

Hinčica, Vít

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How to combat littering – an analysis with a focus on the Czech Republic

Vít HINČICA

**Department of International Business,
Faculty of International Relations, University of Economics,
Prague, Czech Republic**

Abstract: The work attempts to comprehend why littering is so extensive and, with the use of several findings provided in Gary S. Becker's article entitled "Crime and Punishment: An Economic Approach", to explain why under current conditions more waste discarded in the environment can be expected. The article was created from the perspective of the Czech Republic, where the author lives. He analysed some past research carried out by other scientists and institutions from all over the world, and he was also observing the situation in different Czech regions in order to approximately learn how large the problem with littering in his country is and what kind of litter can be found in the Czech nature. Afterwards, the author decided to address the Ministry of the Environment of the Czech Republic so as to learn what measures were planned to be taken in order to significantly reduce littering. As a result of all this, the author himself decided to pay special attention to beverage containers and proposed to impose mandatory deposits on them in order to reduce the volume of litter that can be found out of the appropriate places. The author, basing his arguments on findings of other authors, gets to the conclusion that such a measure – provided that some conditions are respected – can work anywhere in the world, beverage containers not being the only type of litter suitable for this step.

Keywords: littering, deposit, beverage container, Czech Republic, environment

JEL codes: A11, B41, Q01, Q53, Q58

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Correspondence Address: Vít Hinčica, Department of International Business, Faculty of International Relations, University of Economics, Prague, nám. W. Churchilla 4, Czech Republic. Tel.: +420 224 09 5214

E-mail: xhinv02@vse.cz

1. Introduction

For many of us, it is always sad and even somehow painful to see how quickly any environment in which people have appeared can degrade. What is even more difficult to accept is not just someone's impression that rises mainly from his or her visual perception, but one hard fact: in only less than two centuries, the world population that keeps skyrocketing has managed to pollute almost every corner of the Earth. If we narrow our scope of interest only to solid waste that is discarded out of receptacles, then we can argue that this waste is, as for volume, definitely more produced by citizens and not by companies/industries, although the latter are commonly seen as the main problem as regards environmental pollution, perhaps because being easier to be monitored while it is almost impossible to track each individual. Since discarded solid waste grows every day, we have a grey prospect for future decades. Today, one can visit a city, a park, a riverbank, a forest or even a protected natural reservation and some litter dropped by a man can always be seen. In some world regions, this phenomenon of everyday littering is more visible, whereas in others less, but in any case it has become an omnipresent rule and cannot be negated.

Compared to some broadly discussed issues such as global warming or air pollution, littering, startlingly, has still not gained the same level of attention from most policymakers and international institutions even if it something that directly affects all of us regardless of our places of living. The lack of visible orientation of global elites towards littering may foist many questions and these certainly cannot be answered without a serious study. This is because anything said before performing some type of investigation could be considered an erroneous personal perception and not well-founded or comprehensive replies. However, only thinking about such questions may lead us to the conclusion that littering has not indeed been discussed on the global political level seriously enough. In fact, there are only a few cases when we can see public authorities firmly determined to fight littering. Moreover, scientists still seem to approach the issue with reservations, although some pieces of important work on the subject can already be found.

2. Why do people litter

As early as in a study published in the late 1960s, motives for littering were investigated. At that time, people who littered claimed to have done it for reasons of

carelessness, laziness, indifference, or because trash receptacles were not available (Clark et. al., 1972: 1). Another study published in that century also pointed to the significance of the lack of vigilance by municipal authorities (Muñoz-Cadena et. al., 2012: 1741). This reason would not be surprising, since only in the last 50 years has the world population more than doubled (United Nations, 2017: 2), while the vigilance by public institutions in general has not been enhanced in the same way.

I interviewed different people between January and March 2016 after they were watched discarding waste (including cigarette butts) in public places. I only asked people when I saw them committing the act, so I did not wait for them at any place. Usually reacting with some kind of aggression, not everybody was willing to provide a reply and of those who were, few of them claimed that it was “their right” and some of them that “it is to be cleaned up by municipal services anyway.” As there are few workers who clean public spaces (and not only in the Czech Republic where I live), it means that some people do not mind at all that their refuse might be put away after months or even years, the environment thus being permanently polluted in practice and visually contaminating all the nearby or even a farther area (a plastic bottle, for example, reflects the sunlight and can be seen at a distance of even several hundred meters). Another source (The Victorian Litter Action Alliance, 2014: 3) also mentions that littering may be just “a habit” and that some individuals are not able to provide the reason.

As seen, the motives may vary and a very extensive study conducted in the late 1990s showed that the process of disposing unwanted items – either by binning or littering – is more complex than had been previously recognized. It was also reported that many litterers did not seem to be consciously aware of the behaviours they exhibited with disposable objects (Williams et al., 1997: 7).

3. Profile of a litterer

The Victorian Litter Action Alliance, an official body operating in the Australian state of Victoria, where quite severe measures were adopted against litterers as early as at the end of the 1990s (Parliament of Victoria, 1997: 1–27), classifies people with respect to litter behaviour into five groups, as seen in Table 1:

In Müller’s paper (2015), there is a presentation of the research he conducted by observing and interviewing Dutch teenagers in different communities during the summer and

autumn of 2008. His research was guided by two questions: 1) What meaning(s) do teenagers give to litter (in the streets) and littering, and 2) What is their attitude towards litter? (Müller, 2015: 26) Based on youngsters' reactions, he classified them according to their reactions/attitudes (see Table 2). The vast majority of interviewed youngsters (95 out of 110) were able to pollute environment or were at least indifferent to litter around them.

Table 1. Classification of people

Non-litterers	environmentally conscious, do not litter and usually pick up others' litter
Inconvenients	not littering is too hard, too much trouble, someone else's problem
Unaware	unaware of the link between the environment and their litter behaviour
Selectives	usually litter in a context i.e. "it's ok to litter in urban areas but not in the bush"
Anti-establishments	make a statement with purposeful littering

Source: The Victorian Litter Action Alliance, 2014: 4.

