The Deposit-Refund Policy Of Takeout Disposable Cups With Korean Experience

2008/2009:3
Kandidatuppsats i Nationalekonomi, 15hp
Slutseminarie: 2009-06-05

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Examinatorer: Universitetslektor Ulf Grönkvist
Universitetsadjunkt Bengt Kjellgren

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The Deposit-Refund Policy Of Takeout Disposable Cups With Korean Experience

Abstract

This paper focuses on takeout coffee cup deposit-refund with Korean experience which was abolished in 2007. By employing cost-benefit analysis for takeout coffee cups deposit-refund policy for 1 year we can diagnose the rightness of executing and abolishing it and after what kinds of other policies or additional devices could help successful reducing waste disposal policy with in the case of takeout coffee cup. Also how much deposit could be effective to government’s pursuing recycle or refund rate.

INTRODUCTION

The amount of the use of disposable cups has been rapidly increasing in South Korea since the launch of the most common take-out coffee chains such as Starbucks, Coffee bean etc. in Korea in 2000. A disposable product is a product designed for cheapness and short-term convenience rather than medium to long-term durability, with most products only intended for single use. Here, disposable cups are the cups that you can use with convenience and throw away after one or more uses. You can see them usually in take-out coffee shops or MacDonalds’ for coke, coffee or other drinks. Coffee consumers should have this disposable cup with their coffee. It is usually thrown away after one brief use, so it causes waste of material and a lot of cost to use them.

The issue about recycle of disposable materials has been discussed for many years and especially we can find many researches and information in academic papers by Fullerton, D., Kinnaman, C., Palmer. K., Walls. M. etc. M. Walls(2003) was focused on EPR which is extended producer responsibility that producer takes responsibility for waste disposal. There are two approaches to reduce solid waste disposal that is, by producer, or by consumer. The paper says that upstream policy which considers recycling and waste reduction in the level of process would be better than downstream policy. Especially in The Cost of Reducing Municipal Solid Waste(Palmer K., Sigman H., and Walls M, 1995) which we are going to follow the analysis, it configure a model of waste generation and recycling, and the most significant thing about this paper is that it also considered policy intervention which is deposit-refund, advance disposal fee and recycling subsidy. It compares 3 policy interventions in the way of reducing municipal waste disposal by required intervention levels through the model of baseline data and elasticity estimates. Among these 3 policy interventions many papers agree deposit-refund policy is the most effective in the way of reducing municipal disposal\(^1\). Also Jung, J. (2002) emphasizes market-based policy could solve the waste disposal problems with spontaneity.

There are several studies which estimate the responsiveness or waste reduction to disposal charges. R. Jenkins in compiled data on waste disposal with disposal charges. It comes out that a $0.80 per 32-gallon container charge would decrease waste by 9.5% with curbside recycling and 16% with curbside recycling. Along with her consequences, Fullerton and Kinnaman examine the response of the weight of wasted in Charlottesville, Virginia before and after the town imposed a charge of $0.80 a 32-gallon container and concludes households reduced the weight of their garbage by 14 per cent in the presence of curbside

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\(^1\) Palmer, K. et al., 1995

Also when it comes to Korean case, the research by Citizens’ Institute for Environmental Studies shows us how bad situation had been going. Agreed stores didn’t ask consumers whether they wanted reusable cups and introduce the new policy to consumers. As an effort to reduce solid waste disposal by the Korean government the taxes on waste disposal have been charged in 1992 by applying Solid Waste Management Act South Korea introduced a comprehensive deposit program covering packaged paper, metal cans, glass and PET bottles, batteries, tires, lubricating oils, televisions, and washing machines. Nowadays Korean government also considers EPR concept, so it is reinforced. The academic paper by Hong. S (1999) says that a unit pricing system accompanied with aggressive recycling programmes was successful and reduced household waste disposal by 17.8 per cent and increased recycling rate by 16.8 per cent in Korea. Korean people don’t have scruples about discarding disposable cups on the street because if they have to throw them away at home they should pay along with a unit pricing system. Environmental Tax – utility of abolishing cup deposit-refund suggestions(2008) concludes that deposit-refund policy is effective to reduce solid waste disposal and government should have kept this policy.

The objective of this paper is to find out inevitable consequences that Korean government had to abolish the coffee cup reducing voluntary agreement, and we can define whether abolished takeout coffee cup deposit-refund policy has a value that continue or is reacted, and if not, what other kinds of policy could be effective for government’s purpose. Also, we can figure out how much the deposit is needed to reach the reducing rate that government pursues. Finally we can also conclude some suggestions for government and other efforts companies and consumers ought to have and do.

KOREAN CASE

The use of disposable cups has been increasing due to increasing take-out coffee shops, spreading consumption of them and sale pattern which pursues convenience not sustainable environment. The number of disposable cups used in 2002 is about 3 million, and it is increasing annually. These disposable cups are not reused and just thrown away, so they have been causing a lot of environmental problems such as waste of material, the way to destruct them by incineration or filling-up. In order to solve these problems the Ministry of Korean Environment Department concluded “the disposable products reducing voluntary agreement” 4th October, 2002, so 29 companies agreed with it at the beginning then it became to be enacted in 1st January, 2003. ‘The disposable products reducing voluntary agreement’ is applied to fast-food chain with over 330.58㎡ and take-out coffee store with over 165.29㎡.

