

Chapter 6

Conclusion and recommendation

6.1 Summary of the economic problem

China's unprecedented growth over the past two decades has been largely due to two engines of development: globalization and trade expansion, which in turn have demanded a strong emphasis on economic liberalisation and the development of markets and road infrastructure. In Yunnan, China's most Southwestern province, the Asian Development Bank has initiated a series of Economic Growth Corridors to link the capital Kunming with Eastern China and the remaining Greater Mekong Subregion (GMS). However, the full growth potential of those corridors in terms of trade and globalization has not fully been realized.

In addition to growth, China must tackle three social and environmental goals that also contribute to any definition of overall development. First, China is known for the widening gap in incomes between the rich and the poor, and especially between the prospering eastern coast and the stagnating rural hinterland, of which Yunnan is a part. Second, China has the vast majority of the most polluted cities in the world. Finally, alternative sources of energy (solar, wind, biofuel) must be found and promoted to reduce such pollution and to protect the macroeconomy from high and volatile world energy prices. These last two development goals are tightly linked.

6.2 Summary of the research

It was the purpose of this thesis to provide the calculations and simulations upon which applicable policy recommendations could be made by the Yunnan provincial government to promote sustainable growth and balanced development. It was noted at the outset that the data for social accounting matrices take many years to collect and compile. Although SAM analyses in the literature are typically at least 5 years out of date, China's 10%-plus growth over the past 7 years may mean that the 2002 data used in this thesis seriously understate the structural changes that have undoubtedly occurred in the Yunnan economy. These changes may include technical changes in production practices, new forms of energy and transportation, and an increase in the share of industry and service sectors within the economy. Since we lacked data on these changes, this thesis postulates that comparative advantage and the percentage values-added of various branches have remained proportional. Should this assumption be unjustified, this study will still fill the more modest goal of showing how future studies for Yunnan and the rest of China can combine Social Accounting and optimization techniques to generate complementary information for national and provincial planning.

The overall goal of the thesis was to analyze the impacts of exogenous variable changes on Gross Provincial Product, employment creation, poverty alleviation, energy dependency, environmental degradation, and full use of the transportation network. More specifically, the thesis addressed three objectives:

1. To valuate which sectors/industries should be supported with the intention of increasing total value-added and satisfying the sustainable development in Yunnan province.

2. To show how optimal resource allocation could be directed to maximize

overall value-added/welfare in Yunnan province.

3. To propose, on the assumption that the 2002 data are still proportionally valid, policy implementation guidelines for the relevant organization and government in order to develop Yunnan economy.

Toward these ends, this thesis combined the results from multiplier analyses and linear programming optimizations to identify the complementarities and possible trade-offs between narrow improvements in income and broader socioeconomic and environmental objectives. Total provincial value added of the mesoeconomic SAM was optimized using linear programming techniques, subject to the other socioeconomic and environmental objectives that constitute the second “leg” of Chinese development.

A Social Accounting Matrix for Yunnan has been built based on the 2002 Leontief-style input-output table, the Yunnan statistics yearbook, the China finance yearbook and the empirical results from a survey conducted in 2007 by the International Centre for Research in Agroforestry (ICRAF). To the extent that these data sources remain pertinent and have been successfully reconciled, the accomplishment of Yunnan SAM will be benefit to understanding the economic structure and resource flows for the economy of Yunnan. It could also serve as a model for parallel studies in the rest of China.

Based on the SAM accounting multiplier matrix, the multiplier analysis separately identified and calculated the impact multipliers to represent the effects of investments in each economic branch in terms of value added employment creation, poverty alleviation, energy dependency, transportation use, and environmental degradation. The multiplier rankings pointed to which sectors could be targeted with

more government consumption, investment, or export promotion for the greatest impacts in each of these regards.

Then rankings were calculated in terms of an overall integrated multiplier, which was built by weighting the value added, employment creation, poverty alleviation, transportation with positive consideration, and energy dependency, environmental degradation with a negative consideration, to show which sectors the government could target if it wished to promote overall, all-round sustainable development.

Finally, successive linear programming optimizations demonstrated that, by alternatively using a land-based, labour-based, capital-based or balanced optimization strategy, how much of the input in question should be increased or decreased to each endogenous activity.

6.3 Conclusions

We can conclude by answering the research questions of this thesis as following:

- If the overall development priority is to maximize the GDP of the Yunnan economy as measured by total value added, the agricultural sectors like beans, tobacco, sugar crops, other farming, forestry animal husbandry oil bearing crops, grain crops, waste, fisheries, finance and insurance, telecommunication and logistics, accommodation and restaurants should be targeted for exogenous investments from government, banks, the rest of China and the foreign sector.

- If, on the other hand, on the overriding priority is to minimize environmental degradation caused by economic activity in Yunnan, the textiles and apparel, electric, instrument and office equipment, other manufacturing, equipment,

machinery, food and tobacco processing, agricultural extension services, finance and insurance, retail and wholesale marketing, timber and furniture, and fisheries should be earmarked for the exogenous investments from government, bank, the rest of China and the foreign sector. On the contrary, such sectors as papermaking, other chemicals, coking, coal mining and processing, accommodation and restaurant, pesticides, petroleum and natural gas extraction, waste, oil refining fertilizer should be limited for the environmental consideration.

- If the overall planning objective is to minimize the energy dependency of Yunnan economy, then waste, electric, instrument and office equipment, textile and apparel pesticide, food and tobacco processing, other manufacturing, finance and insurance, other services, papermaking, equipment etc. should be targeted for the exogenous investments from government, bank, the rest of China and the foreign sector. At the high end of the energy spectrum, such sectors as electricity and heat, gas, coking, coal mining and processing, oil refining, fertilizer, metal and non-metal mining, transportation and storage, papermaking, other chemicals, coking, coal mining and processing, accommodation and restaurants, pesticides, petroleum and natural gas extraction, waste, oil refining fertilizer should be limited.