Table 2. Classification of youngsters in Müller's study

1 st group of respondents	conforming to the rules of a clean and tidy environment
2 nd group of respondents	bending of the rules of a clean and tidy environment
3 rd group of respondents	breaking the rules of a clean and tidy environment

Source: Müller, 2015: 27.

While in the study prepared by Clark et. al. (1972: 1) it was indicated that men litter twice as much as women, and young adults litter twice as much as the middle-aged and three times as much as those 50 years or older, Finnie (1973) did not observe such relations, neither did the more recent study prepared by Williams et al. who claimed, among others, that "women and men were equally likely to litter" (Williams et al., 1997: 7). Some authors have found relation to age and claim that younger people are more likely to litter than older citizens (Robinson, 1975: 12). An extensive survey performed in 2013 by the Texas Department of Transportation showed that about one-third of residents admitted to littering in the past month. Compared to older adults, Millennials had a much higher incidence of littering (Texas Department of Transportation, 2013: 19).

Although it has not been possible to find at least an approximate profile of a person likely to litter, it has been proved that tertiary and post-graduate education were associated with lower rates of littering, while primary and secondary education with higher rates of littering. Also people currently without work or students were likely to litter more than people

having some regular occupation, home duties or being retired (Williams et al., 1997: 37). Therefore, it can seem that both a level of education and a stable place achieved in society are associated with one's attitudes toward littering.

What is interesting is that people using bins could also litter. After being interviewed by the Australian researchers, some of them seemed to feel embarrassed, as they were afterwards observed (without knowing they were observed) cleaning their litter or even litter discarded in a nearby area by other people.

Moreover, the same study of Williams et al. showed several contrasting findings. For example, people who were observed littering by the authors often expressed strong concern for the environment (Williams et al., 1997: 63). Another conclusion was that over one in three people who were observed littering within the previous five minutes told interviewers that they had not littered in the last 24 hours (1997: 63). Thus, litterers are quite aware of what they do, but they are also likely to lie to hide their behaviour. This argument of trying to hide littering can also be supported by the fact that most new litter appears at night or at places where people do not expect to be watched by someone, or is generated while a man being in a group, where it is easier to feel anonymous or protected. The phenomenon of littering mainly when one is in a group has been proved on different continents.

4. Places likely to be littered

When talking about urban areas only, the City of Edmonton (2016) cites the following as typical places which attract litter: fast food outlets, bus stops, light rail terminals, schools and playgrounds, sporting events, back alleys or downtown parking lots. Including both urban and non-urban areas, The Victorian Litter Action Alliance (2014: 5), for a change, lists easements (the public space immediately outside railway stations), transport and waterfront sites as the most littered in the Australian state of Victoria. It also states that some trash can be typically found at the following places: coastal areas, beaches, rivers and creeks, parks, school grounds, roadway, public bushland, shops/malls, and outdoor transport (2014: 5–6).

In the Czech Republic, the situation is very similar. Inside cities, I observed litter being spread around commercial centres, parks, sites attracting a lot of people, such as stations, public transport stops, stadiums, playgrounds, and also in highly inhabited zones, where enough anonymity is guaranteed. Likewise, a lot of trash is concentrated around railway, tram, and especially road communications, in industrial and apparently abandoned areas, under bridges (homeless people are very likely to go there and spread it, e.g. by

opening bags they collected in garbage cans, while “normal people” are likely to litter simply by throwing refuse from the deck over the rail down), etc. Outside an urban community, one can see litter almost everywhere, usually alongside roads, railway lines, frequent tourist paths or cycling routes, at historic sites, in ski areas, around parking lots, on beaches, river banks etc., i.e. generally at those places where one can expect a lot of individuals who like some adventure and/or fun, but do not care about nature at all. Quite startlingly, more and more litter appears in agricultural areas (fields, meadows...) and in forests, even where no tourist pathways are marked. Such litter is produced by those who work there (e.g. lumberjacks, farmers) and is usually formed by plastic used to wrap hay or by food wrappers. The information provided in this paragraph is valid for the whole Czech Republic, not just for a specific region, and is based on my long-term observations.

The Australian study showed that litter is often not simply left, but deliberately placed in certain locations (Williams et al., 1997: 58). One can be anywhere in the world and will confirm this by his or her eyes. Some people, maybe in order to avoid being considered litterers, do not throw objects simply anywhere, but instead leave them standing on a bench, brick fence or put them on a pavement etc., like if they wanted to show that the litter was simply left or forgotten without wanting it, and not discarded. However, a high proportion of littering was reported by the Australian team to occur in locations where rubbish can be hidden or in places resembling litter bins, such as in bushes or pot planters, under leaves or behind benches. At the university where I work, students were seen to use plant pots to discard their cigarette butts.

Unfortunately for the environment, such places tend to be hard to be entered to be cleaned, so as soon as leaves have fallen down, aesthetic trash can clearly be viewed.

Moreover, people are oftentimes lazy to press their litter (one can verify it by looking at any public bin) and if it cannot enter a bin, they throw it around or place it nearby. The already cited Australian team confirmed that overflowing bins were often regarded as a pretext to allow people to throw another piece of litter around (Williams et al., 1997: 45). Thus, we see how complex the problem of littering is and that with the growing number of world's population the planet is to be even more polluted.