In other words, the definition of ‘the policy of a disposable cup deposit-refund’ is that conversing disposable cups to reusable ones and charging a deposit(100 KWN per each cup for fast-food chains and 50 KWN per each cup for take-out coffee stores) and returning it as soon as customers bring cups back. Agreed stores are strongly encouraged to use reusable

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2 330.58㎡ is a size of transferred 100pyeong which is a unit of area used in Korea, and 165.29㎡ is a size of transferred 50pyeong.

3 Briefly it is called ‘take-out coffee cup deposit-refund policy’
cups instead of using disposable cups, and consumers who take out a disposable cup are charged for 50KRW for take-out coffee shop or 100 KRW for fast-food store, but they are refundable when consumers return them to the store. The rest of the money which consumers don’t get back is used for tank-you sales to be restored to consumers or for sustainable environment campaign. They should announce their details in publics regularly at least one time a 6 months. Figure 1 represents how bottle bill deposit-refund system works. In takeout coffee stores also coffee cup producer sells empty containers to retailer who sells containers filled with coffee to consumers then deposit goes backwards. Then when it comes to deposit redemption retailer or redemption center returns empty containers consumers returned then they get refund.

Figure 1. bottle bill deposit-refund system

Source: www.bottlebill.org

However, according to the result of monitoring 20 stores by Seoul environment research only 35%, 7 take-out coffee stores sale members in counter ask customers to choose either a reusable or disposable cup, in the case customer wants to use disposable one only 5%, 1 fast-food chain inform customers information of refund of it. Only 15%, 3 fast-food stores attach their reusable cups use shops logo and none of them notice where they used non-refunded deposit.

Take-out coffee stores’ disposable cups reducing volunteer agreement is as follow;

Disposable cups-reducing Voluntary agreement for take-out coffee stores

4th October, 2002

Thereupon take-out coffee stores agree to reduce the solid waste caused from disposable matter in order to settle sound consumer habit, and save the sources. As an effort to execute the purpose take-out coffee stores conclude ‘the disposable cups-reducing voluntary agreement for take-out coffee stores’ to reduce the use of disposable stuff used in the stores
and collect used disposable products and promote recycling.

1. Agreed and involved companies have to have cognize of the importance of their role in reducing disposable products and participating sustainable environment movement actively.

1. Agreed and involved companies charge one take-out disposable cup for 100 KRW and return the same amount of money as an incentive to promote the number of times of returning cups and recycling.

1. Agreed and involved companies with over the size of the store 166㎡ have to convert disposable cups into reusable cups to decrease the use of disposable products after 1st January 2003, but they can offer disposable cups with deposit 50 KWN to consumer consume coffee inside a store in the premise they return it directly. * The space of a store is the contract area except the public area.

1. Agreed and involved companies have to exhibit the incomings and outgoings of the disposable cups deposit periodically (once a 6 months at least), spend the profits from the deposit on resoring it to customers like offering thank-you gifts or supporting the environmental preservation.

1. Agreed and involved companies start to execute this agreement from 1st January, 2003 after getting ready to do it such as promotion and improvement and mending of facilities.

1. Government has to support this policy in order to facilitate it.

Sales of disposable cups has been increasing gradually, on the other hand the return amount of disposable cups are increasing very slightly.

**Figure 2. annual amount of sales and refund of disposable cups**

![Graph showing annual amount of sales and refund of disposable cups](image)

**Source:** the Ministry of Environment of Korea, statistics.

In this paper, I want to focus on take-out drink cup case only, because drinking beverage in disposable cups is being considered a kind of fashion icon. Disposable cups of takeout coffee are commonly considered as a fashion. For example, holding a Starbucks coffee cup looks better than a Mcdonald’s coke cup. Second, the main sale product of takeout coffee chain is beverage such as hot and cold coffee, tea, and juice whilst the one of fast-food chain is a meal like hamburger, sandwich, and French fries. Also, consumers usually eat fast-food meal in the store, and they put the garbage including disposable cups into trash bin, so considering that coffee consumers of coffee stores take out their coffee cups more recycling problem is more significant in coffee shops.
Also, two materials are used for take-out coffee cups which are plastic, and paper. The paperboard cups are for hot drinks whilst the plastic PET are for cold drinks. Stores tend to use reusable glasses mug cups for paper cups more in hot drinks because there is more danger of broken cups.

PROBLEM

Abolishment of coffee cup deposit-refund policy

The Ministry of Environment abolished the coffee cup deposit-refund policy in 20th March, 2008. The main reason of it is that it was obscure where the non-refunded deposit had been spent, also some of non-agreed stores also charged deposit on take-out coffee consumers and keep the money as extra profits. Also, consumers had had to pay deposit without any legal basis. It means consumers pay with compulsory but actually there is no legal law they have to pay but it’s based on voluntary agreement. Accordingly it turned out that coffee cup deposit-refund policy was the same as that the deposit was charged on consumers not on stores. That is, if government charges taxes same as the deposit the deposit is charged on consumers but who pays taxes is suppliers. Who pays taxes differs who is responsible for taxes. Therefore companies do their best efforts for fulfilling the policy as there is less incentive. It shows us the paradox of regulation because this policy had been applied with some shortcomings.

To tell the truth since the customers don’t have much knowledge and cognition how much the disposable coffee cup affect on environment. Deposit 50KWN is just thought of as annoying small amount of money. People just could think they are contributing to making this country more eco friendly by spending 50KWN more or even they are thinking 50KWN is a kind of consumption to have the right to contaminate the environment. The deposit had been turning to the cost of making waste in its function. Consumers could feel fair to use disposable coffee cups at the cost of 50KWN. Accordingly the deposit 50KWN is not functioned as an incentive to return coffee cups.

