Economic Growth to 2030 in Timor-Leste

Using a growth accounting framework, this paper estimates the key inputs required by the Timor-Leste economy to narrow its income gap with the upper middle-income economies by 2030. This paper also presents estimates of the required accumulation of human and physical capital and improvements in productivity. The analysis concludes that an internationally high rate of economic growth is achievable over the long term if Timor-Leste matches the quality of policy and management of emerging Asia.

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Asian Development Bank
6 ADB avenue, Mandaluyong City
1550 Metro Manila, Philippines
Tel +63 2 632 4444
Fax +63 2 636 2444
www.adb.org

For orders, please contact:
Department of External Relations
Fax +63 2 636 2648
adbpub@adb.org

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## Abbreviations

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<tr>
<td>ADB</td>
<td>Asian Development Bank</td>
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<td>ASEAN</td>
<td>Association of Southeast Asian Nations</td>
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<td>GDP</td>
<td>gross domestic product</td>
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<td>SDP</td>
<td>Strategic Development Plan</td>
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<td>TFP</td>
<td>total factor productivity</td>
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Summary

Long-run economic growth is the result of a combination of the accumulation of the factors of production, capital and labor, and productivity improvements. This simple formulation of the growth equation underpins what is known as growth accounting. This paper applies the insights from recent growth accounting exercises undertaken for emerging Asia by the Asian Development Bank. The paper estimates the required accumulation of human and physical capital and improvements in productivity needed by the Timor-Leste economy to achieve its goal of becoming an upper middle-income country by 2030.

The analysis concludes that an internationally high rate of economic growth is achievable with sound economic management and favorable external conditions. Income growth will have to be assisted by an orderly development of the petroleum industry that expands production, and by building a high balance in the Petroleum Fund so it provides more investment income. For the nonpetroleum economy, growth factors in Timor-Leste's favor include an expanding labor force, an ability to fund a high rate of public investment from petroleum income, and the potential for a quick catch-up in education and technology.

Capital accumulation through investment in physical capital has contributed most of emerging Asia's economic growth, and will likely contribute most of Timor-Leste's growth during 2011–2030. If recent double-digit rates of growth in the nonpetroleum economy are to continue, it is projected that investment in physical capital will need to exceed $1.0 billion per annum within 5 years, and $1.5 billion per annum within 10 years (in 2010 prices). This would be a very large increase on the 2010 investment level of about $300 million. It is projected that lower but still internationally high rates of growth in the nonpetroleum economy could be achieved if investment in physical capital is around half these levels, that is, at least $0.5 billion per annum within 5 years, and more than $0.75 billion per annum within 10 years (in 2010 prices).

The public sector is currently funding most of investment, but fiscal constraints will probably prevent it from doing so throughout 2011–2030. Sustaining a high rate of economic growth thus rests on achieving a transition from public to private sector-led investment. Timor-Leste's nascent private sector largely comprises micro, small, and medium-sized enterprises and is likely to remain so for at least the coming decade. Yet the economy needs large-scale private investment to achieve high rates of economic growth. Foreign investment can help fill the investment gap. Timor-Leste's success in establishing itself as one of emerging Asia's investment destinations will be pivotal to the economy's growth path.

Sound economic management is required to underpin investment and productivity growth. Emerging Asia's development record provides a benchmark standard that Timor-Leste could target. Matching the standards of emerging Asia will help ensure that the economy is internationally competitive and will attract private investment. Key economic initiatives are described in the summary of the Strategic Development Plan 2011–2030, and their early implementation will do much to sustain economic growth. Timor-Leste's recent application for membership to the Association of Southeast Asian Nations (ASEAN) provides a further focus for action. The targets set by ASEAN for the formation of the ASEAN Economic Community provide a guide as to what constitutes sound economic management. Their achievement will both prepare Timor-Leste for membership and enhance its long-term economic growth.
Introduction

A rapid expansion in income from offshore petroleum lifted Timor-Leste past the threshold for lower middle-income countries in 2007. Rising government expenditure funded from offshore petroleum income has since underpinned a high rate of growth in nonpetroleum gross domestic product (GDP). The Strategic Development Plan (SDP) 2011–2030 has set a goal of continuing the recent double-digit rate of economic growth over 2011–2030, and achieving upper middle-income status by 2030. This would see Timor-Leste joining a growing number of emerging Asian nations that are moving into or approaching upper middle-income status (Figure 1).