5. Materials that are discarded

In the 1970s, commercial areas were reported to have twice as much litter as residential areas, the composition of litter being 50% paper, 20% paper packages, 12% beer

and soft drink cans, and the remainder bottles and broken glass (Clark et al., 1972: 1). Plastic materials still were not spread, while today they have a significant role in our everyday lives. An in-depth report of the European Commission's Directorate-General Environment has pointed to the growing volume of plastic. While in the early 1950s, only 1.5 million tonnes of plastic were produced in the world, in 2008 it was already 245 million tonnes, yet the both numbers not including PET-, PA- and polyacryl-fibers (European Commission's Directorate-General Environment, 2011: 4). It is not clear how much plastic (including also the latter three types of fibre) is discarded in the environment, however a study developed by Lopez Lozano and Mouat could be cited to get a rough idea of the extension of plastic litter. This study claims that the proportion of non-degradable plastic in marine litter floating in North-East Atlantic, in the OSPAR area, is very high and together with polystyrene is over 75% (Lopez Lozano and Mouat, 2009: 21).

The problem related to plastics is that many of them are characterized by their durability (UNEP, 2015: 5); some of them may persist for centuries. This property is useful in our everyday lives. Nonetheless, when such plastics become waste, their presence becomes a significant problem, especially when they are spread in free nature.

However, as per items and at least as far as landmass is concerned, chewing gums and cigarette ends seem to rule the statistics on littering. In the UK, smokers' litter and chewing gum-related litter were the two most prominent categories of litter found in the surveys between December 2013 and March 2014 (Keep Britain Tidy, 2014: 5).

6. Costs

The cost of combating litter is literally astronomic. In any big city, millions of dollars are spent every year, but the result is that on only the following day, trash appears in the environment again. Moreover, new sites are progressively being polluted as inhabited areas grow and more people get access to places which were laid without interest for many decades or even centuries.

For example, in Australia, the estimated cost of litter services nationally is approximately \$300 million to \$350 million annually, of which 5% is destined to prevention (State of New South Wales, 2013). For a change, it was estimated that German municipalities were to spend some EUR 800 million in 2004 to remove litter (Cantner et al., 2010: 32).

Worldwide, many associations and volunteers have tried to clean the environment (usually in spring) on different occasions, some of them called as "action days". This,

however, has few long-term effects. First, because only a small portion of refuse is removed from the nature and only once or twice a year. It is certainly a nice thing to see that a polluted place can become clean again, but the sad thing is that the cleaned place will not remain without litter for more than a few days. In late 2015, I collected refuse in a former industrial area located not far from my abode (some 1.5 km²). Although I managed to clean almost all visible trash, refuse returned back within several hours. I repeated the same experiment in the same area two years later, in July 2017, but the result was the same. Therefore, if discarding is not being reduced in general somehow, then one can keep cleaning every day and the volume of refuse will still grow. Second, similar actions are done by the above-mentioned non-litterers, i.e. environmentally conscious people who do not feel the need to litter. Therefore, those who litter are rarely seen cleaning.

Third, litterers usually do not care that someone else cleans up the rubbish after them (Bayerisches Landesamt für Umwelt, 2016), as I have also tested this personally several times. Besides, litterers may even process this information in such a way that there is nothing bad in littering when some “good people” will eventually clean their refuse up. So, the result of cleaning actions is an important, but still modest alleviation that will not stop littering anywhere.

In the Czech Republic, a wide action called “Let’s clean up the world, let’s clean up Czechia!” (orig. *Uklid’me svět, uklid’me Česko* or simply as *Uklid’me Česko*) is carried out every year and is based on the famous “Let’s do it” initiative. From reading articles published by the Czech organizers on their website and the related social media and from listening to the interviews given by them, one can get an impression that the action is not intended to fight against those who litter, but instead is oriented towards those who are willing to clean. This can be considered a critical mistake, as few litterers may feel addressed when not being publicly condemned enough or at least not being invited to change their attitudes. Moreover, removal of illegal dumps seems to be focused on more by the Czech movement, while littering itself not so much, although an average individual is considerably more likely to drop a piece of litter than to create a whole illegal dump (as the latter requires both enough anonymity and capacity to transport more waste to a remote area).

Either way, no action of this sort will help to significantly reduce the costs, with the number of everyday offences being much higher than the number of sporadic anti-littering actions performed by a community. Even regular cleaning of public places performed by authorities is a drop in the ocean.

7. Catching a litterer

For more than a half century, studies focused on littering have emerged, but their number is still scarce. Many of them have provided primary research, and some of them have come with proposals for the improvement of the current state. In this study, I will try to find out whether and how economic incentives can change the human conduct, thus reducing littering behaviour.

I am going to start with the findings provided in Gary S. Becker's article entitled "Crime and Punishment: An Economic Approach" published in 1974. Afterwards, I present the results of my investigation I performed in the area of my residence. Finally, I will try to explain if a proposal on imposing a deposit on beverage containers could be effective.

Becker (1974: 2) rightly stated that "obedience to law is not taken for granted..." as well as that "conviction is not generally considered sufficient punishment in itself". I will consider some of the Becker's relations. The first of them expresses that the amount of harm would tend to increase with the activity level:

$$H_i = H_i(O_i),$$

with

$$H'_i = \frac{dh_i}{dO_i} > 0,$$

where H_i is the harm from the i -th activity and O_i is the activity level (Becker, 1974: 5). It is indeed clear that the harm represented by the degradation of environment caused by littering will grow with the amount of litter that is thrown out.

The second relation explains that the social value of the gain to offenders presumably also tends to increase with the number of offences (Becker, 1974: 5–6), as in

$$G = G(O),$$

with

$$G' = \frac{dG}{dO} > 0.$$

Thus, the net cost or damage to society is simply represented by the difference between the harm and gain (Becker, 1974: 6):

$$D(O) = H(O) - G(O).$$

Becker's third idea says that offenders usually eventually receive diminishing marginal gains and cause increasing marginal harm from additional offences (Becker, 1974: 6). Even in our case we can assume that the more one litters, the less marginal personal gain (e.g. pleasure) he or she gets (e.g. for not having delivered waste to a bin and thus saving time or freeing his or her hands in advance), as such behaviour over time becomes almost an automatic habit or standard behaviour for such an individual of which he or she may not even think about anymore. However, the marginal harm for the whole society will keep increasing, as more and more area is polluted by the same individual and it is more complicated to convict him and then arrange for cleaning of polluted areas.