The take-out coffee stores and companies also don’t have any incentive to put this policy into operation due to imputing the responsibility of the use of disposable cups to the users of disposable cups that is, consumers. Consequently, there has been less possibility for take-out coffee stores and companies to start a campaign against the waste or eco-friendly projects, on the contrary it could be more beneficial for customers not to return cups and get deposits back in reward. Companies have been spending remained deposit which hasn’t been returned to consumers for making advertisements of themselves and purchasing something nor related with its purpose directly such as reusable cups, a dish washer, a dish dryer, etc. For example, however a dish washer is an asset which the company has to have with their own money, it was purchased with the remained deposit. Now, it is clear that take-out coffee cup deposit-return is not well functioned as its role mainly due to the charge responsibility on consumers not on coffee stores, so the government cannot help from taking responsibility of this consequences.

Also, the subject who is paying tax and who is supported with subsidy differs. In the presence of deposit-refund policy the tax is passed on to consumers in the form of higher
product prices, but the producer may have to actually make the tax payment to the government. Similarly, the recycling subsidy should make itself felt by consumers but is paid by government to processors or collectors.

Deposit should be paid by only cash, otherwise the amount of money paid by card are summed up as sales. However since deposits should be returned to customers in cash they have to be dealt with cash. It causes a sort of problem because consumers who can’t have even small cash such as 100KWN are banned to take out coffee with disposable cups. Many consumers complain that it is unfair that they can’t drink coffee just because of the cash, 50KWN.

Unclaimed deposit

The point of problem is that there isn’t any organization that monitors not only where the stores and companies spend their unclaimed deposit which is not refunded to customers and remained but also there is no document that the companies have opened out. According to the agreement the agreed and involved companies should render an account of all money income, and spent out by putting it on its own website. Although 21 fast-food companies made a voluntary agreement with the Ministry of Environment of South Korea, according to MBC, Munhwa Broadcasting Corporation, a corporate company of Korean broadcast system, some of agreed fast-food companies used the non-refunded deposit for other purposes which are out of its own purpose and point. For example, a doughnut enterprise had have given eco-friendly bags made with the deposit which consumers hadn’t have get back to buyers who bought more than or 11 pieces of doughnuts. A fast-food enterprise which ranks the first in the number of stores made a commercial film and free environment camp with tremendous remained deposit. They are the same as the promotion for the company’s eco-friendly image. Also, the other fast-food company bought a lot of reusable cups made of glass, and one coffee enterprise purchased dish washers. Coffee cup deposit hadn’t been spent for the sake of environment, but it was used for other purposes.

Lack of the effort to use reusable cups by stores

According to research by Citizens’ Institute for Environmental Studies the return rate of cups was decreasing 38.5% to 36.7% by 0.8%. Also, stores have to set up the return table, but most of them didn’t. The most important factor to reach the ultimate goal for reducing waste disposal is the use of reusable cups. As a result of monitoring agreed stores only 30 percent of stores used reusable cups instead of disposable ones for hot beverage and none of them used reusable containers for cold beverage nor salad(Table 1.).

<table>
<thead>
<tr>
<th>Division as function</th>
<th>Sum(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cups for hot beverage</td>
<td>30%</td>
</tr>
<tr>
<td>Cups for cold beverage</td>
<td>0%</td>
</tr>
<tr>
<td>Bowls for salad</td>
<td>0%</td>
</tr>
</tbody>
</table>

Table1. the rate of the use of reusable cups(Citizen’s Institute for Environmental Studies, 2008)
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Also the companies which didn’t report the results of voluntary agreement more than five times, criterion for judging whether they used reusable cups inside stores or not, accounted for 42 per cent. As a consequence the agreement between those companies and the Ministry of Environment of Korea had been terminated until January, 2008. The high termination rate means the lack of both of government and agreed companies’ efforts as well as the limitation of voluntary agreement.

<table>
<thead>
<tr>
<th>Year</th>
<th>The number of agreed companies</th>
<th>The number of terminated companies</th>
<th>The rate of termination(%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>2005</td>
<td>26</td>
<td>3</td>
<td>11</td>
</tr>
<tr>
<td>2006</td>
<td>28</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>2007</td>
<td>18</td>
<td>10</td>
<td>56</td>
</tr>
<tr>
<td>Total</td>
<td>31</td>
<td>13</td>
<td>42</td>
</tr>
</tbody>
</table>

Table2. The rate of termination or voluntary agreement (the Ministry of Environment of Korea, 2008)

Lack of legal basis on coffee cup deposit-refund

There is a limitation of the policy in terms that there isn’t any legal regulation as the company agreed it voluntarily. Volunteering is the practice of people working on behalf of others without being motivated by financial or material gain. Volunteering generally is considered an altruistic activity, intended to promote good or improve human quality of life. Voluntary job is a kind of promise which companies are going to behave like and it isn’t under compulsion. Voluntary agreement brings a matter of putting policy into practice, because when voluntary agreement is not kept this contract could result worse than regulatory treaty consequences. Frankly speaking it is unreasonable to charge deposit on customers without any legal basis, and as I mentioned in 3.1 some of non-agreed companies imposed deposit at their option.