This paper applies the Asian Development Bank’s (ADB) research into emerging Asia’s economic growth to Timor-Leste. It estimates the key inputs required by the Timor-Leste economy to achieve an internationally high rate of economic growth. It also presents estimates of the required accumulation of human and physical capital and of improvements in productivity. The paper concludes with an analysis that an internationally high rate of economic growth is achievable over the long term with sound economic management and favorable external conditions.

Figure 1: Long-Term Projections for Selected Asian Economies

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<td>PRC</td>
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Notes:
1. Projections for other Asian economies are prepared using the base case projections for gross domestic product of Lee and Hong (2010).
2. The projection for Timor-Leste assumes achievement of the national income target.

Sources: Lee and Hong (2010), ADB (2011), and author’s estimates.

See the Strategic Development Plan 2011–2030 (Government of Timor-Leste (2011)).
Growth Targets

Achieving the goal of upper-middle status will require the gross national income to reach the threshold of about $4,000 per capita by 2030 (in constant 2010 prices). Timor-Leste’s gross national income is approximately equal to the addition of nonpetroleum GDP and income from offshore petroleum developments. Income from petroleum comprises direct payments of revenue to the Petroleum Fund from offshore production and the investment income earned from the Petroleum Fund. Thus, whether or not the national income target is achieved is a function of developments in the petroleum industry, the Petroleum Fund, and the nonpetroleum economy.

The lower the level of income from petroleum in 2030, the higher nonpetroleum GDP will need to be if the national income target is to be met. For example, if petroleum income per capita remains at its 2010 level, the national income target will be met if real nonpetroleum GDP rises from its 2010 level of around $650 to slightly more than $2,000 (in 2010 prices, Figure 2). If there is no income from petroleum in 2030, the national income target will be met if real nonpetroleum GDP rises to about $4,000 per capita (in 2010 prices). A national income growth target thus comprises two targets: one for income from petroleum, and a second for nonpetroleum GDP. Population growth also needs to be taken into account.

Figure 2: Contributions to Gross National Income Per Capita

If there is no income from petroleum in 2030, the national income target will be reached if real nonpetroleum GDP grows at an average rate of 12.5% per annum from 2011 to 2030. The latest official estimate is that offshore petroleum production will end by 2025 and petroleum income will be limited to the estimated sustainable income from the Petroleum Fund. Under these conditions, the national income target will be reached if real nonpetroleum GDP grows at an average rate of 12.2% per annum from 2011 to 2030. Under a more optimistic scenario for the petroleum industry, where the income from petroleum stays at the 2010 level after allowing for general inflation (i.e., it stays at around $2 billion per annum in real terms), the national income target will be reached if real nonpetroleum GDP grows at an average rate of 10.6% per annum. If the income from petroleum was twice this level (i.e., at around $4 billion per annum in real terms), the national income target will be reached if real nonpetroleum GDP grows at an average rate of 7.7% per annum from 2011 to 2030.

2 Country classifications by income are prepared by the World Bank, based on a country’s gross national income per capita (https://data.worldbank.org/about/country-classifications/).
3 Gross national income is the addition of gross domestic product (i.e., the income generated in an economy) and the offshore income earned by residents, less the income earned within a country by foreign residents. Timor-Leste’s offshore petroleum income is recorded in official statistics as offshore income earned by residents.
4 The analysis in this paper of nonpetroleum GDP is exclusive of the direct contribution of the United Nations to GDP. This contribution was estimated at around $60 per capita in 2009. Assuming a peaceful outcome of the national elections scheduled for the first half of 2012, the United Nations mission and its direct contribution to GDP is envisaged as ending during 2012.
Projections for the Nonpetroleum Economy

Long-run economic growth is the result of a combination of the accumulation of factors of production, capital and labor, and productivity improvements. Productivity improvements are captured within total factor productivity (TFP). This simple formulation of the growth equation underpins growth accounting. This technique decomposes growth into its different components of factor accumulation and productivity growth. Such exercises provide important insights for economic policy and development planning.

Growth accounting can also be used to prepare projections of economic growth. This section presents projections for Timor-Leste prepared by applying the methodology of recent growth accounting exercises for emerging Asia undertaken by ADB. Projections are based on assumptions for key economic variables, given a shortage of the data and background analysis required to prepare robust forecasts. The projections are designed to show what would be required to achieve certain growth levels, rather than providing a forecast of the expected level of economic growth.