According to Becker, "there is a function relating the number of offences by any person to his probability of conviction, to his punishment if convicted, and to other variables, such as ... his willingness to commit an illegal act." (Only the latter example was mentioned herein, as the other ones presented in the original study are more tied to felonies and other misdemeanours; however, it has already been proved that it is impossible to clearly draw a profile of a typical littering person, so those other variables will have to be necessarily taken into account.) Thus, we have:

$$O_j = O_j(p_j, f_j, u_j),$$

where O_j is the number of offences an offender would commit during a particular period, p_j the probability of his conviction per offence, f_j his punishment per offense, and u_j a portmanteau variable representing all these other influences (Becker, 1974: 10).¹

If we work only with p_j and f_j , whereas omitting u_j , which can be regarded as something that cannot be either identified or controlled and therefore reliably quantified, we could start with a proposal to increase p_j , for example by boosting police forces, enhancing video surveillance in areas that are regularly polluted or very likely to be polluted, or multiplying officers that would investigate littering and afterwards would process cases of convicted people, and so on.

As a follow-up to the above-mentioned assertions, Becker (1974: 7) claimed that "the more that is spent on policemen, court personnel and specialized equipment, the easier it is to discover offences and convict offenders." However, financial resources in today's society are

¹ Both p_j and f_j might be considered distributions that depend on the judge, jury, prosecutor, etc., that j happens to receive.

spent first of all on investigation of felonies that are logically considered to be more imperative for the whole society. Other deeds that are also often seen as heavy criminal acts can range from tax invasions to corruption and sometimes require even more finance and time to be investigated, thus the available resources almost being exhausted for the investigation of other major criminal problems. Therefore, in the case of littering, which is usually classified only as a misdemeanour, almost no human resources are applied to look for and convict those who litter.

Thus, we have to underline that there are not enough resources to convict such large masses of people, especially when we do know that an offender can be practically everyone and that littering can happen everywhere, while in the case of felonies, like murders, it is today much easier to reduce the scope of possible suspects to a couple of individuals, as well as better predict possible places of heavy crimes, especially when almost no one is prone to murdering while almost everyone is able to litter. Moreover, the cost of convicting more people for littering would be too high unless high punishments in the form of monetary compensations are introduced.

We can object to that currently the efficiency of those acting against littering is not high, so even a better enforcement of the currently valid rules could somewhat help. As already indicated, the Mexican study (Muñoz-Cadena et al., 2012: 1741) showed that almost one quarter of interviewed offenders claimed to have littered due to the lack of vigilance by municipal authorities. So, the statement on the efficiency can be considered true. Likewise, the reaction to the litter found in an environment is slow, although a Dutch study confirmed that “signs of inappropriate behaviour lead to other inappropriate behaviours (littering, stealing), which in turn results in the inhibition of other norms (i.e. a general weakening of the goal to act appropriately). So once disorder has spread, merely fixing the broken windows or removing the graffiti may not be sufficient anymore” (Keizer et al., 2008: 1685).

Knowing the latter, in past three years I have contacted different municipalities in my country (more than 50) to report illegal landfills and discarded litter (either directly by email or by a Czech website “ZmapujTo.cz” that receives reports from citizens on damaged or polluted places), and my announcements were seldom answered by an action that would lead to their prompt eradication. The main indicated reasons for not cleaning the polluted area within a reasonable time were that: it was private property on which landfill or litter were found, road, waterway or railway communications being administrated by other public institutions, not enough financial or personal resources, the need to wait for better weather or

even until spring when public communications are said to be used to being cleaned (which in practice is not a general rule at all), or I even received answers such as “it is not our problem that people behave like this” and sometimes I did not receive any reply. Therefore we cannot expect that more people deployed against littering will mean better efficiency unless someone effectively controls their work. In addition, let us suppose now that a mere cigarette butt is also litter (which actually is), would all officers-smokers be willing to penalize someone who behaves the same way (i.e. dropping butts around) as the former may also normally behave once they close doors of their place of work?

Littering, unlike many other offences, has the character of not needing a personal contact with anyone, nor concerns anyone directly unless being produced on private property (in a robbery, for example, one must interfere in the personal area of the aggrieved). Therefore, faces of those who litter are seldom remembered by those to whom some form of harm produced by littering has been caused and the offenders are never sought by anyone if not being seen committing offence unless they generate a real illegal dump which already has the capacity to provoke some social outrage. Second, as litter can usually be called former property of the offender, no one can claim any tangible personal damage (unless someone’s property is polluted), so the motivation to remember and ask the offender for remedy is very low. In other words, when one protects his or her own property, then he or she almost always gets courage to address the offender so as to get the property back or get it repaired, but few people are willing and brave enough to address those who litter, usually under the motto “let sleeping dogs lie”. Thus, littering might be widely condemned as a bad behaviour of some part of the society, but is not widely and actively fought. This is startling since it has been discovered several times that the negative consequences of littering are very wide.

Now we get to the f_j variable. What if fines or other forms of punishment were increased in such a form that would gain the potential of deterring wider masses from littering? Of course, increasing punishment may lead to a higher extent of people who will avoid littering, but not in all situations – for example, at those places where no conviction is likely, their behaviour will remain the same. This may also be the reason why not always heavy fines and strict law enforcement have brought the results that were expected (Torgler et al. 2008: 18).

In this regard it may be useful to cite Rege and Telle (2001: 3) who suggested that in a society where littering is not acceptable, a “person throwing his ice-cream-paper on the street will feel social disapproval from people observing him... many people do not litter even

if they know that nobody is observing them, because littering imposes a feeling of guilt.” Such a fact could be included in the u_j variable and would speak against the necessity to impose even more severe steps against offenders.