Positive effects of take-out coffee cup deposit-refund policy

After executing take-out coffee cup deposit-refund policy there were positive effects on environment and society. The point is that the Korean government just abolished the policy because it was not successful to execute and didn’t come out more effects, even though there are positive results, and they are helpful for the environmental and economic sides, because recycling means we don’t need to import some materials and save a lot of nature.

1) Increasing rate of coffee cup return

The rate of coffee cup return has been increasing by 2 to 5 percent each year as shown below in Figure 3. Even though increased rate is trifling and slight abolishing the policy is a kind of antimony when it comes to its purpose, in the side of environment preservation. The reason of it is that environmental policy doesn’t bring tremendous effects and results this very minute but it becomes turning out gradational progress by being accumulated slightly. I can say that the choice of eradication of the policy was impetuous by
the Ministry of Environment of Korea.

![Graph showing the rate of return from 2003 to 2007]

Figure 3. The rate of disposable cup refund from 2003 to 2007

2) Positive Externalities

People who are willing to return coffee cups to get the deposit back are quite elastic people rather than a group doesn’t care the small deposit of coffee cups. They have enough incentive to do that and for more elastic group they have more incentive and even collect empty plastic or paper cups to earn money. In reality this policy evaporates the positive externalities for unemployed and the poor by collecting and returning them. The government could not have full success to rescue the poor in the many respects like it failed for the unemployed to induce to start work and it had been to obtain the poor outcome in the figures of increased rate of coffee cup return.(Note that it is meaningful even though it has a slight alteration, in this context I am pinpointing that the reason why the police couldn’t bring the maximum result.).

According to the research of KBS, Korean public Broadcast System, unemployed such as both of the age or young could earn some amount of money by collecting discarded disposable cups and refunding them. It brings them to earn extra money. By the policy we can better off for both of the poor and environment.

THEORY

Cost-Benefit Analysis

Cost-benefit analysis is a formal discipline used to help appraise, or assess, the case for a project or proposal, which itself is a process known as project appraisal. We can judge the project is profitable or beneficial and finally adopt or reject it by assessing and comparing all the cost involved and all the benefit involved. Cost Benefit Analysis is typically used by governments to evaluate the desirability of a given intervention, it is an analysis of the cost effectiveness of different alternatives in order to see whether the benefits outweigh the costs. It is divided into 3 parts which are cost analysis, benefit analysis, and conclusion with consideration of comparing cost with benefits. In the assessment of cost and benefits it is needed to consider all costs that we are able to imagine and assessable especially opportunity cost, and positive and negative externalities. This cost-Benefit Analysis has a shortcoming which is accuracy problems. In order to gain the outcome with accuracy also researcher has
to estimate costs and benefits accurately.

First, I would like to assess the effects and outcomes of coffee cups deposit-refund policy by using cost-benefit analysis. If the outcome is positive there was no point of abolishing the policy and the government should have been continuing it. In the negative case, we would better find other ways to reduce solid waste disposal.

We can judge whether government's decision of abolishing the voluntary policy is fair or not as well as approximately how much benefit or cost we have lost or gained for the last 3 years under way of execution. Also, we will know if the policy should revive for the sake of the environmental and economic issues.

Cost of reducing municipal solid waste

I also would like to suggest the way to reduce solid waste in the field of take-out coffee cups with deposit-refund policy. There are a few policy interventions for promoting solid waste reduction, that is deposit-refund I am going to use, taxes and subsidy. Deposit-refund policy is the most effective solution among them, because while taxes just affects on consumers' side and subsidy is much more on suppliers' side, deposit-refund affects on both sides. We will follow the calculation presented in the academic paper "The Cost of Reducing Municipal Solid Waste" (Karen Palmer, Hilary Sigman, and Margaret Walls).

In the presence of deposit-refund policy deposit plays a role as product tax such as Pigovian tax and refund acts as recycling subsidy. It's a combination of both which has two sides effects.

According to the paper the amount of waste disposed, denoted as W, equals total consumption of the good, Q less the amount recycled, R.

\[ W = Q - R \] \hspace{1cm} (1)

In detail we have to know the Q and R which subordinate subject to some variables and coefficients. If the good is not recycled finally, its effective price is the same as the market price \( p_t \). However, when it comes to the goods recycled ultimately, its effective piece equals less the scrap value of the good. The scrap value of the good is the same as the price of the recycled material, \( p_r \) and demand for the good is relevant of these two effective prices. That is,

\[ Q = D(p_t, p_t - p_r) \] \hspace{1cm} (2)

In order to get \( W \) that we want to draw ultimately we need the supply of recycled material. It is written as the recycling rate, \( r \). This supply curve is upward sloping and is

\[ R^s = r(p)D(p_t, p_t - p_r) = rQ \] \hspace{1cm} (3)

Demand for recycled material by secondary material processing firms is

\[ R^d = Rd(p_r) \] \hspace{1cm} (4)

Accordingly, the equilibrium in the recycling market before applying any policy is

\[ R^d(p_r) = r(p_r)D(p_t, p_t - p_r) \] \hspace{1cm} (5)
Therefore, what we want to know finally, W can be drawn with combining the mass balance expression (1) with the two market equilibrium equations (2) and (5), that is,

\[ W = (1 - r(p_r)) [D(p_q, p_p - p_r)] \]

\[ (6) \]

