tomé and Príncipe's Exclusive Economic Zone.

Second, our analysis proposes a number of economic criteria and rules to identify oil-related activities that may have a chance to develop in São Tomé and Príncipe. Compared to the multiple investment opportunities available to the African oil majors (Nigeria and Angola), São Tomé may only have a chance to focus on punctuated investment projects in the areas of building and maintenance of equipment for storage and distribution of oil and derivates, data processing and storing of seismic data, air transportation services related to the oil industry, technical/professional development of staff, and sectoral logistical support (including provision of financial intermediation services and procurement). Developing those projects and investment opportunities will be a testing ground for the implementation of best international practices for local content promotion in the islands.

Third, based on our input-output table, our analysis quantifies the possible impact of the prospective oil sector development on other sectors of the Sãotomean economy. While the Leontief matrix of technical coefficients exposes the limited backward and forward linkages from the oil sector into the rest of the economy, the sheer magnitude of the domestic demand shock stemming from rising oil exports is likely to have major impact on overall output. Indeed, assuming that oil exports average some 70,000 oil barrels per day (with 40 percent of these proceeds accruing to São Tomé and Príncipe as called in the JDZ's charter), gross

output in sectors like energy and water, construction, commerce and services (including education and health) would likely be the fastest growing in response to the oil shock. The policy challenge would be then to secure that these complementarities between the oil and non-oil economy materialize so as to maximize the local benefits from the exploration of São Tomé and Príncipe's expected oil riches.

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APPENDIX I. DEVELOPMENT OF AN INPUT-OUTPUT TABLE FOR SÃO TOMÉ AND PRÍNCIPE

This section sketches the development of an Input-Output table by the authors using information from a supply and uses table produced by the Sãotomean National Institute of Statistics for 2001.

The raw data

The raw data for analysis was a supply and uses national accounts table in the form of a matrix recording how supplies (i.e., sources) of different kinds of goods and services originate from domestic industries (legal entities/corporations and household units) and imports for 2001. The table also shows how these supplies were allocated (i.e., uses) between various intermediate uses or final uses, including exports.

The input-output table

The IO table rearranges the supply and uses table data by expressing rows and columns in the same classification: It establishes direct links (products-to-products or economic activities-to-economic activities) rather than indirect links (products-to-industries) as used in the supply and uses table. Two important assumptions underlie the input-output analysis, i.e., the notions of:

- A single technique of production for each product/economic activity.
- A linear fixed-coefficient production function.

International comparators were used in assessing a representative technique of production for the ten economic activities included in the I-O table developed for São Tomé and Príncipe. These activities followed the standard ISIC classification, namely:

- Agriculture, forestry, and fishing
- Mining
- Manufacturing
- Energy and water
- Construction
- Transport
- Commerce and services (includes hotels and restaurants)
- Public administration
- Education and health

- Other services

We used a multifaceted approach is gauging the representative technique of production for the various activities in the I-O table. Ideally, the technical coefficients would be estimated econometrically, taking a large sample of firms as possible and regressing input on output to find the coefficient. In practice, point estimates are generally used instead, the coefficient being the ratio of the sum of inputs for all firms in the sample to the sum of their outputs. For purpose of our analysis, it was necessary to take a less elegant method, since no single body of reliable data exists that would give the point estimates required. In the event, data sources consulted included sectoral information compiled by the Ministry of Agriculture and the Ministry of Finance , data from the airport and seaport authorities, and the electricity company.

Moreover, the authors' approach was to complement the sources indicated with information on technical coefficients for other rather small states, like Mauritius and Fiji, as well as detailed I-O data for the early years of the development of the state of Israel (1958).[13] The authors' efforts were to try to find consensus where possible on each item, using what appear to be the most reliable source when there was disagreement, or using compromise figures/coefficients when there was little to choose. The process included a substantial trail-and-error method in consultation with national account experts in São Tomé; no attempt is made to outline the process here. The outcome of this deliberate process was the synthetic technical coefficients matrix presented in the main text of the paper (Table 2). The actual I-O table (in dobras of 2001) is presented next.