- If development targeting aims to make the fullest use of the net transportation infrastructure of Yunnan economy, transportation and storage, tourism, metal and non-metal mining, telecommunication and logistics, construction, metal and non-metal manufacturing, fertilizer, forestry, grain crops, oil bearing should be targeted for the exogenous investments from government, bank, the rest of China and the foreign sector. Should those facilities become overburdened, then such low-intensive transportation activities as should be introduced until optimal road-use intensity is achieved.

- If promoting the greatest potential for increasing employment of Yunnan economy is the goal, then all agricultural sectors, telecommunications and logistics, accommodation and restaurant, water, finance and insurance, transportation and storage should be promoted for exogenous investments from government, bank, the rest of China and the foreign sector.

- If the overriding concern of economic planners is to slash the scissors ratio and other measures of poverty as much as possible, all agricultural sectors, accommodation and restaurant, telecommunication and logistic, finance and insurance, timber and furniture, water, metal and non-metal mining, food and tobacco processing etc. should be targeted for the exogenous investments from government, bank, the rest of China and the foreign sector.

- Labour is the most binding constraint to future increases in value added GDP. Specifically, increasing the efficiency or the supply of labour will bring about a 15% improvement in the VA.

- No sector of the economy occupies the top rank across all types of multiplier in terms of value added, employment creation, environmental degradation, energy dependency, poverty alleviation, full use of transportation. However, some sectors do score substantially higher in most of the multiplier ranks. All agricultural sectors, telecommunication and logistics, finance and insurance, food and tobacco processing, timber and furniture. If planners wish to pursue multiple-objective all-round planning, these are the sectors in which to invest through government activities directly and or through joint ventures with banks, the private sector, and foreign and overseas Chinese entrepreneurs.

- The linear program and the integrated multiplier show almost the same results: that investment should be increased in beans, forestry, timber and furniture,

finance and insurance and scientific research. There is thus no contradiction between the multiplier and linear programming approaches. However, the latter is necessary to quantify the exact scale of each branch under optimal 5-year plans.

- According to the results dictated by the balanced linear programming scenario, the government policies should be most favourable to increase the investment on the beans (2080), forestry (460), and finance and insurance (998).

6.4 The weaknesses of the study

It is necessary to notice that the data which was used in the thesis is based on 2002 due to an input-output table used to be normally made in 5 years for any countries including China. On one hand, the current economy situation may significantly change which may cause the research result is different from the real situation. On another hand, the same patterns of technology and comparative advantage may still keep the same. Hence, it is important to make an assumption that the structure of Yunnan economy doesn't significantly change couple of years after 2002. We therefore can really apply the SAM to practical researches.

The plan shows that the industries structure adjustment for the future Yunnan economy will still stay an important role. The research method of the thesis appropriately can be applied to analyze and evaluate the economic policies of the plan for the 11th five-year period for giving policy recommendations. Furthermore, the specific industries should be reinforced could be figured out by the thesis.

Furthermore, the thesis carries out the empirical research which brings an optimal output of the GPP by certain amount factor supply. Combining the income multiplier contribution to GPP and the social and environmental objective on energy,

transportation, employment, poverty and pollution, the research can figure out the priorities industries for policy maker for an integrated sustainable development.

The advantage of the top to bottom SAM is based on the IO table, the data from a huge samples survey which conducted and issued by the government, that ensure the data representativeness and validity. This is also the best and acceptable data source for the thesis.

6.5 Recommendations for using the results of the study

Based on the study results, and under the assumption that the patterns and potentials inherent in the 2002 SAM have not shifted significantly, we suggest for Yunnan Province that:

- Agriculture structural adjustment should be pushed toward the sectors which have higher economic benefits; meanwhile, more exogenous investment should be invested into agriculture, particular in bean, forestry, timber and furniture.
- Finance and insurance services should be increased and improved by favourable policy to satisfy increasing of market demand
- Telecommunications and logistics services should be increased and improved to promote the circulation of the commodities, services and information.
- The scale and volume of polluting enterprises be restricted or reduced.
- Investment on the low energy dependency sectors be encouraged while that in high energy dependent sectors is reduced.

Investments on infrastructure such as superhighways, bridges, and airports be continuously increased so that the globalization and export potential of the province can keep pace with the expansion of the output of sectors identified to have competitive advantage.

Finally, in terms of further research, it is recommended that the current study be updated as soon as possible with the latest 2007-based data; and that companion optimization and SAM studies be conducted in the other provinces of China. This will be particularly helpful in the disadvantaged Western provinces of the country, where government must still act as a Big Leader¹ to guide the way for private and overseas investments.

6.6 Further studies, applications, or extensions of the research

Although the research brings an overview on Yunnan economy, there are still some purposes of research can not be achieved by the thesis. Since the data in the research lagged 7 years when it published, the empirical result based on the data may slightly differ with the assumption that the economy structure will maintain the highly similar due to the sharply change of China economy both economic scale and structure. Therefore, it may be interesting for the future research to consider updating a new SAM once a new IO table has been published to continuously monitor the economy structure change. Some research topics related to agriculture, transportation, energy, employment, pollution and poverty can be in-depth exploited based on the thesis. Moreover, the trade with the rest part of China and foreign countries could be a very interesting topic which is still not discussed in the thesis. Thirdly, based on the thesis, a CGE model can be exploited to carry out policy analysis.

¹ This expression is taken from Robert Wade. 1988, *Governing the Marketing*.