**Deposit-refund policy intervention**

With policy intervention of deposit-refund when consumers should pay extra deposit denoted as ‘d’ the demand price in the presence of the deposit-refund becomes \( p_q + d \). Because demanders who recycle get the refund back they experience no net increase in the effective price for the payment of the final material which is the product. The equilibrium in the ultimate material market with government’s intervention of deposit-refund is as follows

\[ Q = D(p_q + d, (p_q - d) - (p_r + d)) \]

\[ = D(p_q + d, p_q - p_r) \]

\[ (7) \]

The deposit-refund increases the benefit from recycling the good in accordance with changing the equilibrium in the recycled material market denoted r. Thus in the presence of the deposit-refund policy, the market clearing condition in the recycling market is

\[ R^d(p_r) = r(p_r + d) [D(p_q + d, p_q - p_r)] \]

\[ (8) \]

The waste generation is

\[ W = (1 - r(p_r + d)) [D(p_q + d, p_q - p_r)] \]

\[ (9) \]

In order to implement the model, we need to figure out function \( r(p_r) \), \( D(p_q, p_q - p_r) \), and \( R^d \). According to the article “The Cost of Reducing Municipal Solid Waste, Palmer et al.”, the simple form of demand for \( Q \) characterizes market demand as a weighted average of demand at the two prices.

\[ D(p_q, p_q - p_r) = \beta_1(p_q)^{\varepsilon_1} + \beta_2(q_p - p_r)^{\varepsilon_2} \]

\[ (10) \]

\( \varepsilon \) is an own price elasticity, \( \beta_1 \) and \( \beta_2 \) are the weights to reflect the share of \( Q \) at the equilibrium before policy intervention.

For the recycled good, also constant elasticity functional forms are applied

\[ r(p_r) = a(p_r)^{\varepsilon_r} \]

\[ R^d(p_r) = \gamma(p_r)^{\varepsilon_s} \]

\[ (11) \]

\[ (12) \]

\( \varepsilon_r \) is the own price elasticity of demand for the recycled material and \( \varepsilon_s \) is the own price elasticity of supply for the recycled material.

We will use estimates of the elasticities from the economics literature, Franklin Associates in table 3. We use just a part that we need for the empirical analysis which range from paperboard to PET soft drink bottles.

**Table 3.**

<table>
<thead>
<tr>
<th>Material</th>
<th>Quantity consumed (million tons)</th>
<th>Quantity recovered (million tons)</th>
<th>Recovery rate (%)</th>
<th>Quantity of waste (million tons)</th>
<th>Final material price (1990$/ton)</th>
<th>Post-consumer scrap price (1990$/ton)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paperboard containers</td>
<td>32.605</td>
<td>11.478</td>
<td>35.2</td>
<td>21.127</td>
<td>455</td>
<td>34</td>
</tr>
<tr>
<td>PET soft drink bottles</td>
<td>0.435</td>
<td>0.137</td>
<td>31.5</td>
<td>0.298</td>
<td>1548</td>
<td>143</td>
</tr>
</tbody>
</table>

Sources, Franklin Associates [10]; U.S Bureau of the Census’ *Current Industrial Reports; Recycling Times; Resource Recycling*; and other sources available from the author upon
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Table 4.
Elasticities of Demand and Supply by Material

<table>
<thead>
<tr>
<th>Material</th>
<th>Primary Demand Elasticity</th>
<th>Secondary Demand Elasticity</th>
<th>Secondary Supply Elasticity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paperboard containers</td>
<td>-0.463</td>
<td>-0.1600</td>
<td>0.200</td>
</tr>
<tr>
<td>PET soft drink bottles</td>
<td>-2.05</td>
<td>-0.1</td>
<td>0.5</td>
</tr>
</tbody>
</table>

Source: Secondary supply elasticity estimates for paper range from 0.06 estimated by Edgren and Moreland to 1.70 estimated by ICF-1979 (cited by Bingham et al.). PET soft drink bottles estimates are estimated by Palmer et al, p33, 34.

EMPIRICAL METHOD

Cost-benefit analysis of take out coffee cups deposit-return policy

Cost-benefit analysis is a formal discipline used to help appraise, or assess, the case for a project or proposal, which itself is a process known as project appraisal. We can judge the project is profitable or beneficial and finally adopt or reject it by assessing and comparing all the cost involved and all the benefit involved. Cost Benefit Analysis is typically used by governments to evaluate the desirability of a given intervention, it is an analysis of the cost effectiveness of different alternatives in order to see whether the benefits outweigh the costs.

Cost analysis

Cost involved can be divided into customers and company side. Factors of company side consist of transaction cost which is comprised of collect cost and (no!!) processing cost, and time cost of workers at take-out coffee stores. We have to note that there are 2 materials, paperboard and plastic, so we should divide into 2 sections. PET is the acronym for polyethylene terephthalate, and also abbreviated PETE. It is a main material to comprise of transparent take-out disposal cups for cold water. Suppose that weight of the use each is a half.

The objective of this analysis is to judge the need of deposit-refund policy by assessing the estimated balance of implementing it for 1 year.

First, we will calculate the amount of recyclable cups. Average disposable cups sales are 86,960,000 a year. However, since paperboard cups are a half of the total average sales are 43,480,000. Average return rate is 36.6%. Considering them, the amount of recyclable cups is 86,960,000 multiplied by 0.366. Then we can multiply the average weight of Starbucks cups which is 260g. It equals 8,275t (8,275,113,600g) and a half of it is 4,137t (4,137,556,800g)

4 These figures are numbers without paperboard cups of vending machines. We consider the only take-out coffee cups. Numbers with vending machines are the annual sales 12,033million KWN, and the rate of recycle is 13.7%.
1) Collect cost

\[(5 \times 500,000 \text{KWN} + 12 \times 1,000,000 \text{KWN}) \times 61 \times 12 = 10,614,000,000 \text{ KWN}\]

Suppose each collect company has average 5 collect vehicles which cost 500,000 KWN a month and the wage of employed is 1,000,000 KWN a month. There 61 collecting companies and we need to multiply 12 for an annual analysis.