Further technical observations supporting the use of constant input-output coefficients and a strong aggregation of data into few economic activities are the following: [14]

- The assumption most frequently used as a first approximation is that of constant input coefficients. It is a heroic assumption to assume that the ratio of agricultural input to industrial output will remain constant over time, since the branch composition of agriculture and industry will change, and with it average input ratios. However, if we assume a more disaggregated I-O table, in terms of single products or homogeneous groups of products, the assumption becomes more plausible. For example, the ratio of the input of raw cotton to the output of the spinning industry at constant prices is mainly a technical one, and it may be assumed--as a first approximation--to remain unchanged for sometime.

- Data disaggregation may not be needed where the input structure of different branches is similar (i.e., where the input coefficients are the same). In this case, these industries may be aggregated into one sector, for even if there are changes in their relative outputs, the input coefficient of the consolidated sector will remain constant, and equal to the coefficient of each component sub-branch.

[13] See K. L. Sharma (n.d.) and Michael Bruno (1962).

[14] As noted in Michael Bruno (1962).

- When the demand for the products of different branches moves in the same direction, i.e., when there is a constant relationship between the outputs of some branches, it is also permissible to aggregate them, since the input coefficient of the consolidated sector will remain constant (and equal to the weighted average of the coefficients of the component branches). An example of the latter is the case of industries whose output consists mostly of input into another industry, such as leather and shoes, weaving and clothing.

TABLE 1

TOTAL INTERSECTORAL FLOWS, SAO TOME AND PRINCIPE ECONOMY, 2001

(IN MILLION DOBRAS, 2001 PRODUCER´S PRICES)

supplies to \ consume from		INTERMEDIATE DEMAND											FINAL DEMAND						
	SECTORS	Agriculture, forestry & fishing	Mining	Manufacturing	Energy & water	Construction	Commerce & Services	Transport & Communication	Public administration	Education & health	Other services	*Adjusted Variable*	**TOTAL INTERMEDIATE OUTPUT**	Private Consumption Expenditure	Government Consumption Expenditure	Gross Fixed Capital Formation	Changes in Inventories	Exports	**TOTAL**	**TOTAL OUTPUT**
1	Agriculture, forestry & fishing	7,531	0	24,152	0	1,879	9,610	1,127	0	0	0		**44,299**	186,291	0	0	8,067	22,928	***217,286***	**261,585**
2	Mining	0	0	0	0	6,275	0	0	0	0	0		**6,275**	0	0	0	760	0	***760***	**7,035**
3	Manufacturing	8,048	296	71,813	2,582	24,270	29,841	4,787	0	1,181	5,000		**147,818**	412,125	0	64,882	-47,278	957	***430,686***	**578,504**
4	Energy & water	416	301	3,796	3,243	2,926	4,251	589	2,501	757	4,223		**23,003**	20,700	0	0	0	0	***20,700***	**43,703**
5	Construction	0	0	4,458	0	9,820	7,740	2,014	16,021	0	0		**40,053**	0	0	186,656	0	0	***186,656***	**226,709**
6	Commerce & Services	24,468	266	8,661	2,268	8,113	14,297	4,229	5,470	926	1,402		**70,100**	17,553	0	0	0	24,242	***41,794***	**111,894**
7	Transport & Communication	22,521	0	92,855	2,988	11,300	13,627	28,702	15,586	753	0		**188,332**	27,465	0	0	0	35,937	***63,402***	**251,734**
8	Public administration	0	0	2,474	0	0	0	0	22,267	0	0		**24,741**	0	84,352	0	0	4,509	***88,860***	**113,601**
9	Education & health	266	0	2,562	599	0	1,321	1,073	1,430	1,100	2,665		**11,016**	10,115	0	0	0	0	***10,115***	**21,131**
10	Other services	0	0	387	0	0	735	536	4,380	0	5,801		**11,839**	26,939	6,620	0	8	0	***33,567***	**45,406**
	Adjusted Variable													-49,527	0	0	0	48,335	***-1,192***	**-1,192**
-	**Domestic Production**	**63,250**	**863**	**211,158**	**11,680**	**64,583**	**81,422**	**43,057**	**67,655**	**4,717**	**19,091**	**0**	**567,476**	**651,662**	**90,972**	**251,538**	**-38,443**	**136,907**	**1,092,636**	**1,660,112**
-	Gross value added	193,118	3,465	51,595	32,023	162,125	20,279	189,685	21,205	14,583	26,302	0	**714,381**							
-	Import of goods & Services	5,136	2,707	271,027	0	0	10,192	18,994	24,741	1,832	11	*-1,192*	333,448							
-	Taxes on Products	82	0	44,726	0	0	0	0	0	0	0	0	44,808							
-	**TOTAL SUPPLY**	**261,586**	**7,035**	**578,506**	**43,703**	**226,708**	**111,894**	**251,736**	**113,602**	**21,132**	**45,405**	**-1,192**	**1,660,113**							
-	**PRODUCTION**	**256,368**	**4,328**	**262,753**	**43,703**	**226,708**	**101,701**	**232,742**	**88,860**	**19,300**	**45,393**	**0**	**1,281,857**							

