

A Dynamical System Model for Analysing Economic Impacts of Competition upon A Water Company

Jin Li and Xin Yao

The Centre of Excellence for Research in Computational Intelligence and Applications (CERCIA),

The School of Computer Science, The University of Birmingham, Edgbaston, Birmingham, B15 2TT, UK

1. Introduction

Having been introduced by Government in the Water Act 2003 (WA03), competition between water supply companies within England and Wales will take effect on 1 December 2005.

It is highly desirable for a water company to develop a means to evaluate the possible economic impacts of the competition on its business.

This poster describes a real world competition scenario exploration software tool, developed by Cercia at the University of Birmingham. The tool is currently in commercial use by a major water company in England.

Underlying the tool is a dynamical system model, which allows the company to explore possible impacts of competition onto its business based on a variety of competition scenarios. The focused impacts lie on water consumption, as well as the revenue.

Analysis of both potential impacts are carried out based on a mathematical model of customer company-switching under parallel forms of competition.

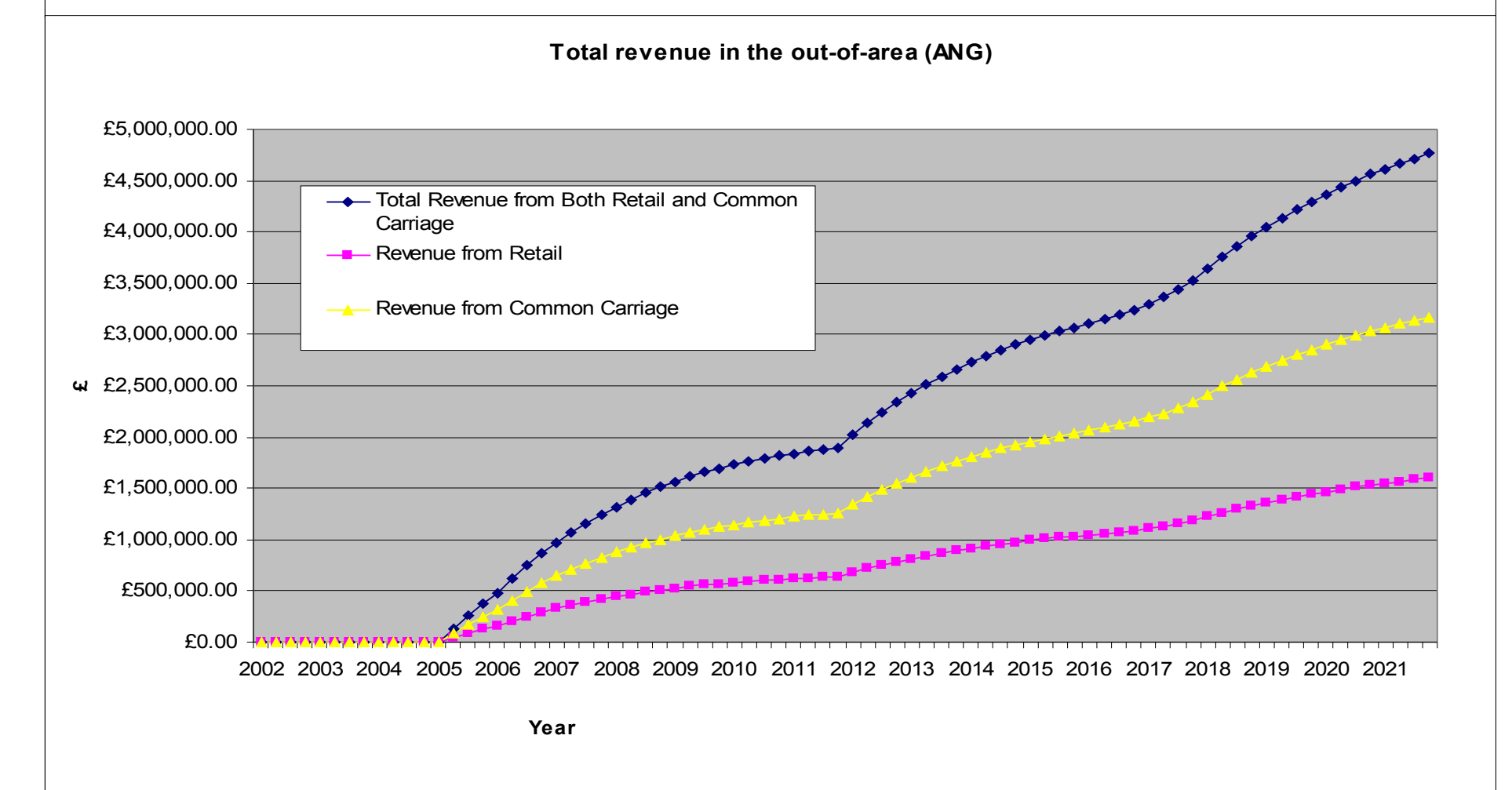
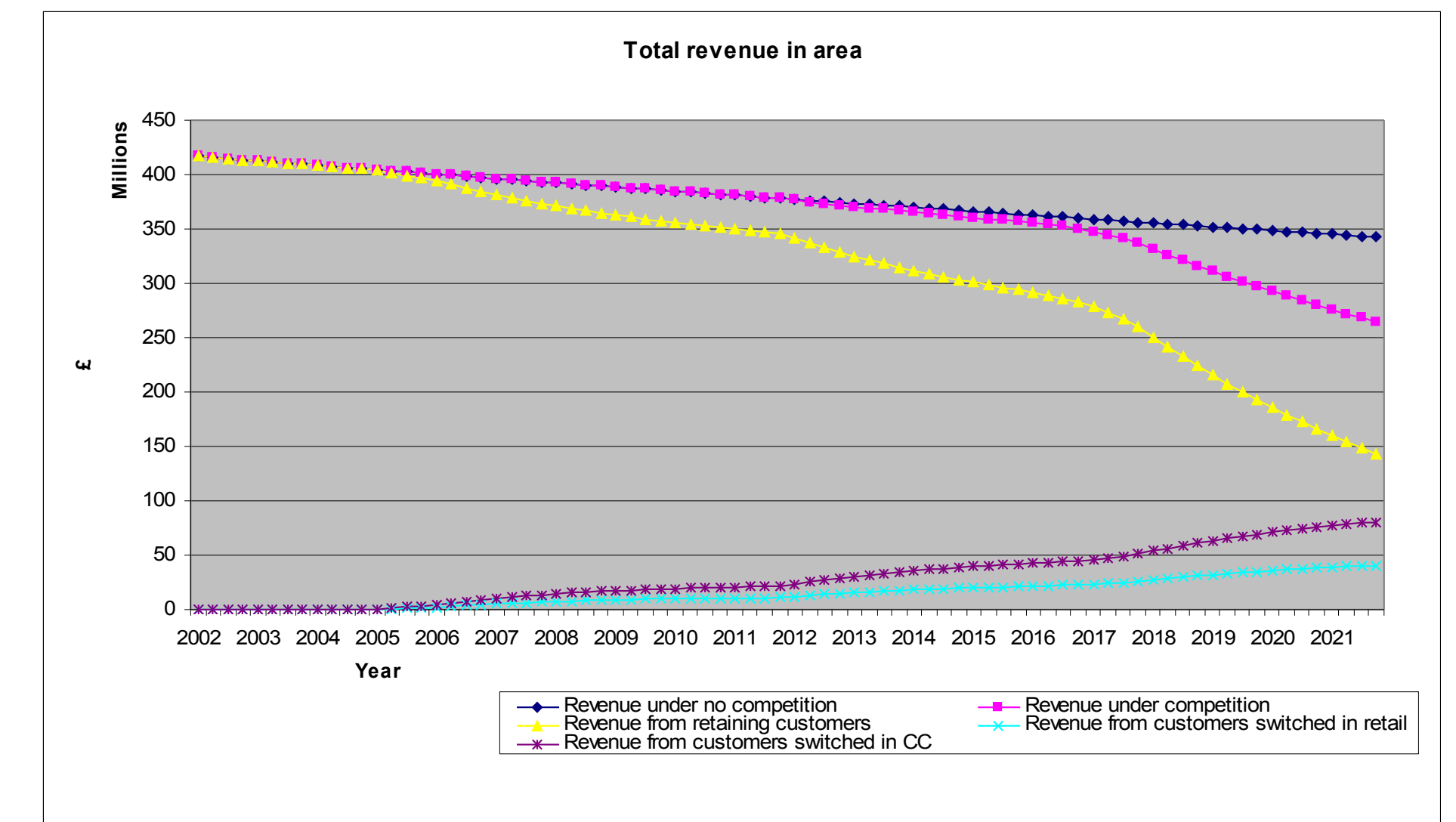
2. Mathematical Model

