Studies

THE ICO ECONOMETRIC MODEL OF THE
WORLD COFFEE ECONOMY
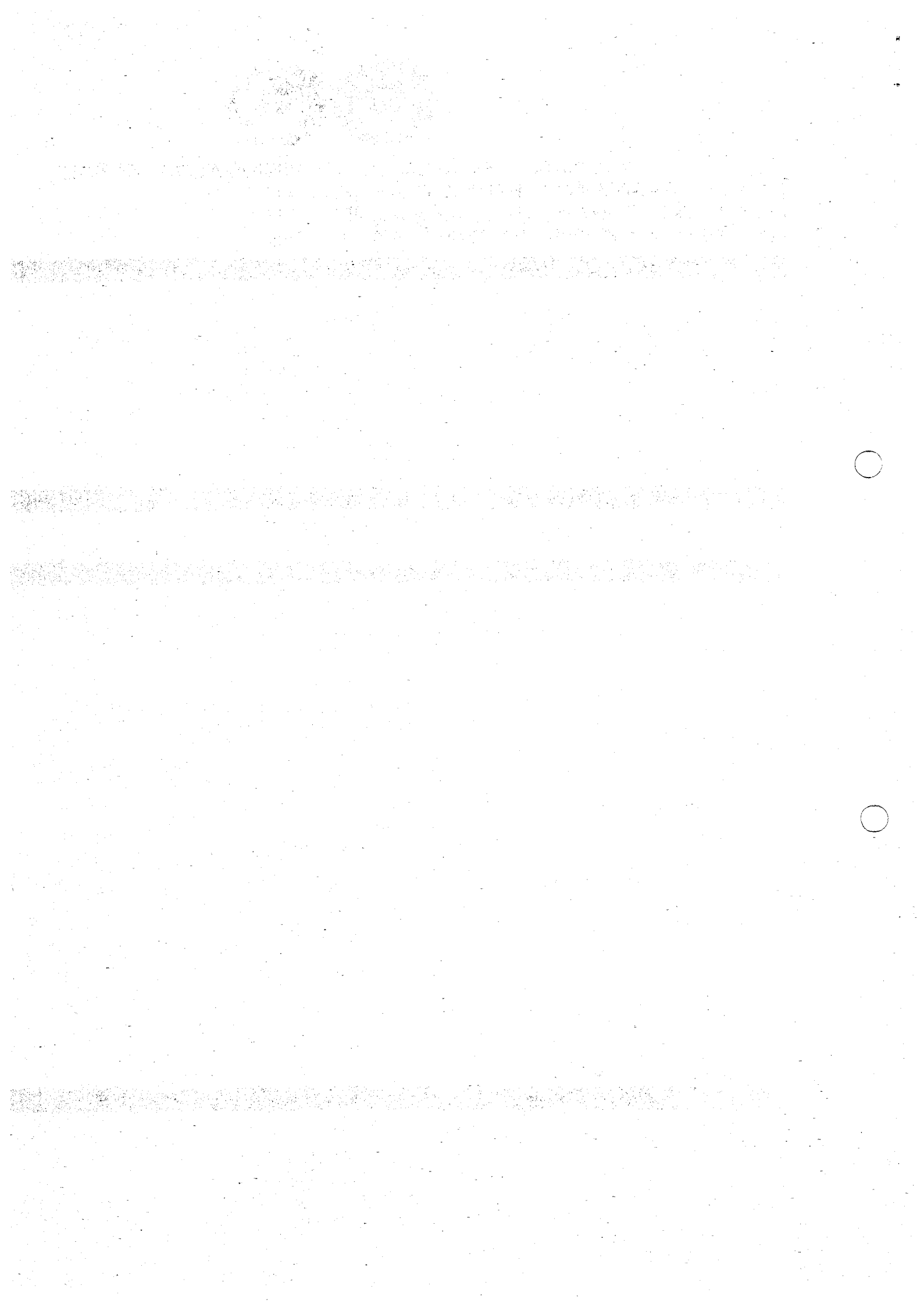
The ICO Econometric Model of the World Coffee Economy

By

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on behalf of the ICO

Objectives of the Study

The main objective of the current study is the construction of a
new, forward-looking model of the World Coffee Economy by
extending previous work undertaken by Dr. Mavrotas (jointly
with A. Maizels & R. Bacon) in this area. In Maizels, Bacon and
Mavrotas study (1997, Oxford University Press) a World Coffee
Model was constructed (along with similar models for cocoa and
tea) to carry out simulation analysis related to possible supply
management policies by producing countries. Although the
previous study has certain strengths as far as the whole analysis
is concerned, its econometric analysis was in a way constrained
by the relatively short time-period covered, particularly as far as
the 1990s is concerned. More precisely, the previous
econometric model of coffee was estimated by using coffee data
for the period 1966-90 only, thus it was not able to capture the
important developments in the coffee market which took place
in the 1990s - namely, the set up of the Coffee Retention

Scheme by the Association of Coffee Producing Countries in October 1993, the implications of the new Coffee Agreement of October 1994 as well as bad weather conditions in Brazil (see the frost of June 1994) among others.