2) Reprocessing cost

- Paperboard cups
  \[405,000 \text{KWN/1t} \times 4,137t = 1,675,485,000 \text{ KWN}\]
  Reprocessing cost of pulp costs 405,000KWN per ton, the weight of recyclable disposable cups a year is 4137 ton.

- PET cups
  \[150,000 \text{KWN/1t} \times 4,137t = 620,550,000 \text{ KWN}\]
  Reprocessing cost of PET plastic is 150,000 KWN per ton including the price of used PET.

3) The cost of workers at take-out coffee stores

\[120,000(4,000 \times 30 \text{ for a month}) \times 1,537 = 184,440,000 \text{ KWN}\]

Assume that an average time to collect and rearrange cups is 1 hour on average. According to the Ministry of Labor of Korea the minimum wage of Korea is 3,770 KWN and take-out coffee workers usually get the minimum paid. The number of agreed stores is 1,537 and I assume that each store has 1 worker only.

The total sum of costs is 13,094,475,000KWN.

**Benefit Analysis**

I considered the both benefits from direct and indirect benefits. Direct benefits are the positive effect from reduced use of foreign currency, reduced cost for landfill or burning in terms of cost whilst indirect benefits are comprised of better environment, more enlightened people, etc.

1) The benefit from reduced original material

- The benefit from reduced amount of imported pulp
  \[3,516.5 \text{t} \times 740 \text{ $} = 2,601,840 \text{ $} \times (3,122,208,000 \text{KWN})^5\]

The benefit from reduced amount of imported pulp means that the saved money of the use of dollars for pulp. As I mentioned in 6.3 the recyclable disposable cups weights 4,137t a year, and 1t of used paper can produce 0.85t of pulp, so the total pulp that can be reproduced from disposable cups equals 3,516.5t. Standard price on a ton of pulp costs 740 dollars.

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5 The exchange rate is 1$=1200KWN. 2,601,840 $ \times 1200 = 3,122,208,000
- The benefit from reduced amount of imported petroleum
  \[4,137t \times 1.25 \text{ bbl/t} \times 20.7613 \text{ $/bbl} = 107,361 \text{ $} \ (128,834,247 \text{KWN})\]
  An average price of Dubai crude oil is $20.7613. In order to convert the weight of oil in bbl to the volume in ton an average density of oil 15°C is 0.8, so we need to multiply 1.25 to adjust it. 1.25 is the ration between ton and bbl.
  The benefit from reduced amount of imported pulp is 3,122,208,000KWN and the benefit from reduced amount of imported oil is 128,834,247KWN. Therefore, the total benefit from reduced original material is 3,251,042,247KWN.

2) the benefit from reduced landfill for saved pulps of paperboard cups

\[2145 \times 10,900,000,000/6254 = 3,738,487,368 \text{ KWN}\]
2145m is the result of multiplied figure of 4146t, the amount of reduced solid waste by returned cups and 1.7m, the size of land where 1t of used paper can be buried.

3) the benefit from reduced lumbering trees

\[41,137t \times 1.7 \times 10,000,000 = 69,932,900,000 \text{ KWN}\]
1t of used paper values 1.7 times of 30-year-old trees which has the same value 10million KWN. As these figures are multiplied with 4164t, the weight of recyclable disposable cups the benefit from is 69,932,900,000KWN

Cost - Benefit Analysis

We can sum up the total costs and benefits. As represented in table3, the total costs are 13,094,475,000KWN on the other hand the total benefits are 76,922,429,615KWN. Now we can compare two numbers to apply for the government policy. Definitely, the total benefit far outweighs the total costs. The total benefits are 5.5times larger than the total costs. It means keeping take-out coffee cup deposit-refund policy is better off than stopping it. By applying the policy into practice, we can reduce approximate imported pulps worth 3,122,208,000KWN and imported petroleum worth 128,834,237KWN. Also we can gain benefits from reduced landfill worth 3,738,487,368 and reduced trees worldwide worth 69,932,900,000. Counting reduced trees are a very important factor because the ultimate objective to try to cut down the waste disposal it sustainable earth for the next generation. It is a kind of indirect element to be considered. Costs consist of collect costs worth 10,614,000,000, reprocessing costs worth 1,675,485,000 and 620,550,000 each and wage costs worth 184,440,000, so total 13,094,475,000. All benefits can offset all the costs involved, so this policy has positive effects on society both economically and environmentally. This concept is related to Utilitarianism, the idea that the moral worth of an action is determined solely by its contribution to overall utility: that is, its contribution to happiness or pleasure as summed among all people. It is thus a form of consequentialism, meaning that the moral worth of an action is determined by its outcome.

