

AN ECONOMETRIC MODEL OF THE  
WORLD RUBBER ECONOMY

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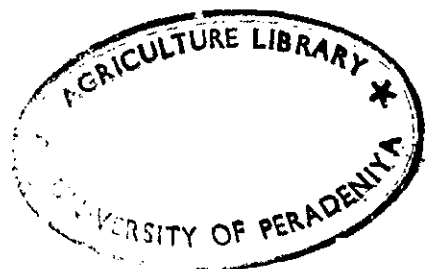
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## Abstract

This study examines the determinants of the demand and supply of natural rubber and is concerned with the specification, estimation and validation of an econometric model of the world rubber economy. The model is subsequently applied to forecast the production, consumption, market share and prices of natural rubber and to assess the implications of certain policy variables/measures.

The projections for total rubber consumption were derived as follows. The sequence followed was; analysis of economic growth, vehicles on road, new sales of vehicles, manufacture of vehicles and tyres and finally the demand for total rubber consumption. The model initially computes the growth of income by country. Estimates of total GDP were obtained by combining the estimates of GDP per capita with World Bank projections of population growth. The analysis of vehicles on road for both cars and trucks is based on analyses of country-wise saturation levels of vehicle ownership and on the path towards these levels. These saturation levels varied with the infra-structural and geographical variables that characterize each country. Developed countries clearly indicated signs of levelling-off or decline in the saturation levels. The growth in vehicle ownership was estimated using income developments as the major explanatory variable.

New sales of vehicles cannot be directly derived from the earlier analysis of vehicles on road as the age distribution of the vehicles matters. Hence, a model to capture this age effect is developed and estimated for all major countries. Manufacture of vehicles is closely related to sales. Yet, deviations are evident since

vehicle manufacturing countries can be either net exporters or importers. Manufacture of tyres is linked to production of vehicles and number of vehicles on road in view of the demand for original tyres and replacement of tyres respectively. This relationship was quantified for all countries and was used to project tyre production. Projections of total rubber consumption were achieved by adding the two components; rubber consumption in the tyre sector and the general rubber goods sector. The former is derived from tyre production and assumptions on rubber weight per tyre while the latter is related to per capita income levels. Thus, a strong shift is observed across the globe in demand for NR from "Industrial West" to "Developing Asia".

The methodology used to make projections of long-term supply of NR emphasized the effects of age and technology in the year of planting as the major forces behind changes in supply. The age distributions and technical production levels are combined in the estimation of 'normal production' using a vintage model. The yield profiles have been estimated to describe the relationships among age, year of planting and yield per unit area. Assumptions on replanting and new planting are combined with the yield profiles to project the 'normal production' for the future. The study reveals that possibility of increasing the global supply of NR by any significant quantity, both in the short and medium-run appeared to be rather remote.

Among the major consumers, only Western Europe and Japan have shown some response to price changes, with elasticities of around 0.07 and 0.04 respectively. Apart from the three largest NR producers *viz* Thailand, Indonesia and Malaysia, the other producers such as India, Philippines and Sri Lanka do not appear to responded to prices since no reliable price response could be obtained at the aggregate level.

The regression results further revealed that response to prices were more pronounced in the case of smallholders than the estates, in both Indonesia and Malaysia. The study suggests that consumption is considerably less responsive to prices than production. This implies that given price changes cause supply to react stronger on demand.

The resulting projections at aggregate level indicate a continuous rise in 'normal production' which however does not keep pace with expected rise in the world demand. This friction between supply and demand tends to impose an upward pressure on NR prices. The higher price levels that needed to maintain equilibrium between demand and supply induce a larger production relative to the 'normal' levels and lower share of NR relative to total demand. In the long run, the high prices will further reduce the market share of NR, but, will enhance the production capacity. If the latter response in area expansion is set at an elasticity of 0.3, the expected prices in the future appear to be relatively steady at a level attractive to both producers and consumers. It will further ensure a steady supply of NR without causing a decline in market share.