The current study aims at bridging the above gap related to coffee modelling in previous studies. More precisely, the new model extends previous research on world coffee modelling in order to cover most of the 1990s by using data from the International Coffee Organisation, as well as from other sources, where appropriate. Furthermore, by adopting a robust econometric methodology, the study constitutes a clear departure from previous models in this area.

Model Structure

The model consists of three main parts:

- the demand side

- the supply side

- a third part related to the determination of the world coffee price

I. The Demand Side of the Model

Earlier studies include Akiyama & Duncan (1982), Vogelvang (1988), Akiyama & Varangis (1989), Akiyama & Varangis (1990), Lord (1991) and Yeboah (1992). More recent studies include Maizels, Bacon and Mavrotas (1997) and FAO-ICO (1999).

The present study adopts the following methodology as far as demand analysis is concerned:

- Demand equations are established and subsequently estimated for the largest consuming countries, including one producing country, Brazil.

- The consumption of other producing countries & other member non-producing countries is aggregated into a "rest-of-the-world" variable.

- The former socialist countries of Eastern Europe and the Soviet Union have been excluded because of lack of data.

- Finally, detailed data produced by the ICO, on retail prices exist only from 1975, which becomes the earlier starting-point for this study.

Along the above lines, per capita consumption is related to per capita real income and the real retail price (retail coffee price deflated by the general retail price index).

II. Modelling Coffee Production

Earlier studies on modelling coffee production models include Akiyama & Duncan (1982), Akiyama & Varangis (1989) and Lord (1991). More recent studies include Maizels, Bacon and Mavrotas (1997) as well as FAO-ICO (1999).

Some important issues to be considered first:
- coffee is a tree crop in which there is a considerable lag between decisions to plant more trees and the output of more coffee;
- there has been some evidence of a two-year bearing cycle, a heavy crop one year being followed by a lighter crop the following year;
- the impact of weather.

Current Study

The present study treats the output and planted area of coffee by separate equations, the former reflecting a short-run harvesting decision (constrained by the area of mature bushes), and the latter reflecting an investment decision.

A. Output Equations

Output equations will be estimated for the nine largest producing countries for which there were data available (1967-97).

Coffee output is modelled as a function of area harvested, real producer price of coffee, a lagged output variable and a time trend.

B. Area Harvested Equations

Area harvested equations are specified as a function of real producer price of coffee (several time lags tried) and a time trend.

III. Prices and Market-Clearing

A. World Price to Retail Price Links

- Equations linking retail prices to the world price are needed for all the consuming countries separately identified in the demand section of the model.

- Eqs. will be estimated for eight large consuming member countries and for Brazil.

- The model relates the nominal retail price to the world coffee price (ICO composite indicator price measured in US$), the exchange rate against the dollar, and time trend.

B. World Price to Producer Price Links

For the nine main producing countries it is possible to link producer prices to the world price by estimating producer price equations as a function of world coffee price, the exchange rate against the dollar, and time trend.

C. World Price and Closing Identities

- *world coffee price equation*
the world price equation is the focal point of the whole model: it relates the world coffee price to the ratio of producer stocks to world coffee production, the lagged world coffee price, a time trend, and a dummy for the quota years.

- *link equation*
this is an equation that is needed to determine consumer stocks in our model: the consumer stock level is related to the log of the world price in the previous period

- *closing identities*
To close the model a series of identities are required:

    - *consumption identities* (world consumption identity, consumption of all members consumers and consumption of all member producers)

    - *supply identity* (aggregates the production of all modelled countries with that of the rest of member producers to give total member production)

    - *stock identities* (include identities associated with changes in member producer stocks, changes in member consumer stocks and with stock changes related to stock levels; finally, exports from member countries to member countries are related to imports into member countries from all sources).

Methodological Issues

On the econometric methodology front, the current study constitutes a clear departure from existing empirical research in this interesting area. A particular feature of much of the existing literature is the neglect of the important issue of an appropriate time-lag structure in the central equations of the model (particularly in the output and area harvested equations) in the sense that the time-lag structure has been imposed on the data arbitrarily by the author/s and has not emerged from the data itself. The current study corrects this shortcoming by adopting, where appropriate, a *general-to-specific* econometric methodology as well as recent developments related to the *cointegration* of economic time-series.