Table 5
The Result of cost-benefit analysis(Comparison between Costs and Benefits)
(Unit: KWN)

<table>
<thead>
<tr>
<th>Costs</th>
<th>Benefits</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paperboards</td>
<td>PET</td>
</tr>
</tbody>
</table>
The Deposit-Refund Policy Of Takeout Disposable Cups With Korean Experience

<table>
<thead>
<tr>
<th>Collect Costs</th>
<th>10,614,000,000</th>
<th>Reduced imported original materials</th>
<th>3,122,208,000</th>
<th>128,834,247</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reprocess Costs</td>
<td>1,675,485,000</td>
<td>620,550,000</td>
<td>Reduced landfill</td>
<td>3,738,487,368</td>
</tr>
<tr>
<td>Wage Costs</td>
<td>184,440,000</td>
<td>Reduced trees</td>
<td>69,932,900,000</td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>13,094,475,000</strong></td>
<td></td>
<td><strong>76,922,429,615</strong></td>
<td></td>
</tr>
</tbody>
</table>

The accuracy problem exists in every cost-benefit analysis. The accuracy is dependent on how accurate costs and benefits are assessed. I also omit some factors not only that I couldn’t recognize but also that I couldn’t assess even though I know there is either of costs or benefits. For example, I could have added reduced landfill benefits on PET. However, because of the lack of information I just calculated it on paperboard side. However, it is obvious that the total benefits are much larger than the total costs, so I think we can just skip the omitted factors as long as we are perceived of that this figure is not perfectly right.

The model of waste generation and recycling with intervention of deposit-refund policy

In this chapter I am going to calculate how much deposit is needed to reduce 10% of waste disposal. Also, how much deposit is required to satisfy the objective rate declared by the Ministry of Environment of South Korea.

1) Paperboard containers

The compulsory recycled rate for paperboard containers in Korea is 28%. The refund rate, 36.6% is bigger than the regulated rate, so for the sake of better environment we assume that the government target 10% reducing the waste disposal. As we can see Table 4, 5, recovery rate is 35.2, final material price is 455 $/ton, post-consumer scrap price is 34 $/ton, primary demand elasticity is -0.463, secondary demand elasticity is -0.1600 and secondary supply elasticity is 0.2.

According to equation (11) the recovery rate equals alpha multiplied by price for recycled goods squared by elasticity of secondary supply elasticity. Therefore, the equation is

\[ r(p_d) = 0.173(p_d)^{0.2} \]

\[ 35.2\% = 0.173(34)^{0.2} \]

We can rewrite the equation with the objective to reduce waste disposal by 10%

\[ 45.2\% = 0.173(34 + d)^{0.2} \]

Deposit denoted by \( d \) is approximately equals 84 $/ton(100,800 KWN). As about 3846 paperboard cups are possible to be produced with 1t of paperboard material, each disposable cup has to charge at least 27KWN on consumers.

2) PET containers

\[ \alpha \] is an exogenous variable. It is deducted from 0.352 = \( \alpha(34)^{0.2} \) subject to that recovery rate is 35.2, post consumer scrap price is 34 $/ton with secondary demand elasticity, 0.2
We are following the same method to induce the result. Recovery rate is 31.5%, final material price is 1548 $/ton, post-consumer scrap price is 148 $/ton, primary demand elasticity is -2.05, secondary demand elasticity is -0.1 and secondary supply elasticity is 0.5. Also we can substitute the real numbers for figures
\[
\begin{align*}
r(p_t) &= 0.029(p_t)^{0.5} \\
31.5% &= 0.029(148)^{0.5}
\end{align*}
\]
We can also make an equation to reduce waste disposal by 10%
\[
41.5% \approx 0.029(149 + d)^{0.5}
\]
Deposit, d, is estimated of 50 $/ton (60,000₩) and per each 16₩.

However, the compulsory recovery rate for PET in Korea is 71.7% and an average refund rate for takeout disposable cups is 36.6%. With recovery rate 36.6% the equation is
\[
36.6% = 0.03(p_t)^{0.5}
\]
In order to reach the pursuing rate, 71.7% the equations becomes
\[
71.7% = 0.03(148 + d)^{0.5}
\]
Deposit, d, is approximately equivalent with 392 $/ton (470,400₩). Thereupon with consideration of number that can be produced with 1 ton of PET the appropriate price for one plastic disposable cup is about 122.3₩.

<table>
<thead>
<tr>
<th>Table 6</th>
<th>The Result from the model of waste generation and recycling with intervention of deposit-refund policy</th>
<th>(Unit: KWN₩)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Paperboard containers</td>
<td>27</td>
<td>-</td>
</tr>
<tr>
<td>PET containers</td>
<td>16</td>
<td>122.3</td>
</tr>
</tbody>
</table>

EMPIRICAL RESULTS

The result from cost-benefit analysis

We have estimated the costs and benefits involved in the recycle. The objective of the analysis is to see how much we can lose or gain by executing take-out coffee cup deposit-refund policy a year. It can be a good source or criterion to see the estimated effects and also a reasonable reason whether government executes it or not.

In costs analysis, collect costs is the most significant factor which costs 10,614,000,000 a year, reprocess costs which are the costs of cleaning, pressing, and refiguring them are 1,675,485,000, and 620,550,000 for paperboard and PET cups respectively. The total estimated cost of deposit-refund policy is 13,094,475,000KWN. Estimating costs was quite sure comparing with benefits, because we have to consider both of direct and indirect benefits that the result cannot work out immediately or cannot be assessed by money. Direct benefits are reduced imported original materials, 3,122,208,000 for

\[ \alpha \text{ in this equation for PET bottle containers is also a constant. It is from } 0.315 = \alpha(148)^{0.5} \]
The Deposit-Refund Policy Of Takeout Disposable Cups With Korean Experience

paperboards, and 128,834,247 for PET, and reduced landfill more than 3,738,487,368 regarding non-estimated PET reduced landfill. We considered indirect source, reduced trees, 69,932,900,000 which is a huge amount of money.