Projections are prepared of Timor-Leste's nonpetroleum GDP over 2011–2030 for a range of scenarios, as follows:

**TIM A**, the baseline scenario. This is based on recent trends in Timor-Leste, parameters from the international literature, and the experience of emerging Asia. A key assumption is that TFP growth will match the average achieved by emerging Asia over 1981–2007, which is 1.4% per annum.

**TIM B**, which is the same as the baseline scenario but with TFP growth at a rate required to continue the recent double-digit growth in nonpetroleum GDP.

**TIM C**, which is the same as TIM B but with the immediate achievement of the Strategic Development Plan's goal of all students completing 12 years of schooling, and a rate of TFP growth that will achieve an average double-digit growth in nonpetroleum GDP.

**TIM D**, which is the same as the baseline scenario but with an investment ratio required for an average double-digit growth in nonpetroleum GDP.

**TIM E**, which is the same as TIM D, but with the ratio of investment to gross national income capped at about 60%. TFP is assumed to grow at a rate required for an average double-digit growth in nonpetroleum GDP.

**TIM F**, which is the same as TIM E, but with a less restricted cap on the ratio of investment to gross national income. The scenario assumes that income from petroleum revenue falls to zero in 2025 and TFP will grow at a rate that will see Timor-Leste achieve upper middle-income status in 2030.

The methodology and key assumptions made in preparing the projections are described in the Appendix. The basic growth accounts for Timor-Leste are presented in Table 1.

Table 2 provides for a comparison of the basic growth accounts among the larger economies of emerging Asia from Lee and Hong (2010). The accounts are presented for: the People's Republic of China; 4 newly industrializing economies of Hong Kong, China, the Republic of Korea, Singapore, and Taipei, China; 7 Asian developing economies of India, Indonesia, Malaysia, Pakistan, the Philippines, Thailand, and Viet Nam; and emerging Asia. Figure 3 compares the basic growth accounts for Timor-Leste with country groups of emerging Asia.

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6 A reader-friendly update of the understanding of economic growth is provided in Lin (2010).

7 See, for example, Barro and Lee (2010), Lee and Hong (2010), Park (2010), and Park and Park (2010).
The projections identify what is needed to achieve double-digit growth in nonpetroleum GDP over 2011–2030. Scenario TIM A falls short of this target with a projected average growth in nonpetroleum GDP of 7.7%. The scenario adopts as a benchmark emerging Asia's record over the past 3 decades, on the basis that this is potentially representative of Timor-Leste's state of development than the projections for 2011–2030. Notably, the scenario assumes the rate of growth in TFP achieved by emerging Asia over 1981–2007.

Scenario TIM B provides a projection of the growth rate for TFP that will achieve double-digit growth in nonpetroleum GDP over 2011–2030, on the basis that all other baseline assumptions apply. It is found that Timor-Leste's TFP will need to grow at twice the rate achieved by emerging Asia over 1981–2007, and exceed the rate projected for emerging Asia for 2011–2030.

Scenarios TIM A and TIM B assumed that the recent rise in the average years of schooling, to 10.1 years for the age group 20–24 years, is also achieved in the younger age groups during 2011–2030 (Figure 4). This would constitute a rapid improvement, and lift the average years of schooling in Timor-Leste close to that seen in much of emerging Asia (Figure 5).
Figure 3: Contributions to Gross Domestic Product Growth

Projections for Timor-Leste compared to emerging Asia’s past performance

ADE = Asian developing economies, GDP = gross domestic product, PRC = People’s Republic of China, NIEs = newly industrializing economies, TFP = total factor productivity, TIM = Timor-Leste, TIM A = baseline scenario, TIM B = high TFP growth scenario, TIM C = education catch-up scenario, TIM D = high investment scenario, TIM E = broad-based, double-digit growth path, TIM F = high investment and high TFP growth scenario.

Notes:
(i) GDP for Timor-Leste refers to nonpetroleum GDP.
(ii) Averages for country groups of emerging Asia are simple averages.
(iii) The addition of the individual contributions to growth equals the GDP growth rate.
Sources: Lee and Hong (2010), and author’s estimates.
Figure 4: Average Years of Schooling by Age Group

Source: Author’s estimates based on data from the National Statistics Directorate (2011).

Figure 5: Average Years of Schooling in Timor-Leste and Emerging Asia

ADE = Asian developing economies, PRC = People’s Republic of China, NIEs = newly industrializing economies, TFP = total factor productivity, TIM = Timor-Leste, TIM A = baseline scenario, TIM B = high TFP growth scenario, TIM C = education catch-up scenario, TIM D = high investment scenario, TIM E = broad-based, double-digit growth path, TIM F = high investment and high TFP growth scenario.

