ECOLOGICAL AND EONOMIC POTENTIAL OF SECONDHAND MARKETS FOR DEMATERIALIZATION OF THE ECONOMY

Oleksiy Goncharenko
Odessa national polytechnic university, Odessa, Ukraine

Since the 1970s, a growing body of research by environmental scientists has suggested that greater material efficiency, use of better materials, reuse and recycling, and the growth often service economy are contributing to the "dematerialization" of the economy.

In this context, it is often suggested that the recycling and reuse of products, materials, and wastes have significant potential for increasing material efficiency and reducing environmental impacts. Taking this idea to its limit, Graedel and Allenby (1996) have suggested that the ultimate goal of environmental management could be the evolution of the economy into a system in which all materials are reused and recycled. But despite the interest in dematerialization and reuse of materials, there is as yet no theoretical framework for understanding the future evolution of material use in industrialized societies.

The potential for second-hand markets to reduce demand for new goods is investigated. Using a variant of an economic model originally developed by Anderson and Ginsburgh, the physical implications for material use are explored. The second-hand market grows if transaction costs decrease or if product lifetime increases. In this model, growth often secondhand market reduces demand for new goods if there are waste used goods that can be brought into the market. But if there is not a ready supply of waste used goods, growth of the second-hand market can increase demand for new goods, thereby increasing material consumption. Moreover, even when second-hand sales reduce demand for new goods, it is typically not on a one-

for-one basis. The extent to which the purchase of used goods replaces the purchase of new goods is shown to be an explicit function of the relative value provided by used versus new goods.

Consider a product that is used by the purchaser for only one period (for example, 1 yr), but which has an additional lifetime L, so that the total lifetime of the product is $1 + L$ periods. After the purchaser has used the product for one period, he can sell it, store it, throw it away, or give it away. The price for a new product is PN. If the product is sold after the first period, the used price ispS, which the seller receives, plus a transaction cost s, which must be paid by the buyer and includes search costs, delivery costs, and so on. Even if $pS = 0$ (if there is insufficient demand for the used product and the seller is willing to give it away free), the buyer is still required to pay the transaction cost. Disposal is assumed to entail neither financial costs nor benefits. The value of the service

provided by a used product is *v*, and the value provided by a new product is v + *k*, where *k* is the extra benefit of newness. Consumers have different valuations of these services according to a parameter 0 that is between zero and one, with higher 0 denoting individuals with higher willingness to pay.

The options available to the individual are *N*, buy new and sell/give away/store/throw away; *U*, buy or find used; and *Z*, do not consume the product (the zero option). The utility *V*- Effect of Dematerialization SecondHand Markets (EDSHM) under each of these options is as follows.

1. $V_N = \theta(\upsilon + \kappa) - p_n + p_s$ (1)
2. $V_U = \theta\, L\, \upsilon - (p_s + \tau)$ (2)
3. $V_Z = 0$ (3)

EDSHM as a Function of Transaction Costs. The size of the markets for second-hand and new goods depends on the parameters s, *v*, *k*, *L*, and p_n. This section focuses on transaction costs s, and the next section focuses on product lifetime parameter *L*.

Total material consumption of course includes manufacturing and production wastes as well as the material in the product, which is taken to be proportional to *N*. Above a certain maximum transaction cost sm, the secondhand market (*U)* does not exist. As the transaction cost decreases below sm, the second-hand market grows and the number of people buying new decreases. But as s continues to decrease, the waste is used up.

EDSHM as a Function of Product Lifetime. The model also assumes that second-hand owners may own more than one of the product and that the price for new goods is exogenous. These assumptions are unlikely to characterize all second-hand markets of interest. By changing equations (1 - 3) to develop new models, the implications of different market behaviors could be explored. Data on how consumers and markets react to changes in the lifetime of products, transaction costs, or product obsolescence would allow the development of models that reflect observed market behaviors.

A key factor in this model is whether the second-hand price is or is not effectively zero. Examples of second-hand markets with nonzero secondhand price might include markets for cars, housing, and some books. The model indicates that in markets with positive second-hand price, increased second-hand sales would not correspondingly decrease sales of new goods. If all other variables remain constant, increased second-hand sales in these markets can increase sales of new goods and increase material consumption. On the other hand, in markets with zero second-hand price, such as markets for electronics, furniture, clothing, and garage-sale items, increased secondhand sales can be expected to decrease the demand for new goods.

The model presented here has implications for extended producer responsibility

and the substitution of services for products. It has been argued that firms would have an incentive to be more efficient with materials and energy if products were leased rather than sold to consumers however, it has also been argued that one motivation of the lease-only strategy of firms.

Economics for Ecology [Текст]: матеріали XX Міжнародної наукової конференції, м. Суми, 6-9 травня 2014 р. / Редкол.: Д.О. Смоленніков, Л.А. Кулик. - Суми : СумДУ, 2014. - 145 с.