The objective of cost-benefit analysis is to judge the impact of the policy. The total benefit far outweigh the total cost by 63,827,954,615 W. It means takeout coffee cup deposit-refund policy brings us 63,827,954,615 net benefits, so we need to keep continuing it. If we not, it is the same that we are losing that worth of money. The Korean government shouldn’t have abolished it but it happened because of some reasons that I mentioned in 3.1, 3.2 and 3.3. Why it failed was not the limitation of it. There was no limitation or problem in the policy, but there was a problem in the way it was employed such as lack of cognition by consumers, lack of efforts to force stores to do that, and basically no legal basis or incentive given to both of suppliers and consumers to make them allow it. Hence, government has to try to make other supplant devices that can give some economic incentive. A company’s ultimate goal or existence is to maximize benefit which sometimes means profits, and also each person is the creature to pursue he/her own satisfaction, so it is significant to access environmental issue which characters public goods with this concept.

The model of waste generation and recycling with intervention of deposit-refund policy

In order to reduce 10 % of waste disposal the government needs to impose 27 W and 16 W each. However, if we consider that the previous deposit was 50 W a cup the numbers don’t seem appropriate. However to fulfil the compulsory rate of recycle is 71.7% for PET we need to charge 122.3 W a cup. Considering other transact costs this number is minimum, so the deposit should be at least 122.3 W a cup. Accordingly to reach government’s goal they need to increase the price of deposit. It could be more effective incentive to gather discarded cups. However 122.3 is also a bit small compared with the answer most of people in Korea think that 500 W has an incentive to refund it. Accordingly, it is highly recommended for the Korean government to raise the price of deposit to give customers more incentive.

CONCLUSION AND POLICY RECOMMENDATION

Considering all the problems and the results from the analysis it is obvious that we need the legal basis. There is no incentive for the companies to follow the voluntary agreement except the private mind and will or personal concern for environment or conscience. Once legal basis set up companies should follow the rules even though they don’t want. Deposit-refund policy that Korean government applied was focused on the restraining the consume by customers not on repression of the use of disposable cups by suppliers, so it becomes natural to fail it between government and companies under the situation that participation of users have more influence to policy’s execution than companies.

The main reason that the policy has failed is that it is totally dependent on consumers’

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8 Seok, J et al.(2008) Environmental Tax – utility of abolishing cup deposit-refund suggestions
behavior. Apart from government’s intention consumers just thought of deposit a kind of payment for the use of disposable cups to offset a guilty conscience. The thing the government should do is, instead of abolishing the policy, to modify the system to change burden charged on consumers to suppliers and make them feel responsibility for it. Through the change above this policy can be improved and have more influence power.

To do fulfill them above, first of all we need legal basis. As I mentioned in 2.Korean Case companies didn’t reveal where they used non-refunded deposit. If there is legal rule that force companies to make the balance in public consumers can access the information and they wouldn’t worry that companies can misuse or abuse their deposit for environment. We can expect transparent balance. Also the ultimate goal of company is to maximize profits or values it is doing what brings benefits. Companies prefer more values to other things like environment or welfare. However, companies also have to try to trigger consumers to return cups.

This policy shouldn’t be a voluntary agreement it should be applied to all responsible stores, so any company cannot be an exception. There is a minimum recycle ratio and the rate for paperboard is 28% and for PET is 71.7%. However, considering the rate of refund 36.6% we need to make more efforts at least to reach the minimum. Government needs to set the specific responsible rate of return, because it can make companies get involved into the policy actively. Also, we need to regulate the obligatory use of reusable cups inside stores. When it comes to breaking the rules, there should be punishments such as a fine.

Also, government can give subsidy to some companies which fulfill it successfully for recycling system or collecting boxes. We need to give an economic incentive to devoted companies like admitting indirect marketing activities by attaching company’s logo on the thank-you gift to promote company’s image.

Deposit is not just a price of a disposable cup, it is a price of not only disposable cup but also sustainable environment. Therefore we need to increase the deposit at least till 122 that we concluded for PET containers. It offers more likely incentive for customers who are interested in fashion to refund it for small amount of money. Refunding could seem to be old-fashioned. If deposit is sufficient enough to cover almost all customers, the policy would be successful.

In Sweden, even though there is no deposit-refund for take-out coffee cups with comparing well organized bottle-bill system, consumers can purchase bottles by any means of payment such as credit card, cash, and bottle-bill receipt. Sweden has a good aggregate system to collect bottles and the recycle rate is very high. In Sweden, first consumers need to pay small amount money to buy bottles then they get a receipt that can be used in supermarket. The point is that consumers can refund bottles at any bottle-refund machine but the receipt can be valid only at the supermarket where machine is located. Then consumers can buy some products with the receipt or just can get refund from it because the receipt is the same as money. In order to solve the problem that deposit cannot be purchased by card, the government also has to consider the way to solve it.

It is highly recommended that takeout coffee stores could accept all kinds of takeout coffee cups regardless of the brand of coffee cups which are sole by other brand coffee stores. It could be a better idea to set up the coffee cup refund machine in every store to save time.
and cost of workers and provoke consumers’ refund rate of cups.

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