Nonetheless, even if a society wanted to impose higher sanctions on offenders, the increase will very unlikely be too high, as there might be a lot of lawmakers pointing to the issue of the price discrimination which was already described by Becker. He claimed that “only convicted persons are punished” (1974: 10). The price discrimination in the case of littering can be thus considered very high, because only a small percentage of littering people are convicted, while, for example, in the case of felonies the probability of having to pay for the committed crime is much higher, as the p_j is not too low (there is a social demand for investigating felonies and therefore more effort employed for this purpose and, as already said, a reduced number of people are likely to commit heavy crimes).

With the same level of p_j , i.e. the probability of being convicted per every littering action, the price discrimination could be seen as even higher, because some currently littering people will fear a higher level of punishment, so they may stop littering, but those who do not stop will pay more, and in relative numbers even more. And again, littering will be hardly considerably reduced, as it cannot be controlled everywhere. Moreover, if for example a 1 000 EUR fine is imposed for any piece of litter, there might be voices that those who are rich will not mind it, while those who are not will pay a too high price for such a “petty crime”.

The greatest effect would be if both p_j and f_j grew. However, to ensure that the growth of f_j will somehow correspond to the growth of p_j is practically impossible in the case of littering. While it is quite simple to impose severe punishment for littering, it is almost impossible to ensure the growth of p_j . So, a battle against litterers while using these two variables resembles tilting at windmills.

We may try to influence the u_j variable, too. When we know for example that a higher level of education can have some impact on the level of littering, society may try to improve educational programmes. Such a proposal should be, of course, treated from various perspectives. For example, I was used to regularly collecting waste while a pupil in primary school, but this habit is not so frequent among Czech schools today and in some schoolyards one can see rubbish lying for several months. When the head teacher and teachers do not mind this, then one cannot expect pupils and students not to be tolerant of it. Thus some components of u_j can be weakened.

What is more critical when trying to change people's customs is that there are too many movies, music clips and series where littering is shown as a regular habit, and can therefore be seen even as a promotion. Children or adults watching stars on TV and on the Internet may think that it is acceptable to throw litter out of a car window, because a publicly known person behaves the same way. So there is more pro-littering behaviour in today's visual content than anti-littering campaigns. Such visual content is not only available right now, but will be stored for future generations, thus influencing wide masses of population and having possible real effect on some components of u_j , too.

Based on the previous information, I will try to abandon the game with variables and without condemning anything said, will try to consider the problem from the monetary perspective.

8. What is the situation like in the Czech Republic

As I already mentioned, my visits to different Czech regions are frequent. I walk both in the countryside and urban areas as well as alongside road communications. I have been paying attention to littering for a longer time and I have also collected litter on many occasions and tried to learn of what it is composed. Given that cigarettes butts are not counted, the waste I find is almost entirely represented by plastic bottles, aluminium cans (in the latter case mostly energy drinks), and more recently cups, these followed by plastic bags, paper, plastic or glass food wrappers, and then by paper tissues, and other material such as forgotten personal items or parts that fell down during transportation of goods.

Apparently, there have only been two studies dedicated to littering in my country, whose authors performed some field experiments. These two studies were presented almost a decade ago, and both of them showed that among litter, plastic is the most frequently seen material (if cigarette butts are not counted) (Procházka, 2009: 13; Příbylová, 2009: 18).

It may be worth mentioning that a Canadian survey performed in 2009 pointed to the growth in the number of collected cans in comparison with a similar study performed in 2005 and claimed that "cans represented the second most common item found" (Southeast Environmental Association, 2009: 10). In the Canadian survey, it was also stated that "the amount of cups...was most common item collected" (2009: 10). In the Czech Republic, too, the popularity of cups as well as their presence in the environment is increasing as most coffee and fast-food services are being opened across the country. It would be interesting to investigate whether the low weight of cups, plastic bottles or cans is a factor that contributes

to their disposing out of cars along roadways, because heavier products are more likely to harm other drivers or pedestrians, although it is true that glass bottles or plastic bottles filled with some content can be found, too.

One aspect to emphasize is that glass wrappers are seen in my country as well, but rather rarely. Usually it is not possible to see too many glass bottles in the nature, and we may assume that this is because in the Czech Republic, most glass bottles are returnable (usually having a volume of 0.33, 0.5, 0.7 and 1 l).

9. The official gap

I wanted to compare my empirical findings with official statistics covering the situation in my country, but I could not find anything relevant at any place. Nor, as already mentioned above, could I find any recent scientific research about littering in my country. Therefore, I decided to learn more about littering in the Czech Republic at the most competent place.

In late March 2016, I contacted the Ministry of the Environment of the Czech Republic with a set of questions concerning littering as the Ministry's official web site did not explicitly speak about littering (only general waste management and illegal waste dumps were discussed, as of March 2016) and I never saw any analysis or anti-littering campaign launched from the Ministry's side. From the answers I received, I assume that, quite surprisingly, the Ministry does know well about this problem, even has recently worked on steps to fight it more effectively, but it still does not regard littering as an issue which would require more public attention.

The questions were the following:

1. Why does the Ministry not have this area, i.e. throwing litter in the environment, marked as a priority? Please provide a short explanation.
2. Is, according to the Ministry, the situation with littering still bearable? Please provide a short explanation.
3. Do you have some survey on how much litter people throw freely out in the environment per year and do you know whether this trend is improving or worsening?
4. Do you have some figures on how big the annual expenditure is for the clear up of litter from places which are not destined for discarding (e.g. in forests, alongside roads, in municipalities), and what per cent of litter is thus removed from the environment?

5. Is any new legislation or efficient measures being prepared in order to reduce significantly this behaviour in society?
6. Does the Ministry watch steps which have been taken by other countries in recent years in order to reduce this problem? If yes, is it going to be an inspiration?

The statements provided by the Ministry on two different occasions (on the 1st and the 15th April 2016) by two different persons (the Director of the Legislative Department and an employee of the Department of Waste) were quite long, but did not always directly answer what was asked. The following answers, in a bit reduced form, were provided by the Department of Waste, the Legislative Department answered only one question (No. 5), because they claimed to be competent to do so on this point.