The mathematical model addresses the competition between an incumbent company and new-entrant companies (i.e. licensees). The model captures aspects of demonopolisation of markets and customers' company preferences, as well as cases where multiple forms of competition occur in parallel (e.g. wholesale or/and common carriage).

The model is able to approach various scenarios characterised with different parameters such as dual switching rates (i.e. a losing rate and a gaining rate), competition forms, and competing market sizes (i.e. fractions of all incumbent customers eligible for competition). These parameters are adjustable based on users' choices according to market situations. The ultimate outcomes of the model are predicted customer market shares changed quarterly over many years.

The mathematical model has been extended further by two advanced models. Firstly, a water competition scenario consumption model is capable of making predictions of overall water consumption, given average potential water consumption per customer per year. Secondly, a water competition scenario revenue model is capable of generating predicted revenue by taking into account various tariffs of the incumbent company and all/part of new licensees, together with assumed possible tariffs imposed in wholesale or/and common carriage due to the competition.

4. Forecasting Result Examples



3. The Tool

A software system tool, built on Microsoft spreadsheets, has been developed to accommodate all of the three models aforementioned. The tool provides users with friendly GUIs (Graphic User Interface), enabling them to easily play with a variety of scenarios for the three models. Some of the snapshots of the software tool are illustrated on the left.

5. Summary

The mathematical system model that we develop provides a mean to analysis impacts of competition onto a water company's business. Thus, it helps the company more likely to make right decisions on its future policies.

Although the model has been developed to meet the needs of a water company on analysis of economic impacts due to the competition, great potential exists for this model to be exploited in other similar industries, such as gas, electricity and telecommunication.