APPENDIX II. LOCAL CONTENT POLICIES IN SELECTED COUNTRIES

This section summarizes the experiences and policies in a selected group of countries and/or jurisdictions regarding local content in the oil and gas sector. For each country/region, we provide a summary of the resource base and the policies undertaken over time to foster local content.

A. The United Kingdom

Interest in the North Sea was initiated following the 1959 discovery of a major gas field in the Netherlands. Exploration in the UK's continental shelf started in the early 1960s. As of end-2002, there were 96 platforms in operation producing oil and gas from over 140 fields in the UK's continental shelf. Total production in 2002 was about 770 million barrels of oil and condensates and 3.8 Tcf of natural gas. The continental shelf has a considerable amount of infrastructure, including over 10,000 kilometers of oil and gas pipelines and a number of onshore terminals.

Evolution of government policies

Early 1960s: no offshore oil policies and regulations existed.

1965: a licensing system and a fiscal regime is developed to encourage exploration and generate tax revenue. The UK government implemented a discretionary licensing system (rather than auctioning) whereby it allocated blocks to prospective oil companies generally committed to rapid exploration programs and use of UK-based suppliers.

1970s: British offshore exploration policy thoroughly reviewed due to (i) the discovery of two massive oil fields (Forties and Brent), (ii) first oil shock, and (iii) a growing realization that British firms were not capturing a significant amount of work supplying goods and services to expanding oil industry.

1973: New offshore policies kick in: (i) the Offshore Supplies Office (OSO) is created, (ii) provision of financial assistance to the UK supplies industry starts, and (iii) auditing procedures for monitoring purchases made by oil companies is established. The audits were undertaken by OSO and required the oil companies to submit quarterly reports listing contracts in excess of 100,000 pounds, the successful bidder and the list of UK firms who had bid on the contract or had been approached by the oil companies. In the monitoring procedure, the UK share was defined as "representing the value of contracts and main sub-contracts placed with companies which made a substantial contribution to the UK economy through employment, manufacturing, or sub-contracting."[15] While no legal sanctions were imposed on companies low UK local content, the view was that these countries were likely to expect difficulties in being successful in future bidding rounds.[16]

[15] As reported in Wade, 2004, page 31.

[16] As reported by Cameron, 1986, page 50.

Early 1990s: In the context of a strengthened relationship with the European Union, the UK's government's focus changes from promoting local content within the UK offshore oil and gas industry to support private investors develop export markets in a competitive environment.

B. Norwegian Continental Shelf

Norway's offshore oil industry started in 1962, following expressed business interests to explore the Norwegian North Sea. Following agreements to divide the North Sea with the UK and Denmark in 1965, the Norwegian government held the first licensing round; this led to the first well exploration staring 1966. During the following 40 years, the Norwegian offshore oil and gas industry grew very rapidly. By 2001, the domestic petroleum sector accounted for 23 percent of the country's GDP, 45 percent of its exports, and 2 percent of its total investment. Crude oil production in 2002 was about 1.2 billion barrels and 2.3 Tcf of natural gas. The continental shelf contains a considerable amount of infrastructure (pipelines, onshore terminals, and fabrication yards) developed during the last 40 years of oil exploration.