Ad 1) The first question about why littering is not marked by the Ministry as a priority was not answered at all. Instead, we can learn “that from the [Czech] legislation and the mentioned [in the email correspondence] documents it follows that in the area of handling waste prevention of waste production always stands on the first place and that obligations of how to treat waste are strictly delimited in the legislation.”

Even if the question was not directly answered, we were informed about the steps on which the Ministry worked or participated in order to fight littering. It is, however, not clear why the Ministry, as the utmost authority, does not promote publicly its steps in the area of littering and does not inform the public on all of the negative effects such behaviour brings about.

Regarding the first answer, we were also referred to the Government order 352/2014 that proclaims the binding part of the Plan of waste management of the Czech Republic for 2015–2024 (hereinafter referred to as “POH”). In the order, there is a chapter (1.6) that comes with measures by which littering should be limited. Among these measures there figure: an increase in prevention, working on the rise of public awareness, provision of information on the possible punishment both for individuals and companies, a better enforcement of laws and also an increase of fines.

Furthermore, some links on an affiliated agency were provided by the Department of Waste, but these links did not say about littering, instead focusing on the issue of waste management as a whole again.

We were informed, too, that the issue of littering is being taken into consideration during the update of the State Program of Environmental Enlightenment, Education and Public Awareness (orig. *Státní program environmentálního vzdělávání, výchovy a osvěty v ČR*; EVVO). Likewise, non-governmental organizations and non-profitable organizations are

supported during their programmes, which aim to clean litter up. Moreover, the Department of Waste pointed out that there are more entities (regions, municipalities etc.) which have to tackle the problem and implement the proposed measures.

Finally, the Department of Waste stressed that any citizen, natural and legal person has the obligation to discard litter at places designed for such a purpose (why the Ministry provided such an answer, and instead did not address this statement to the prospective perpetrators, is unknown).

Ad 2) The Ministry referred the questioner to its first answer. Moreover, it added that due to the non-satisfaction with the current state of the littering, the situation is being tackled in the new POH, whereas the new “law on waste and on the change of some laws”, currently under the process of amending and gradual approving, covers illegal dumps.

Ad 3) and Ad 4) The Ministry does not record litter discarded out of the appropriate places. Only production of waste is tracked as data from the so-called obligated persons (entities) are collected. The Department of Waste points out that since most litter from the environment is collected by municipalities, it becomes part of their reports on the production of municipal waste.

At this point, I would like to say that in autumn 2017 I browsed websites of 5 largest Czech cities and could not find any statistics on littering in their reports and almost none of them mentioned littering as a problem. So again, there is little knowledge on how much trash appears in the nature and too little consideration of the issue as a problem.

Ad 5) The Ministry referred to the first answer and pointed to the answer provided on April 1 by the Legislative Department. The latter mentioned the new, already above-mentioned law on waste and on the change of some laws. Within this new law, some of the measures proposed in the Government order 352/2014 are being developed, mostly considering illegal dumps, but littering is also implied. What is interesting is the increase in fines. Generally said, in the case of non-proper handling of waste, a natural person will usually face a fine of up to 100 000 CZK (approximately 3 920 EUR) and in some instances of up to 1 million CZK (approximately 39 200 EUR) (Czech Republic, 2016). The question is how littering will be judged in practice, once the law has been prepared, because today the perpetrators, if ever caught, hardly face a fine higher than a few euros.

Ad 6) To this question, the Department of Waste indicated that “the issue of waste management is being introduced into the legislative regulations and mandatory documents in conformity with the EU rules. As the system of treatment of municipal waste and cleanness of

cities and municipalities is treated in each EU country differently, we cannot copy but only be inspired.” Although the original question was different and did not mention copying, we did not learn whether there would be some inspiration, and not only from an EU country. It seems that no inspiration will be taken, as the Department of Waste stated that the already set documents of the Ministry “are an important step for the reduction of littering” (Ministry of the Environment of the Czech Republic, 2016).

10. Proposal

In no instance did the Ministry respond with the assessment of the efficiency of the proposed measures. Likewise, it did not mention the possibility of extending deposit on other types of products.

Given the results of my investigation described herein, it is worth asking what if a deposit was imposed on all types of beverage containers? This would not be limited to glass bottles, but also on plastic ones, aluminium cans and even on cups. We need to emphasize that a similar measure was proposed by some Czech politicians some years ago, but without success. It has already been said that in the Czech Republic, most glass bottles are being returned and no one complains and almost no one is likely to throw them out in the nature, so why not to do it with other types of beverage containers?

For example, as of 2009, there were eleven U.S. states that had bottle deposit laws (California, Connecticut, Delaware, Hawaii, Iowa, Maine, Massachusetts, Michigan, New York, Oregon, and Vermont). These states represented 29% of the U.S. population and 28% of our sample (Viscusi et al., 2013: 146). Lee et al. (1988: 837) reported that the state of Oregon experienced litter reduction of 75 to 85% in less than two years after mandatory deposits went into effect there. Based on their study working with a representative sample of respondents, Viscusi et al. (2013: 125) also confirmed the efficacy of the introduction of deposits. Walls (2011: 6) adds that several studies show that alternatives to the deposit-refund are inferior. These statements look positive, although not all countries could experience such a great positive impact like in the case of Oregon.

In Germany, a well-known law imposing deposit on different types of bottles was introduced in 2003. A study prepared by AGVU and Roland Berger Strategy Consultants (RBSC) in 2007 stated that only 6% of public litter in Germany had been represented by beverage packaging before the adoption of the law, while the majority of litter was in the form of non-packaging materials such as film/foil, cigarettes, etc., and the latter were not

covered by the law on deposits (AGVU and RBSC, 2007: 5). These numbers seem to induce that any deposit on beverage containers cannot always bring tangible results and, indeed, the German authors themselves stated there was “no material impact” with the introduction of the law, although they admitted that “deposits on disposable packaging have slightly reduced public litter” (AGVU and RBSC, 2007: 61).

