



Structural change in the Australian electricity industry during the 1990s and the effect on household income distribution: A macro–micro approach



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ABSTRACT

The Australian electricity industry experienced significant structural change during the 1990s mainly as a result of microeconomic reform. We analyse the effects of the structural change on the distribution of household income using a macro–micro approach. Our work shows that, nationwide, all income deciles experience higher real incomes in the order of 2%. Our results show that a previously state-owned monopoly industry can experience significant structural change while generating significant improvements in household real income without leading to significantly adverse impacts on national or regional income inequality. It suggests that policy makers in advanced economies should seriously consider such reforms given that they may generate large economic benefits with rather small economic costs.

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1. Introduction

In the early 1990s, Australian governments¹ introduced a series of microeconomic reform policies for infrastructure industries: electricity, gas, water and sewerage, urban transport, ports and rail freight, and telecommunications; [PC \(2002\)](#) summarises these reforms. The reforms were part of the process inspired by the Hilmer Report ([Commonwealth of Australia, 1993](#)). The Hilmer Report's terms of reference focused on government businesses and regulations that had created protected enterprises: these had been a feature of industry policy in Australia for most of the 20th century. Hilmer argued for the introduction of competition policy in these areas to increase competition for the purpose of promoting economic efficiency and other social goals ([King and Maddock, 1996](#)). Thus, a major aim of the policy initiatives was to spur productivity improvements and attendant increases in real incomes, as well as better choice and services for consumers. Since the initial introduction of the reforms, the affected industries have undergone significant structural changes that are observable in their cost structure and output prices ([PC, 2002](#); [Giesecke and Madden, 2004](#); [Aghdam, 2011](#)).

As major service providers, changes in infrastructure industries can potentially have far-reaching impacts on other industries, businesses and households. Both [PC \(1999\)](#) and [Madden \(2000\)](#) noted that the competition policy reforms were regarded by many in the community as being responsible for the increased economic divide between capital cities and regional Australia. Related to this view, there has also been community concern over the impact on income distribution of sectoral changes, in general, and infrastructure industry changes, in particular, viewed as a result of the microeconomic reforms. Such concern has also been expressed by the economics profession, e.g., [Quiggin \(1997\)](#). Our interest is to address this concern by estimating the effects on income distribution of these changes: we focus on the electricity industry, which is an important supplier for most sectors in an advanced economy.

Given the interdependence of the electricity industry and other sectors, our approach applies an economywide framework with a high degree of sectoral detail and inter-sectoral linkages: i.e., computable general equilibrium (CGE). CGE analysis of reforming infrastructure industries is rather uncommon: examples include Argentina's utilities sectors ([Benitez et al., 2003](#)); Bolivia's gas sector ([Andersen and Faris, 2002](#)); Morocco's rural areas ([Löfgren et al., 1997](#)); Australia's utilities sectors ([Giesecke and Madden, 2004](#)); and Australia's electricity industry ([Whiteman, 1999](#)). Analysing the distributional effects of such reforms within a CGE framework is even less common: [Boccanfuso et al.](#) examine the impact of electricity industry reform on income

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¹ Australia's system of government is of federal form with constitutional responsibilities shared across the national (central) government and eight regional (state and territory) governments.

distribution in Senegal (Boccanfuso et al., 2009a) and Mali (Boccanfuso et al., 2009b).

In an Australian context, there are two studies that have analysed the distributional effects of certain aspects of structural change in the electricity industry. PC (1996a) uses an input–output model and household survey data to estimate the effects on household expenditure of price reforms by government trading enterprises (GTEs) in the electricity industry and other utilities. PC (1996b) uses a CGE model in conjunction with an income distribution model to analyse the effects of a range of reforms including the electricity industry. Each of these studies concentrates on only one side of the household budget – PC (1996a) focuses on the expenditure side, PC (1996b) on the income side – so the overall impact on household real income remains unclear in each study. Moreover, input–output models, as applied in PC (1996a), suffer from their own limitations: they do not capture effects generated from sectoral reallocation of resources, particularly labour, that are considered important in capturing the distributional effects of a policy change; and they assume no behavioural responses when relative prices change.

We conduct a more comprehensive analysis of the effects of Australian electricity industry changes on household income distribution. We integrate both sides of the household budget to capture the total (direct and indirect) effect on household real income, by incorporating expenditure and income data on individual households within a multi-region CGE model. Within this framework we simulate the electricity–industry-specific changes during the 1990s to generate region-specific changes in the prices of goods and services, and productive factor returns and usage. Region-specific prices and other variables calculated by the CGE model are linked in a top–down manner to expenditure prices, employment and factor returns at the household level.