Note: Averages for country groups of emerging Asia are simple averages.

Sources: Lee and Francisco (2010), and author’s estimates based on data from the National Statistics Directorate (2011).
Scenario TIM C quantifies the contribution to economic growth of a faster catch-up in education participation. Scenario TIM C assumes that the SDP’s goal of 12 years of schooling is achieved immediately, lifting even the average years of schooling. The average years of schooling is projected to grow at 3.5% per annum over 2011–2030, compared to the 2.9% per annum assumed in scenarios TIM A and TIM B. These growth rates compare favorably to the 2.2% annual average growth rate of emerging Asia from 1970 to 2010 derived by Lee and Francisco (2010), and their projection of a 1.1% annual average growth rate across emerging Asia in 2011–2030.

Scenario TIM C also assumes TFP grows at a rate that ensures double-digit growth in nonpetroleum GDP over 2011–2030. The slightly faster catch-up in education participation under scenario TIM C means TFP can grow at a slightly lower rate than projected in scenario TIM B.

Scenario TIM D examines the effect of a higher rate of investment on the required improvement in TFP. The scenario is based on the ratio of investment to nonpetroleum GDP rising to almost 100% (Figure 6). It is found that this investment rate will achieve double-digit growth in nonpetroleum GDP if TFP growth over 2011–2030 matches the average for emerging Asia over 1981–2007 (as in scenario TIM A).

A ratio of investment to nonpetroleum GDP of almost 100% is very high by emerging Asia standards, where investment is typically between 20% and 40% of GDP (Figure 7). Even in Singapore, which has recorded the highest investment rates in emerging Asia, the investment rate has remained below 60% (ranging from 40% to 60% from the 1960s before declining recently). International comparisons, however, should make allowance for Timor-Leste’s special circumstances. In emerging Asia, gross national income is very close to GDP, and the ratio of investment to gross national income is close to the ratio of investment to GDP. In contrast, Timor-Leste’s gross national income is currently about four times nonpetroleum GDP, and gross national income is likely to remain much higher than nonpetroleum GDP over most of 2011–2030. Over the coming decade, most investment will be funded from petroleum income. Gross national income provides a better indicator of the economy’s ability to fund this public investment than the narrower nonpetroleum GDP. Hence, international comparisons of investment rates are more meaningful to Timor-Leste when expressed as a ratio to gross national income.

The ratio of investment to gross national income for scenario TIM D is within typical levels over the coming decade. However, it is projected to continue to rise thereafter, to well above a typical level. Such a high investment rate is likely to test economic sustainability. The challenge posed by a reliance on high investment rates is highlighted by the real level of investment projected for scenario TIM D. The investment rate of scenario TIM D is projected to require an increase in the annual level of investment to more than $4 billion by 2030 (in 2010 prices). Even with a transition from public to private-led investment, as is targeted by the SDP, this would be an extremely high requirement for the economy.

This suggests that while a high investment-based growth path such as that projected in scenario D would be sustainable over this decade, it would probably be unwise to continue such a path. A development path that achieved a switch in the 2020s from a reliance on investment-led growth to productivity-led growth is more likely to be sustainable.

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8 The projections for Timor-Leste also assume a typical quality of education. The contribution to growth from education would be lower than projected if the quality of education is below a typical international standard. In which case, other inputs to economic growth would be required to make a larger contribution to economic growth.
GDP = gross domestic product, GNI = gross national income, TFP = total factor productivity, TIM = Timor-Leste.
TIM A = baseline scenario, TIM B = high TFP growth scenario, TIM C = education catch-up scenario, TIM D = high investment scenario, TIM E = broad-based, double-digit growth path, TIM F = high investment and high TFP growth scenario.
Source: Author’s estimates.
Scenario TIM E presents a broader-based growth path. This emphasizes pursuit of all potential sources of growth, including TFP growth, investment in physical capital and improvements, and education. This is the baseline scenario but with the same catch-up in education participation as in scenario TIM C, and a ratio of investment to gross national income that is capped at about 50% and reduces to a more typical level of 30% by 2030. TFP is assumed to grow at a rate required for average double-digit growth in nonpetroleum GDP. The required average growth rate of TFP for 2011–2030 is found to be 2.3% per annum. This would still be a high rate of TFP growth compared to emerging Asia.9

The final projection, Scenario F, examines what is required to achieve the national income target if petroleum revenue falls to zero by 2025. Investment is assumed to rise to almost 95% of nonpetroleum GDP in the coming decade, as assumed in Scenario TIM D, and decline thereafter. With this restriction on investment, TFP needs to grow at a very high rate to achieve the national income target. The required average growth rate of TFP for 2011–2030 is found to be 3.3% per annum. Lee and Hong (2010) found that the PRC achieved such a high rate of TFP growth over 1981–2007. However, no other emerging Asian economy is projected to achieve this over the period 2011–2030. This suggests that it would be very difficult for Timor-Leste to achieve a TFP growth rate of 3.3% per annum.