The perception of the relative non-significance of beverage containers within litter can be, however, contrasted by findings of Hogg et al. (2011: 33) who claim that: “It could be argued that the disamenity effect of litter might be a function more of its volume (related to its visibility), and possibly its potential to persist, than the number of items (i.e. the counts). Given the relative insignificance – in volume terms – of chewing gum and cigarette butts, it could be the case that beverage containers actually contribute relatively significantly to litter related disamenity (because of their disproportionate contribution, relative to count-based measures, to the visibility of litter).”

If this latter statement admitted, then any reduction in discarding beverage containers will have a higher real impact on the environment than the same or even a higher reduction in discarding cigarette ends or other items of similar character. Indeed, for example one plastic bottle or aluminium can visually contaminate the environment more than a couple of cigarette butts. It may be worth mentioning that a recent paper investigated what the impacts of ‘beacons’ and ‘other’ litter items were on observed littering behaviours and the accumulation of litter at the observed sites. The findings suggest, among others, that the presence of large, more salient items of litter (e.g. branded or brightly coloured items) might further increase the likelihood of additional litter being dropped (Tehan, R. et al., 2017: 10).

Moreover, if we start introducing deposit on something that can be both easily recycled and perceived as valuable, then we can move the limited sources society has to educating and convicting people who keep contaminating the environment with such litter which is hardly to be accepted for recycling – at least from today’s perspective – as valuable refuse, i.e. cigarette ends, chewing gum, etc. If we do not do anything claiming that the total number of beverage containers does not superpose the number of other refuse anyway, then we will never move forward and instead – will keep spending additional money on cleaning and convicting with no palpable effect.

Of course, there are and will always be people who eventually decide to throw refuse away, but the number of such people is relatively very low and the contamination of the environment by deposit bottles is therefore not so visible. In the Czech Republic, it is more

likely to see a deposit glass bottle broken or damaged as a result of some “wild” social event than to find a glass bottle simply discarded alongside a road or in a forest (the deposit, despite being low, usually some EUR 0.10, motivates most people to carry their empty glass bottles even if a bin is not available).

For sure, one can claim that other types of refuse which have the same volume impact (food wrappers, for example) should also be subject to a deposit law. This question is not neglected or disapproved in this article. However, it represents a more complex issue because other litter than beverage containers is usually not as homogeneous (much more shapes, dimensions, complicated material composition) which may create many problems with finding a political consensus on what to still subject under a deposit. One has to remember that while most beverage containers can be reused simply by filling them again with new liquid, most other packaging cannot, either because of the caused damage (unpacking) or contamination, and its attractiveness for a wider use than that of converting them into a new source via recycling therefore decreases.

For this reason, I, for the time being, will discuss only effects of introducing deposits on beverage containers, arguing that more recycling of the non-deposit litter should be promoted and the saved sources from cleaning up litter in the form of container beverages should be moved to the conviction of people that will keep throwing non-deposit litter. Such a model can certainly be applied on other litter in the future, so the extension of deposits is just an issue of government policies and cost effectiveness of the industrial processing of other types of litter.

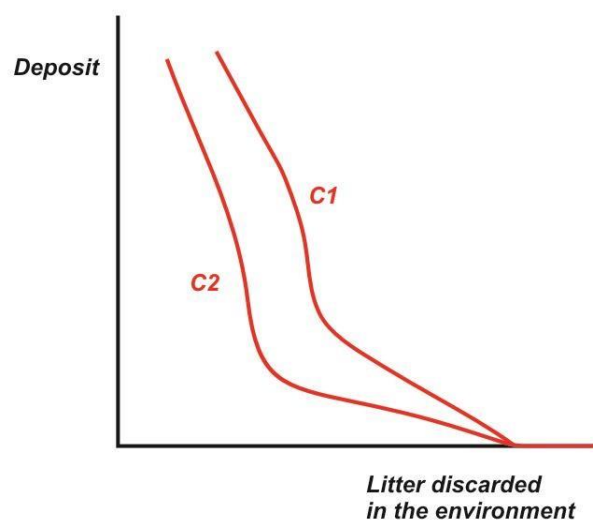


Fig. 1. The littering curves: The relationship between the amount of litter and the level of deposit imposed

Source: Author's own elaboration.

The presented image shows two curves that I have named “the littering curves”. The image displays what happens in the situation when no deposit is introduced on beverage containers as well as what happens when a deposit is imposed. The horizontal red line shows that litter thrown in the environment is to grow if the price of litter is zero. Moreover, as over time the population will grow, there will always be less time needed to find more litter in the nature unless some actions or measures are taken to reduce littering significantly. We know that there are not enough people to clean up the new litter, so indeed the litter will skyrocket.

If a deposit is introduced, the amount of litter thrown out in the nature will start to decrease. The curve named C2 shows a situation wherein people are more sensitive to price changes. Therefore, even a relatively low deposit (e.g. EUR 0.10) motivates many people to carry their waste into a point where the deposit is to be returned.

As it can be seen, at some point the amount of discarded litter decreases more and more slowly and higher deposits must be introduced to motivate those who have been still unwilling to return the bottles. This is because in everyday life there are situations in which people consider that sometimes it is not worth taking their litter despite the imposed deposit. Typically, one is on a trip and has only one bottle and the point where it can be returned is too far, so the personal “transaction” costs tied to the movement to the returning point are considered high. Some of the people, of course, are likely to use a bin to get rid of their bottle, but the rest will still prefer littering. So, only when the deposit amount exceeds the value of the possible personal transaction costs and other variables can other significant cases when litter is produced be avoided. This situation can be seen in the graph too, when the curve stops rising to the top and instead again approaches the vertical axis.