Significance of the Model

By adopting a rather forward looking dynamic approach, the study will provide the interested parties (the International Coffee Organisation, coffee producers and coffee consumers) with a new updated model of world coffee economy which can be subsequently used for forecasting purposes.
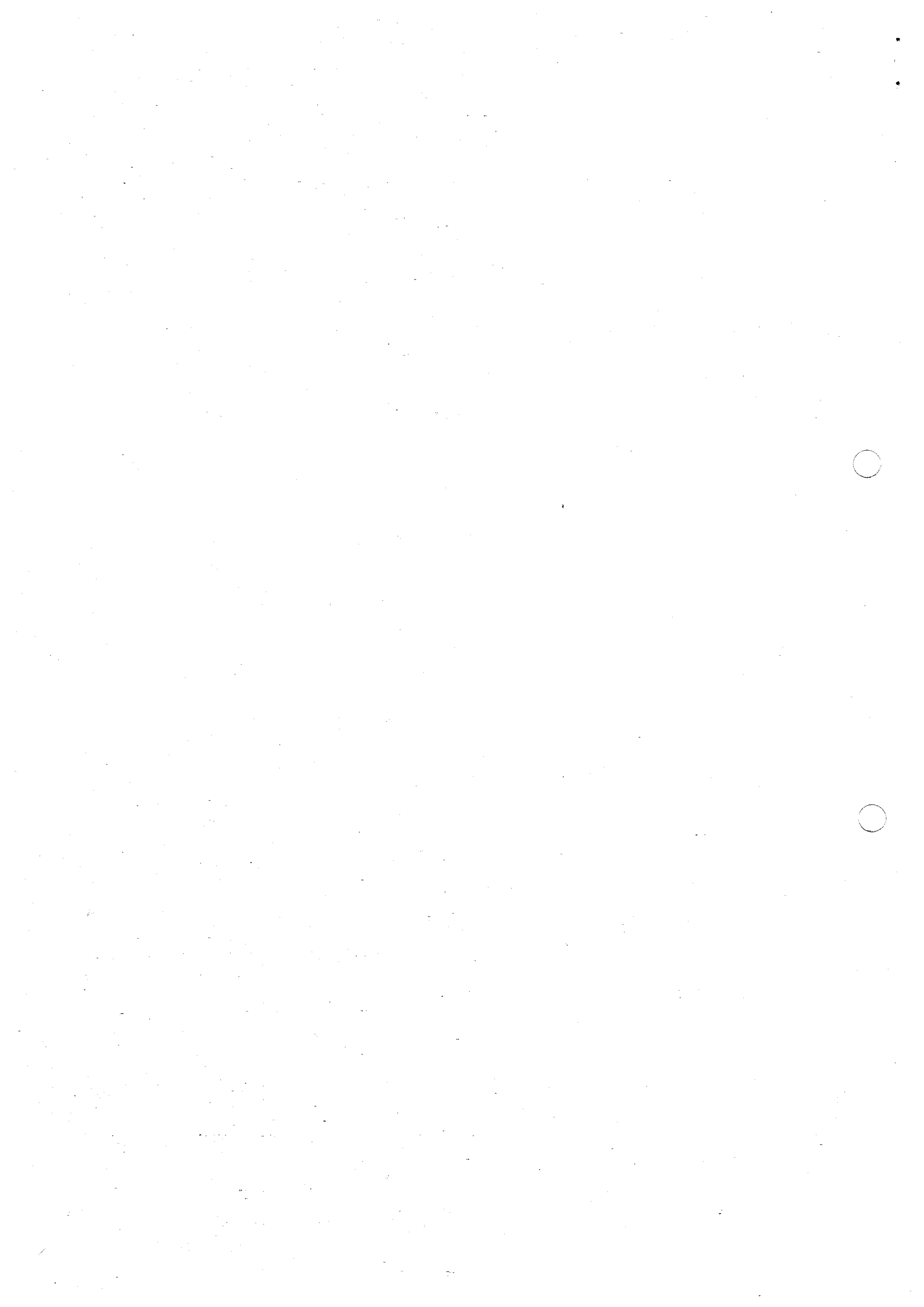
ANNEX

I. Main Producing Countries included in the Model

Brazil
Colombia
Indonesia
Vietnam
Mexico
Ivory Coast
India
Guatemala
Ethiopia
Rest-of-the-world

II. Main Consuming Countries covered in the Model

United States
Germany
Italy
France
Netherlands
United Kingdom
Spain
Japan
Brazil
Rest-of-the-world