Evolution of government policies

1965: the Norwegian Petroleum Law was enacted. It enabled the government to choose which international oil companies it would work with to maximize local benefits. In the beginning, the preference was given to companies that would join with local business interests. By 1967, government equity participation in offshore development was required. The percentage could be reduced if Norwegian interests were included as part of the group licensed to develop a specific field.

1970s: Like in the UK, offshore exploration policies were substantially revisited. The government based its policies on the need for state participation, which it did through the state oil company Statoil and Nirsk Hydro. These companies were given preferences in licensing decisions and were viewed as instrumental to increasing the chances for Norwegian-based supplier to enter the industry.

1972: Article 54 of the Royal Decree of 1972 dealt with local content and directed the government to pursue the goal of insuring that Norwegian goods and services should have preferences, provided they were competitive in terms of price, quality, schedule and service. The Goods and Services office was established for (i) monitoring and cooperating closely with international oil companies to develop a domestic industry, (ii) stimulating the local supply industry through joint ventures, (iii) encouraging R&D and technology transfer, (iv) reviewing tendering procedures and ensuring that local companies received full and fair opportunity to bid, and (v) establishing targets for local participation.

Early 1990s: Norway entered the European Economic Area. Article 54 was rendered invalid and the government's ability to undertake the measures included in the Act was curtailed. Current emphasis is on the government's efforts to support an international expansion of the local supply industry with due regard to market principles and efficiency considerations.

C. Denmark

Exploration of the Danish North Sea began in 1965, with the first well drilled offshore. Production began in 1972. Danish production generally lagged that of the UK and Norway. According to experts, this was due to a combination of factors including resource potential, lack of formal energy policy, and the provision of an exclusive license to a single company (DUC) for the North Sea oil exploration. The system was reformed in the 1980s when an agreement was reached with DUC to open up certain areas of the Danish North Sea to exploration by other companies. By 2002, Denmark produced some 135 million barrels of crude oil and 0.4 billion cubic feet of natural gas per year.

Evolution of government policies

Denmark has no local preference or purchasing policies in place. In the beginning of the industry, most of the work was performed locally, but as Denmark's economy evolved within the EU, import restrictions and local preferences became irrelevant. Larger platforms and structures are usually supplied by European companies, while Danish suppliers have become competent suppliers in services and as suppliers of small to medium sized structures and equipment.

D. Australia

The offshore petroleum industry began in 1965 with the discovery of the first offshore field in Australian waters. Since then there have been some 240 significant discoveries made in the country's offshore basins. Oil and gas production offshore Australia occurs on over 50 producing platforms which in aggregate produce some 260 million oil barrels and 1.3 Tcf of natural gas per year.

Evolution of government policies

Australia has no local content policy in place. The petroleum regulations specifically state that there is no local preference policy. Yet, operators are encouraged to use Australian suppliers and manufacturers to the greatest extent possible.

1984: the Industrial Supplies Office (ISO) was established to act as a facilitator for project developers and local industry. ISO followed a soft approach to encourage local participation in large oil and gas projects and (i) provided information on Australian suppliers to local operators, (ii) encouraged local companies to from joint ventures to make them more competitive, and (iii) assisted Australian companies with the tendering process.

2001: the Australian Industry Participation Framework (AIPF), agreed by all state governments, articulates government policies and strategic directions towards enhancing the levels of participation of Australian industry in large investment projects.

E. Brazil

Brazil's oil and gas industry revolves around the role of Petrobras, the country's state-oil company. Petrobras was formed in 1953 when the government enacted a national petroleum policy. The company was granted exploration and production licenses throughout the entire country and was made responsible for oil/gas refining, transportation, and distribution.

Brazil's offshore oil industry began in the 1960s with the discovery of the Guaricema field. By mid-1970 further offshore discoveries propelled the development of the country's offshore oil and gas industry, mainly in deep and ultra-deep fields. Currently, Petrobras is a world leader in deep-water drilling.