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9 This result is insensitive to reasonable variations in the assumption regarding the initial value of the capital stock.
Key Issues

Observations

An internationally high rate of economic growth is feasible. The rate of growth in nonpetroleum GDP over 2011–2030, as projected for the six scenarios, exceeds the growth rates projected by Lee and Hong (2010) for the larger economies of emerging Asia for the same period. Achievement of the double-digit growth rates of nonpetroleum GDP projected for scenarios TIM B to TIM F would be a major challenge for economic management, as it would require a very high rate of TFP growth and/or investment. A double-digit rate of growth is, nonetheless, possible under sound economic management and favorable external conditions. A somewhat lower growth rate in nonpetroleum GDP would be more firmly within the bounds of expectations. A growth rate in the high, single digits is still likely to result in Timor-Leste being one of the fastest-growing economies in Asia over 2011–2030.

Sustainable petroleum income can make the difference. Maintaining a substantial income from petroleum through 2030 will greatly assist the achievement of the national income target. The higher the income from petroleum, the more achievable the national income target will be. It will thus be important to expand offshore petroleum production through the orderly development of the petroleum industry, and to maintain a high balance in the Petroleum Fund so it can provide a generous level of investment income. Continuing high world oil prices would also do much to make the national income target achievable. This is because of the direct boost high prices provide to petroleum revenue, and the incentive that high prices create for the exploration and development of new fields.

Capital investment is the main potential source of economic growth. A finding common to all projections is a reliance of the economy’s future growth on capital accumulation—on investment in physical capital. For the six scenarios, capital accumulation is projected to contribute at least half of Timor-Leste’s growth in nonpetroleum GDP over 2011–2030. This reliance of economic growth on the accumulation of physical capital is in line with the importance of capital accumulation to Asia’s growth performance. Capital accumulation has contributed most of emerging Asia’s economic growth, and will likely contribute most of Timor-Leste’s growth in the nonpetroleum economy for 2011–2030. Quality investment projects that provide a high development impact will be essential to realizing the growth dividend available from investment.

If recent double-digit rates of economic growth are to be sustained, investment may need to be as much as $1 billion per annum within 5 years and as much as $1.5 billion per annum within 10 years (in 2010 prices). This would be a very large increase on the 2010 investment level of about $300 million. It is projected that a lower but still internationally high rate of economic growth could be achieved if investment is around half these levels. The projections suggest that a minimum target would be for an investment of $0.5 billion per annum within 5 years, and $0.75 billion per annum within 10 years (in 2010 prices).

Catch-up will also provide a source of economic growth. The relatively high growth rate projected for Timor-Leste is consistent with the “conditional convergence” effect. Economic theory and empirical analysis have found that a country with a low initial income level relative to its potential income level will tend to grow faster than a country that is closer to its potential income level.10 This is mainly because of the potential for a quick catch-up through the adoption of better technologies, and techniques than those available to higher-income economies in their earlier stages of development. This “conditional convergence” effect is one reason why projections for emerging Asia by Lee and Hong (2010) for 2011–2030 are generally for lower growth than growth achieved over 1981–2007. The projections are in line with the expectation presented in the SDP that Timor-Leste can expect higher-than-typical rates of economic growth in the early phase of convergence to a higher-income economy.

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10 See the discussion of Lee and Hong (2010), pp.10–14.
A transition from public to private sector-led investment will be required. The public sector is currently funding most of the investments. Fiscal constraints will probably prevent the public sector from doing so throughout 2011–2030. Moreover, the returns from public investment can be expected to eventually trend down. Sustaining a high rate of economic growth thus rests on the achievement by 2030 of a transition from public to private sector-led investment. A transition to private sector-led investment will reduce the required drawdowns from the Petroleum Fund and/or public borrowing, and conserve the net value of public savings. Private sector-led investment will also help to secure the technology, commercial networks, and production practices required for high productivity growth.