Our approach is typically referred to as macro–micro (Boccanfuso et al., 2009a,b). Within this class of analysis, it is most accurately sub-classed as a form of the CGE micro-simulation sequential approach (e.g., Chen and Ravallion, 2004), also known as CGE micro-accounting. In CGE micro-accounting, the representation of households is purely an accounting framework with no behavioural responses. Our work represents the first attempt to analyse the distributional effects of electricity reform in an advanced economy within a CGE framework that incorporates both sides of the household budget. Our work is also the first to analyse the distributional effects of Australian electricity reform with a regional dimension.

2. Microeconomic reform during the 1990s²

2.1. Changes in Australian infrastructure industries

At the beginning of the 1990s, Australian governments began an extensive process of microeconomic reform of Australian infrastructure industries. The main objectives of these reforms were to increase competition and improve performance in these industries. Prior to the commencement of the reform process, almost all infrastructure industries were dominated by GTEs providing services with monopoly rights. Thus the reform process has been largely concerned with improving the performance of GTEs. For GTEs, the reform process can be categorised into four broad areas: commercialisation; corporatisation; capital market disciplines; and competition policy.

Commercialisation involved GTEs taking a more market-driven approach to service provision and pricing. Thus, competitive tendering and contracting out of service provision have been introduced, community service obligations are now funded in a more direct and transparent way, and GTE regulatory functions have been transferred from GTEs to independent regulators. *Corporatisation* focuses on making GTEs

autonomous entities within the public sector, with commercially-oriented boards pursuing commercial objectives without ministerial interference. Financial and non-financial performance monitoring and reporting regimes were set up to measure and compare performance. Price regulation has also been largely transferred from ministerial control to independent regulators. *Capital market disciplines* required GTEs either to reduce negative rates of return or earn higher positive rates of return. *Competition policy* focussed on removing existing entry barriers to infrastructure industries and thereby stimulating competition and increasing contestability. Increased competitive pressure is aimed at lowering prices and improving service provision and quality.

2.2. Changes in the Australian electricity industry

The Australian electricity industry has undergone significant reform over the 1990s consistent with the Hilmer reforms. Reforms include corporatisation of electricity utilities, the introduction of competitive neutrality measures, and reform of market and tariff structures. The reforms have led to significant reductions in employment in the industry, concurrent with more flexible work practices. The introduction of competitive neutrality measures has required that governments fund community service obligations directly, thus reducing cross-subsidisation across customer groups. Further, utilities are now required to pay dividends and taxes to governments.

The market structure reforms mainly consisted of separating contestable market elements from non-contestable market elements. Thus entry barriers to electricity generation and retailing were removed, while electricity transmission and distribution continued to be provided by a regulated monopoly supplier. The introduction of competition in generation and retailing over the 1990s led to the establishment of the National Electricity Market, which operates as a trading pool, made up of generators, retailers and wholesale customers.

Tariff reforms have focussed on removing cross-subsidies so that each customer group pays a price that reflects the cost of supplying them. One effect of tariff reform has been an increase in the weight given to access charges relative to usage charges in total electricity charges. Another effect of tariff reform has been the introduction of time-of-use tariffs, where access and usage charges vary depending on the time of day, so that charges are higher at times of peak demand and lower at other times. Some states and territories have also created independent price regulators who are responsible for imposing controls on prices or revenues, a responsibility previously subject to ministerial discretion.

3. Method: a macro–micro approach

Our modelling approach links two separate analytical frameworks for the purpose of generating results at a high level of household detail within a model of the wider economy. We link a detailed CGE model of Australian regions with detailed regional household accounts on income and expenditure. The representation of households is purely an accounting framework with no behavioural responses. Our approach is typically referred to as macro–micro, and within this class of analysis, it is most accurately sub-classed as a form of the CGE micro-simulation sequential approach, also known as the CGE micro-accounting approach.

3.1. The history of linked models

As the inventor of microsimulation, it is not surprising that Orcutt (1967) was the first to describe a process for linking models that operate at differing levels of aggregation. He envisaged multiple models being linked through “...adaptors and key variables used as intermediaries...” (p. 120). The approach involved models that describe part of the economy being linked as modules that together would describe the overall system. The most succinct summary of

² This section draws on PC (2002), Sections 1.3 and 2.1.

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