Today, Brazil produces approximately 1.5 million barrels of oil and 44 million cubic meters of natural gas per day (some 550 million and 0.6 Tcf annually) and is the 15th leading oil producer in the world.

Evolution of government policies

The Brazilian government has maintained a very active role in the overall development of the oil and gas industry since the early 1950s, including the formation of Petrobras, which has direct involvement in almost all field developments.

Petrobras remains the predominant player in the Brazilian industry despite the opening of the industry in 1997. The latter resulted in about 50 international oil companies entering the Brazilian market through a number of licensing rounds held to date. As part of the opening up, the National Petroleum Agency (ANP) was established in 1998 to regulate petroleum activity in the country and ensure local benefits from oil projects. Average local content commitments in Round 5 licensing (August 2003) were: 78-100 percent in exploration activities, 30-55 percent in drilling, and 5-90 percent in development.

F. Malaysia

The country's offshore oil and gas industry started in the 1950s. First oil discoveries happened in 1962. These were followed by a number of other discoveries, most notably several large gas discoveries. In 2002, Malaysia oil production averaged some 800,000 barrels per day or 250 million for the whole year. Annual gas production has grown significantly in recent years, reaching 2.1 Tcf in 2002.

Evolution of government policies

The objectives of Malaysia's oil and gas policy have been straightforward from the start: to maximize local benefits through the development of local capabilities and industrial base to support the growing onshore and offshore oil and gas industry.

Prior to 1974: oil companies operated in Malaysia under s concession system in which the government making land available to oil companies in return for royalties.

1974: following the first oil shock, the government issued the Petroleum Development Act by which it established the state-owned oil company, Petronas, and gave it full ownership and rights to all lands in the country, onshore and offshore, for oil exploration and development.

Petronas has been a key vehicle to develop local content. Local supplier development was encouraged through the use of a licensing system whereby in order to become a registered bidder for any oil and gas supply activity, companies have to be registered with Petronas. Key requirements for obtaining a license include: (i) establishment of an incorporated business in Malaysia with sufficient local equity participation, (ii) agreement to observe official guidelines regarding management, employment and the use of local resources, and (iii) agreement to acquire all materials and supplies locally and if not available locally, to purchase them directly from manufacturer.

Through the use of Petroleum Sharing Contracts (PSCs), Petronas has entered into numerous joint oil exploration and development agreements with international oil companies. As part of the PSCs agreements, oil companies are required to purchase goods and services locally to the maximum extent possible.

G. Nigeria

Nigeria oil and gas industry began in the 1930 when Royal/Dutch Shell began exploration in Nigeria's onshore areas, primarily the Niger Delta region. By 1972, Nigeria's onshore and shallow waters oil production had reached 2 million barrels per day. In 1995, Shell discovered the massive offshore Bonga field that led to a move from onshore to offshore operations in Nigeria.

Today, Nigeria's focus is on its offshore producing regions. Daily production in Nigeria is limited by its OPEC quota which averaged 2 million barrels per day in 2002 (740 million total for 2002).

Evolution of government policies

Nigeria is a member of OPEP since 1971. Historically, Nigeria's oil and gas supply industry has received a very small share of the benefits from oil and gas expenditures made in the country. Estimates made by the Nigerian National Petroleum Company (NNPC) in 2000 suggested that Nigerian companies received less than 5 percent of the US$3 billion annual expenditures made by oil companies operating in the country.

Since 1999, the government has moved to increase local content in the Nigerian oil and gas industry. The Local Business Development/Global procurement Unit was established through joint efforts by Chevron Nigeria Ltd. And the NNPC. This initiative included activities relating to (i) the actual award of contracts to Nigerian firms, (ii) the farming out of oil fields to local Nigerian oil companies, (iii) facilitating technology transfer and (iv) holding Local Content Development fairs. The results indicate success as Chevron Nigeria reportedly increased its local content from 25 percent in 1997 to 82 percent in 2001. However, the vast differences in the local content participation estimates (5 percent in 2000) and 82 percent for

Chevron's expenditures in 2001 highlight the lack of monitoring and standard definitions in measuring local content.