There is a prospect of a medium-term dip in economic growth. The private sector may need considerable time to develop before it is ready to lead the economy. The formal private sector is very small and much of the informal private sector is engaged in agriculture at regionally low productivity levels. The core pool of entrepreneurs required to lead the private sector is still to emerge. The main opportunities for many of Timor-Leste’s potential entrepreneurs remain in micro, small, and medium-sized enterprises, yet the economy needs large-scale investment to achieve high rates of economic growth. The still emerging state of the private sector gives rise to the prospect of a medium-term dip in economic growth. This would arise if the ability of the public sector to sustain investment wanes before its contribution can be replaced by the private sector.

Foreign investment can help. Foreign investment can partly fill the investment gap and thereby help avoid the medium-term dip in economic growth. Timor-Leste’s success in establishing itself as one of emerging Asia’s investment destinations will be pivotal to the economy’s growth path.

Suggestions

Target the standards of emerging Asia. As illustrated by the success of emerging Asia, achieving a high rate of economic growth will require a sound policy and institutional setting, a high standard of infrastructure, and a well-educated labor force. Emerging Asia’s development record in these areas provides a benchmark standard that Timor-Leste could target. Matching the standards of emerging Asia will help ensure that the economy is internationally competitive and will attract private investment.

Benchmark against comparable countries. A practical issue to be faced is how Timor-Leste could express detailed targets and monitor progress toward their achievement. One approach is to adopt the standards of comparable economies as benchmarks. These could be expressed as physical benchmarks, such as the coverage of paved roads per kilometer, school enrollment rates, or the share of the population with access to electricity, safe water, and sanitation. Benchmark could be more performance-related, such as a comparison of prices of key commodities, the cost of key inputs to production, or measures of service quality.

Benchmarks could also be usefully established for the quality of the policy and institutional setting, given the important role it will play in realizing Timor-Leste’s growth potential. The annual country performance assessment undertaken by ADB (and the comparable country policy and institutional assessment of the World Bank) provides one mechanism for cross-country comparisons of the quality of the policy in institutional setting. Timor-Leste’s recent application for membership of the Association of Southeast Asian Nations (ASEAN) provides another potential benchmarking mechanism. ASEAN members have adopted the ASEAN Economic Community Blueprint to bring forward the implementation of the community to 2015. This blueprint contains clear targets and timelines for the implementation of priority actions. Timor-Leste could establish a mirror process that would also ensure a readiness to join the community in the future. Achieving the targets and timelines set will prepare Timor-Leste for full membership and enhance long-term economic growth prospects.

11 For example, as quantified in Straub and Terada-Quigara (2010).
12 For example, see the comparisons of Timor-Leste and other small economies in ADB (2010).
13 The blueprint is documented in ASEAN (2008). Regular monitoring of progress is undertaken by the ASEAN Secretariat, and this would provide Timor-Leste with a useful mechanism for assessing its progress.
Link macroeconomic projections with expected developments in the structure of the economy. The projected growth in economy-wide TFP needs to be linked to the productivity improvements achievable through the commercialization of agriculture and then industrialization. What path will Timor-Leste follow? The economy may follow an atypical path, because of (i) the country’s small size and relative remoteness, which tends to inhibit industrial activity and results in smaller economies skipping the industrialization phase as observed in other regions; and (ii) the country’s dependence on the public sector, which will tend to curb industrial growth and result in an earlier-than-normal expansion of the services industry. Analyzing such issues will enhance the understanding of the economic developments likely to occur over the period 2011–2030.

Explore the implications for employment and unemployment. More than 15,000 young people will enter the labor force in 2011, and by 2030, around 25,000 young people will be entering the labor force every year (Figure 8). The employment projections of the growth accounting framework provide a macroeconomic perspective that lacks an explanation of where or how much of this labor would be needed. The employment and unemployment situation is an important dimension of economic growth that can inform the understanding of the quality of the growth process. A growth process that is inclusive and provides employment opportunities across the community would be preferable to one that concentrates the benefits of growth in a small share of the labor force. A mapping of labor demand and supply (by skill) to the macroeconomic projections would be a useful addition to the macroeconomic projections. An understanding of the structural change likely to occur during 2011–2030 will be important to such a mapping.

**Figure 8: Labor Force Projections**

Note: Estimates are based on the latest estimates for the labor participation ratio (63%) and the population growth rate (2.4%) per annum.

Source: Author’s estimates.