The graph may induce the idea that if no litter were to be thrown, then an authority would have to impose quite a high deposit to make all people stop littering. This is, however, only a theory, because a too high deposit would be hardly socially accepted (in fact it would be a credit granted by people to someone). Not only for this reason should we always expect that littering will continue; the goal should be to find the optimum deposit to reduce littering as much as possible.

Curve C1 shows the same principle; however, it points to the situation in which society or a group of people do not care if litter is discarded or does not represent an interesting value for them. So a society’s price sensitivity enters our model. Thus, an infinite number of curves can be created both for each individual and society.

Knowing the weak impact the deposit law had in Germany, at least as claimed by AGVU and Roland Berger (2008), we may argue that the problem could be in the low value

that the imposed deposit could represent for most German potential litterers (as known, Germany is one of the richest world regions where people have high wages, so the deposit may not sometimes be high enough for most of the litterers). So, curve C1 could describe this problem better than curve C2. Thus, a higher deposit may be a solution to get a higher reduction in litter in the form of beverage containers. Moreover, one also should bear in mind all the variables of the Becker's model, i.e. p_j, f_j, u_j .

11. Recommendations

Every government should take into account that in order to reduce littering with most efficiency price sensitivity of the nation/population should be thoroughly analysed. A small amount of deposit may not have any considerable effect and therefore have a low impact on removing litter from the environment. On the other hand, a too high deposit could be regarded as a tax or credit given to the government, which takes away too much finance from households and companies.

The introduction of a deposit should be performed together with a campaign that will underline the negative effects of littering, especially on human and animals' health. People must not be scared, but must be widely and objectively informed on the real impact of littering behaviour. Society must feel involved in the problem. The campaign is necessary because not everybody watches documentaries or has time or takes interest in getting the relevant information on their own. People should understand that if littering decreases, the effects will be positive for the whole society and will not be limited just to a reduction of risks to their health.

Furthermore, people must be informed that more severe punishments are to be introduced on those who will decide to boycott the effort of the other people to keep the environment clean. Otherwise, the opinion that "good/stupid people clean while littering continues anyway" could prevail. People should be informed that the resources saved on cleaning sites from beverage containers will be transferred to the cleaning of the old litter laid in the nature for years or decades as well as to a more effective method of cleaning for the litter not under the deposit law.

Any introduction of a deposit must be preceded by a period during which companies, producers and other stakeholders will be able to introduce measures that will bring the maximum possible efficiency to the whole deposit system. The introduction of a deposit must be smooth and avoid major mistakes. Otherwise, a negative media campaign could be easily opened and the whole deposit system would be thus condemned to its quick disappearance.

I come with this recommendation since for the past years there has been no day in my life I would leave my home and see clean environment, regardless of where I go. The only thing I observe is that only some areas are cleaned, but seldom cleaned properly, while in other places (usually outside municipalities) trash simply piles up for months or even years and it seems no one cares. Since we do not have sufficient workforce and capital to have all areas cleaned, nor to convict every litterer, the only thing that might globally help is the imposition of a deposit.

12. Conclusion

In this paper I tried to describe the phenomenon of littering in general and to present some analytical comments on the current state of this behaviour in my country of residence, i.e. the Czech Republic. We have seen how global and serious issue littering is. A significant part of today's global society keeps littering, or at least remains indifferent to the problem. Surprisingly, littering happens frequently among youngsters, despite rising education (public awareness) and various campaigns. If this negative trend continues, we can expect more and more litter everywhere people go. It has been shown that littering is also a huge problem in the Czech Republic and that the attitude of the Ministry of the Environment of the Czech Republic towards the problem is rather mild. To significantly change the situation in my country, I, building my arguments on the results of the investigation described herein, propose to progressively impose a deposit on the kinds of beverage containers not already covered by the current measure. However, I must point out that the same or similar measure can be imposed anywhere in the world and will always have some positive impacts. I also claim that the authorities and relevant institutions are responsible for setting, implementing, promoting and keeping such a measure running in an efficient way.

Note: The paper was presented by means of a poster only at the Romanian Association of Young Scholar's International Interdisciplinary Doctoral Conference held in 2016, Bucharest, Romania. Its full content has not been published anywhere. Moreover, the original text was modified.

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JAK ZWALCZAĆ ZAŚMIECANIE – ANALIZA Z NACISKIEM NA CZECHY

Streszczenie

Praca stara się zrozumieć, dlaczego zaśmiecanie jest tak rozległe, i dzięki kilku odkryciom zawartym w artykule Gary'ego S. Beckera pt. " Crime and Punishment: An Economic Approach" wyjaśnia, dlaczego w aktualnych warunkach można się spodziewać więcej odpadów odrzuconych w środowisku. Artykuł powstaje z perspektywy Republiki Czeskiej, w której mieszka autor. Ten analizował wcześniejsze badania przeprowadzone przez innych naukowców i instytucje z całego świata, a także obserwował sytuację w różnych czeskich regionach, aby w przybliżeniu dowiedzieć się, jak duży jest problem z zaśmiecaniem w jego kraju i jaki rodzaj miotu można znaleźć w czeskiej przyrodzie. Następnie autor postanowił zwrócić się do Ministerstwa Środowiska Republiki Czeskiej, aby dowiedzieć się, jakie środki są planowane w celu znacznego ograniczenia zaśmiecania. W wyniku

tego, autor postanowił zwrócić szczególną uwagę na pojemniki na napoje i proponuje nałożyć obowiązkowe depozyty, aby zmniejszyć ilość śmieci, które można znaleźć w odpowiednich miejscach. Autor, opierając swoje argumenty na ustaleniach innych autorów, dochodzi do wniosku, że taki środek – pod warunkiem, że pewne warunki są przestrzegane – może działać w dowolnym miejscu na świecie, a pojemniki na napoje nie są jedynym rodzajem odpadów odpowiednich na ten etap.

Słowa kluczowe: śmiecenie, depozyt, pojemnik na napoje, Czechy, środowisko

Kody JEL: A11, B41, Q01, Q53, Q58

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