Another initiative to encourage local content development has been the establishment of the One Oil and Gas Free Zone in 1997. Since its inspection some 90-100 companies have located in this free zone and a cluster of expertise is developing, in addition of thousands of job opportunities for local residents.

H. Angola

Oil production started in Angola in 1955, following the discovery of oil onshore in the Kwanza basin. This was followed, during the 1960s, by the discovery and development of oil fields off the coast of Cabinda, where production started in 1968. In the early 1990s, oil exploration of deep and ultra-deep oil fields off the Angolan coast began with an extraordinary success rate to date. By end-2005, Angola produced some 1.4 million barrels of crude oil per day.

Evolution of government policies

In the immediate post-independence period (1976), the government set up a national oil company, the *Sociedade Nacional de Combustíveis* (Sonangol) and promulgated a petroleum law (law 13/78) in 1978. The law made the state the sole owner of the country's petroleum deposits and established Sonangol as the exclusive concessionaire for oil exploration and development, while allowing Sonangol to enter into associations with foreign companies to seek the financial resources needed for oil exploration, development and production.

The Angolan petroleum sector is dominated by international companies. Sonangol's role is to establish partnerships with this companies through Production Sharing Agreements (PSAs) and, in a few blocks, through direct stake holdings in contractor groups or joint ventures.

Sonangol's technical and organizational capacity to offer blocks for bidding, negotiate with interested oil companies and manage its stake holdings has gradually strengthened since its establishment in the mid-1970s. Also, since the mid-1990s, Sonangol has been restructured, becoming a holding company with autonomous subsidiaries, including Sonangol Pesquisa e Produção, for exploration and production, and Sonangol Distribução for marketing of refined products. In addition, the company has secured itself a pivotal role in the supply and service sector of the oil industry, by establishing a nexus of joint ventures (with foreign partners and local business interests). These companies, which provide such services as helicopters, supply boats, support bases, seismic studies, civil construction and drilling, have given Sonangol a key leverage, amounting in some fields to a virtual monopoly in the local market.

I. Trinidad and Tobago

Trinidad and Tobago (T&T) has been a small oil producing country for some time, but it is rapidly becoming an important natural gas producer. T&T has large proven natural gas reserves which it has developed into an LNG and petrochemical industry.

Evolution of government policies

The need for greater local content, including local ownership, has been extensively debated in T&T.

2004: the government adopted a Local Content and Local Participation Framework Policy for the energy sector, along its entire value added chain. The policy framework defines local content to include ownership, control, decision-making and preferential access to financing. International companies are required to commit to contracting with local companies. Education and training of workers and support for local businesses in developing "strategic" skills are critical elements under the framework. Also, the government is to establish a database on the status of projects and opportunities for local suppliers.

The T&T government identified a potential US$2.7 billion in annual business across the economy that domestic businesses are losing to foreign competitors. In this context, the Centre for Energy Enterprise Development was established to provide small- and medium-size companies with advice and tools to effectively compete in the industry.

Beyond explicit policy directives, the T&T government has been actively engaged with the business community in supporting a broad based effort of job training, small business capacity building and technology development to supply industry need and create export opportunities.

An important element of the government's local content strategy is focused on the development of the non-oil economy to create alternative pillars of economic growth after the oil reserves are depleted.