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14 Timor-Leste is still in the early stages of structural change. To grow well, economies need to pursue opportunities perpetually, to shift factors of production inputs (e.g., land, other natural resources, labor, and capital) from less productive uses to more productive uses. This shifting of factor inputs brings about changes to the make-up of activity within an economy. Structural change takes place at many levels. At an industry level, most developing economies make a transition from an initial reliance on subsistence agriculture to growth in commercialized agriculture, then to industrial activity, and ultimately to a service-oriented economy. At the labor force level, subsistence workers move to the informal sector and then to the formal sector. At the business level, self-funded small-scale operations are replaced by medium- and large-scale businesses led by investors and staffed by employees. Such changes in the economy involve “creative destruction” as better-performing industries or operations expand while others contract or even disappear.

15 See, for example, the discussion of the experience of the Pacific Island nations in Sugden and Taniguchi (2007).
Make use of a growth accounting framework. Long-term economic projections for Timor-Leste are currently produced using an economic framework based on an assumed incremental capital-output ratio. This projection technique has the advantage of simplicity and ease of use. It is, however, difficult to validate the assumed incremental capital-output ratio, which drives the projection of economic growth. It also carries the limitation of offering few insights into the sources of growth, notably as the projection technique is silent on developments in human capital formation and clouds developments in the productivity of the economy. The growth accounting framework provides a systematic technique for disentangling developments in physical and human capital formation, and productivity growth. It is likely to offer a better economic framework for understanding long-term labor market developments, required improvements in factor productivity, the contribution to growth at the industry level, and the feasibility of growth projections.

16 The framework is used, for example, in IMF (2010) and United Nations Development Programme (2011).
17 The implied incremental capital-output ratios for the 2011–2030 projections are 6.2 for scenario TIM A, 5.0 for TIM B and TIM C, 9.1 for TIM D, 7.0 for TIM E, and 6.5 for TIM E. With the exception of scenario TIM D, the implied incremental capital-output ratios are broadly comparable to the ratio of 6.0 assumed in preparing the alternative moderate-to-high growth scenario of the United Nations Development Programme (2011). The growth accounting framework of this paper can be applied with different data values to replicate broadly the United Nations Development Programme’s alternative growth scenario. This alternative growth scenario is close to Scenario TIM A of this paper, although the alternative growth scenario requires a higher growth rate in TFP (estimated at 1.8% per annum versus the 1.4% per annum of scenario TIM A) to compensate for the lower investment level of the alternative growth scenario.
Conclusion

Projections based on trends in Timor-Leste and the experiences of emerging Asia suggest that Timor-Leste’s economy is likely to continue to grow at an internationally high rate. Growth factors in Timor-Leste’s favor include a growing labor force, an ability to fund a high rate of public investment from petroleum income, and the potential benefits of catch-up in education and technology.

Achieving the double-digit growth in nonpetroleum GDP targeted by the SDP would require strong performance across all key sources of economic growth, raising education standards, investing in physical capital, and raising the productivity of the economy (i.e., raising TFP). A somewhat lower growth rate of nonpetroleum GDP, a growth rate in the high single digits, would be more firmly within the bounds of expectations. Such a growth rate would still result in Timor-Leste being one of the fastest-growing economies in emerging Asia over the period 2011–2030.

Achievement of the national income target of becoming an upper middle-income economy by 2030 would need to be assisted by maintaining a high level of income from petroleum. It is thus important to support the orderly development of the petroleum industry so that production expands, and to build a high balance in the Petroleum Fund so it provides more investment income. World oil prices will also have an important bearing on the growth outcome.

The growth projections are supportive of the current emphasis on public investment in physical and human capital, and efforts to put in place the enabling environment required for private sector-led growth. The SDP presents important initiatives in these areas. Early implementation of these initiatives will do much to enhance the prospects for economic growth. Timor-Leste’s recent application for membership of ASEAN provides a further focus for action.
Appendix: Methodology

Following common practice, the economy’s aggregate production function is assumed to be a Cobb-Douglas production function:

\[
Y = AK^\alpha (hL)^{(1-\alpha)}
\]  

(1)

where:

- \(Y\) = nonpetroleum GDP (excluding the United Nations’ contribution),
- \(K\) = the stock of physical capital,
- \(h\) = human capital per unit of labor,
- \(\alpha\) = the share of capital in output,
- \(L\) = represents the number of laborers, and
- \(A\) = total factor productivity (TFP).

The production function is rewritten in terms of output per labor (\(y = Y/L\)), i.e.:

\[
y = Ak^{\alpha}h^{(1-\alpha)}
\]  

(2)

where:

- \(y\) = output per labor, and
- \(k\) = physical capital per labor.

