Pergamon

Resources Policy 26 (2000) 39–50

RESOURCES POLICY

www.elsevier.com/locate/resourpol

Short-run demand and supply elasticities in the West European market for secondary aluminium

Jerry Blomberg *, Stefan Hellmer

Luleå University of Technology, Department of Business Administration and Social Sciences, Division of Economics, SE-971 87 Luleå, Sweden

Received 27 September 1999; received in revised form 5 March 2000; accepted 12 April 2000

Abstract

As the principal user of old scrap, secondary aluminium smelters and refiners have traditionally played a key role in the recycling of aluminium, producing primarily cast material demanded primarily by the automobile industry. The purpose of this paper is to explore the supply–demand relationships in the market for secondary aluminium alloys. Based on a standard microeconomic model, where the determinants of supply and demand are identified, an econometric model, using data from Germany, France, Italy and the UK for the time period 1983–97, is estimated. The model is used to assess the relative importance of the factors determining the supply and demand of the European secondary aluminium industry. The results show that both the supply and the derived demand for secondary aluminium is own-price inelastic, which is reasonable given the short-run framework. On the demand side, the level of auto production is found to have a substantial impact on the level of secondary aluminium alloy demand. We conclude that the model describes the market reasonably well. The inelastic supply in combination with the sensitivity to changes in the level of auto production provides a tentative explanation of the observed volatility in secondary aluminium prices. Furthermore, the inelastic supply responses indicate that policies aimed at increasing recycling using price-based incentives will be inefficient.

Keywords: Secondary aluminium; Aluminium recycling; Panel data; Supply and demand; West Europe

Introduction

Purpose and background

Recycling is sometimes viewed as an activity guided by forces other than those prevalent in the market. Hence there is a perception that recovery of worn-out products and the production of new material from these need to be mandated or otherwise regulated. However, markets for recycled metal scrap and the products derived from it have existed for a considerable time. The purpose of this paper is to explore the supply–demand relationships in the West European market for secondary aluminium casting alloys.[1] Building on a standard microeconomic model of short-run price determination we will identify and estimate the determinants of supply and demand. This effort is not only interesting because it adds to our understanding of an important recycling market, it will also help us to understand the high volatility in secondary aluminium prices. For example, the German secondary aluminium alloy price reached a high of 70 ct/lb in

* Corresponding author. Tel.: +46-920-723-35; fax: +46-920-720-35.

E-mail addresses: jerry.blomberg@ies.luth.se (J. Blomberg), stefan.hellmer@ies.lnth.se (S. Hellmer).

[1] By secondary aluminium we mean metal predominantly produced from aluminium scrap. It should be noted that with this market definition, we leave out a great portion of the aluminium recycling industry. The remelter industry, for example, recycles considerable amounts of new (production) scrap. Our motivation for not including supply from remelters is that many of them work on a toll basis or are integrated with primary smelters. Thus, their supply is not determined by market forces to the same extent as the secondary refinery industry supply is. A further motivation is that we want to capture the market forces driving the recovery of scrap from worn-out products (old scrap). For technical reasons, the refinery industry is the only part of the aluminium industry that is able to use old scrap. See Results and Analysis in this paper for further details.

0301-4207/00/$ - see front matter
PII: S0301-4207(00)00015-5

Table 1
Production and consumption of aluminium in Europe in 1970–97 (thousand tons)

Year	Production of secondary aluminium	Production of primary aluminium	Total consumption
1970	800.5	2015.1	3347.8
1980	1183.5	3759	5048.6
1990	1712.1	3927.4	6907.3
1997	1851.4	3299.5[a]	7900.2[a]

Source: Metal Statistics and Organisation of European Aluminium Refiners and Remelters (OEA).
[a] 1995.

real terms both in 1984 and 1989 and a low of 30 ct/lb in 1994. Such swings in price might have detrimental effects on the willingness to undertake long-term investment in the industry, with possible negative ramifications for recycling.

Recycling of aluminium has been undertaken since the metal started to be used in the late-nineteenth century, primarily due to the high value of the scrap because of the energy-saving potential when manufacturing metal from aluminium scrap instead of bauxite. However, only in the 1980s and 1990s has aluminium recycling entered the public consciousness. Today, municipal recycling centers for used beverage cans are more or less common throughout the western world, as is the recycling of almost all aluminium metal from end-of-life vehicles. Aluminium is the world's most used non-ferrous metal, with annual world consumption twice as high as copper (aluminium is second only to iron and steel). Its prominent role in public discussion is not misplaced. In Western Europe, recycling of aluminium scrap and the production of secondary metal from it has taken on even more prominence since European primary production started to level off and finally decline during the 1980s and 1990s. As is evident from Table 1, the relative growth of the secondary refinery industry has been almost one and a half times as rapid as the growth in the primary sector, partly due to the high energy cost of the latter. Table 2 indicates the great importance of the secondary refinery industry for some major European countries. The relative size of the two industries has varied over the last 30 years, but since the beginning of the 1980s the secondary industry has grown consistently in importance and is now, in the case of Italy, more than twice the size of the primary industry. Even if total consumption of aluminium over time has often outgrown any domestic supply in most European countries, secondary aluminium has held its position reasonably well. In 1997, secondary aluminium comprised approximately one-fifth to almost one-third of total consumption.

Table 2
Domestic secondary aluminium production 1997 (relative shares)

Country	Domestic secondary production/Domestic primary production	Domestic secondary production/Total domestic consumption
Germany	0.76	0.18
France	0.61	0.25
Italy	2.36	0.29
United Kingdom	0.96	0.31

Source: Metal Statistics and Organisation of European Aluminium Refiners and Remelters (OEA).

Given the growing importance of secondary aluminium both in terms of European "domestic" production and in terms of the growing share of consumption, we believe there is a need to better understand how the market for secondary alloys functions.

Earlier research

Owing to this demonstrated significant role of secondary aluminium, it is surprising that is has hitherto attracted so little attention from academia. Many of the earlier studies of metal recycling, such as Bonzcar and Tilton (1975), Slade (1980) and Stollery (1983), concentrate on the recycling of copper in the USA.[2] Only very few efforts have been made to study other metals (such as aluminium) and other countries or regions.

One example of such an effort is a study by Grace (1978). Grace attempts to establish a method to calculate recycling rates for metals and uses it to compare recycling rates between countries. While using aluminium as the base case, he also applies the method to copper and lead. He calculates recycling rates for the three metals for six countries—Germany, France, Italy, the UK, the USA and Japan—during the period 1965–75. He concludes that there seems to be evidence that the supply of scrap aluminium outgrows the demand for castings made from secondary aluminium. Hence, increased

[2] It could be argued that copper and aluminium share some characteristics in that both are metals. Also the process by which they are collected and recycled is similar, and hence there should be things to learn from these efforts (which there are) when dealing with aluminium recycling. However, we have stopped short of only discussing the studies explicitly treating aluminium.