Appendix III. São Tomé and Príncipe: Scorecard for Oil Sector Development

Table 1. ScoreCard on Universe of Oil and Gas Activities

Memo Item: Angolan Company Name	Area of Expertise	Input Requirements	Ranking Criteria: Capital / output ratio	Production Scale 1/	Know-how technology intensity	Skilled labor intensity	Location constraints	Physical infrastructure requirements	Legal and other institutional requirements	Total Score
		I. Primary Sector								
Pesquisa & Producao	**Oil Exploration and Development**	High-tech oil exploration infrastructure	-1	-1	-1	-1	0	-1	0	-5
		software experts	1	0	-1	0	0	0	0	0
		network support	1	0	-1	0	0	0	0	0
		geologists	1	-1	-1	-1	0	0	0	-2
		petrochemical engineers	1	-1	-1	-1	0	0	0	-2
		support teams								
Sonamer (49) 2/	**Deep-water drilling activities**		-1	-1	-1	-1	0	-1	0	-5
Sonastolt (45)	**Technical support to oil drilling**		0	0	0	0	0	0	0	0
Petromar (60)	**Building and Maintenance of equipment for production, storage, and distribution of oil & derivates**	working capital	-1	-1	-1	-1	-1	-1	0	-6
		support staff (maintenance)	0	1	0	0	1	0	0	2
		storage	0	0	1	1	1	-1	0	2
Sonasurf (49)	**Supply of sea vessels to oil industry**		-1	-1	0	0	0	-1	0	-3
Sonangol Shipping	**Oil shipping**	sea ships fleet	-1	-1	0	0	0	-1	0	-3
	(Handles sea transport oil crude oil)	pilots	1	-1	0	0	0	0	0	0
		onboard engineers	1	-1	-1	-1	0	0	0	-2
		crew members	1	1	0	0	0	0	0	2
Sonangol Distribuidora	**Distribution of crude oil & gas**		-1	-1	-1	-1	0	-1	0	-5
Sonatide (51)	**Management and ship supply supporting oil industry**		-1	-1	-1	-1	0	-1	0	-5
Sonasing (50)	**Treatment and storage of oil for export**		-1	-1	-1	0	0	-1	0	-4

Source: Sonangol' group's internet site (www.sonangol.co.ao) and Alvesson et. al. (2003)
1/ Proxied by the size of sector's investment to total investment in the economy.
2/ Number in parenthesis indicates Sonangol's share in company's capital (in percent).

Table 1. ScoreCard on Universe of Oil and Gas Activities (Concluded)

Memo Item: Angolan Company Name	Area of Expertise	Input Requirements	Ranking Criteria: Capital / output ratio	Production Scale 1/	Know-how technology intensity	Skilled labor intensity	Location constraints	Physical infrastructure requirements	Legal and other institutional requirements	Total Score
		II. Secondary Sector								
Refineria da Luanda	**Oil Refining**		-1	-1	-1	0	1	-1	0	-3
Sonamet (40) 2/	**Production of structures for oil industry (platforms; oil transportation systems)**		-1	-1	-1	-1	-1	-1	0	-6
TECHNIP Angola (n.a.)	**Engineering services for oil enterprises**		0	0	-1	-1	0	1	0	-1
Wapo Angola (35)	**Provision of diverse technical services to oil industry (includes procurement)**		0	0	0	0	1	1	1	3
Sonawest (49)	**Database processing and storing of seismic data**		0	1	-1	0	1	1	0	2
		III. Tertiary Sector								
Sonair	**Airline Services SA**	charter planes	0	0	1	1	1	-1	0	2
	(Provision of air	pilots	1	0	1	0	0	0	0	2
	transportation services)	support teams	1	0	1	0	0	0	0	2
Oil Trading Offices	**Oil Trading Offices**	building headquarters	0	-1	-1	-1	0	0	-1	-4
Sonangol USA	(Trading of oil and oil derivates in	oil traders	0	-1	0	0	0	0	0	-1
Sonangol Ltd	US and other world market)									
ESSA	**Professional development & training of staff**	building headquarters	-1	0	1	0	0	0	0	0
		teachers/trainers	1	1	1	0	0	0	0	3
		support staff	1	1	1	1	0	0	0	4
Mercury Telecom	**Telecom**	telecom operators	-1	0	0	0	0	0	0	-1
	(In charge of company's telecom)	engineers	1	-1	-1	-1	0	0	0	-2
		technical support	1	1	1	0	0	0	0	3
Base do Kwanda (60)	**Logistical support to oil production and oil services sectors**		0	0	0	0	1	1	1	3
Sonadiets (30)	**Technical support, servicing, and training of staff**		1	1	1	0	0	1	0	4
Sonastolt (45)	**Technical support of oil drilling companies**		0	0	-1	-1	1	0	0	-1

Source: Sonangol' group's internet site (www.sonangol.co.ao) and Alvesson et. al. (2003)
1/ Proxied by the size of sector's investment to total investment in the economy.
2/ Number in parenthesis indicates Sonangol's share in company's capital (in percent).