Equations (1) and (2) can be expressed in terms of growth rates, i.e.:

\[
\Delta \ln Y = \Delta \ln A + \alpha \Delta \ln K + (1-\alpha)\Delta \ln h + (1-\alpha)\Delta \ln L
\]  

(3)

and, in per labor terms:

\[
\Delta \ln y = \Delta \ln A + \alpha \Delta \ln k + (1-\alpha)\Delta \ln h
\]  

(4)

That is, by expressing output as the combination of the economy’s productive inputs and the economy’s TFP, the growth of output per labor can be decomposed into growth rates of physical and human capital per labor and of TFP. Equation (4) is widely used to explain differences in growth performance across countries, and allows projections to be made of GDP based on the capital-labor ratio, human capital, and TFP.

Following Lee and Hong (2010), human capital per labor is assumed to be related to the number of years of schooling, as follows:

\[
H = e^{\varphi(s)}
\]  

(5)

where:

- \(\varphi(s)\) = a measure of the efficiency of a unit of labor, with \(s\) years of education, being relative to one without any schooling.

In addition, \(\varphi(s)\) is assumed to be linear, i.e.:

\[
h = e^{\theta s}
\]  

(6)

where:

- \(\theta\) = a measure of the average marginal return to an additional year of schooling.

Again following Lee and Hong (2010), who draw on the international study of Barro and Lee (2010), the estimated rate of return to an additional year of schooling is assumed to be 8% (i.e., \(\theta = 8\%\)).

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18 As highlighted in Lee and Francisco (2010), this definition focuses on educational capital as a main component of human capital and excludes the contribution to human capital from a range of other factors such as health and skills.
Baseline projections of economic growth of Timor-Leste for 2011–2030 are prepared by adopting the following additional assumptions:

(i) The capital stock is 2.3 times nonpetroleum GDP in 2010. This estimate is the simple average of the ratio for emerging Asia for the 1970s.\textsuperscript{19} The ratio for emerging Asia is derived by preparing estimates of capital stock using the perpetual inventory methodology described in Barro and Lee (2010) and data from the Penn World Table Version 6.3 (Heston et al. 2009). The ratio for emerging Asia is found to be rising slowly over time. For example, the simple average for the 1960s is 2.1 while the simple average for the 1980s is 2.6. The 1970s are adopted as the period most likely to represent the current state of development of Timor-Leste’s economy.

(ii) A constant ratio of investment to nonpetroleum GDP of 50% in 2010, being an estimate for 2009 derived from data presented in the Government of the Democratic Republic of Timor-Leste (2010), and remains at 50% during 2011–2030.

(iii) Private investment is one-third of the level of public investment in 2010 (i.e., private investment is equivalent to around 12.5% of nonpetroleum GDP in 2010).

(iv) A capital share of 0.4 during the period 2011–2030, following Lee and Hong (2010).

(v) A constant depreciation rate of 6% during the period 2011–2030, following Barro and Lee (2010).

(vi) A constant labor participation ratio of 63%, being the estimate from the 2007 Living Standards Measurement Survey (National Statistics Directorate 2008).

(vii) A constant population growth rate of 2.4% per annum during the period 2011–2030, being the preliminary estimate of the population growth rate for 2004–2010 (National Statistics Directorate 2010).

(viii) A 4.7 average years of schooling for the population aged 15 years and over in 2010, being an estimate derived from the 2009–2010 Demographic Health Survey (National Statistics Directorate 2011).

(ix) That the recent rise in the average years of schooling, to 10.1 years for the age group 20–24 years, is also achieved in the younger age groups during 2011–2030.

(x) Income from petroleum is $2.5 billion per annum to 2024, and is limited to the income from the Petroleum Fund thereafter, at an assumed level of $1.0 billion per annum (in current prices).

\textsuperscript{19} Emerging Asia is defined in this paper as comprising the People’s Republic of China; Hong Kong, China; India; Indonesia; the Republic of Korea; Malaysia; Pakistan; the Philippines; Singapore; Taipei, China; Thailand; and Viet Nam.
References


Economic Growth to 2030 in Timor-Leste

Using a growth accounting framework, this paper estimates the key inputs required by the Timor-Leste economy to narrow its income gap with the upper middle-income economies by 2030. This paper also presents estimates of the required accumulation of human and physical capital and improvements in productivity. The analysis concludes that an internationally high rate of economic growth is achievable over the long term if Timor-Leste matches the quality of policy and management of emerging Asia.

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