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# Policy measures to counter rising energy prices

In-kind transfers, cash transfers and VAT rate cuts

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# Abstract

This paper examines literature on policies used to compensate households for rising energy costs, including in-kind transfers, cash transfers and VAT reductions. It also shows how targeted transfers stand against universal transfers, and how the policy measures affect energy consumption.

The study shows that the differences between cash transfers and in-kind transfers are generally small, but that energy might be an exception. VAT reductions can successfully decrease prices for some types of energy, but mostly benefits the wealthiest. The costs of targeting transfers are small, particularly when it comes to cash transfers. Energy consumption can be increased by the taken measures, but likely not to a great extent.

Keywords: In-kind transfers, cash transfers, VAT, targeting

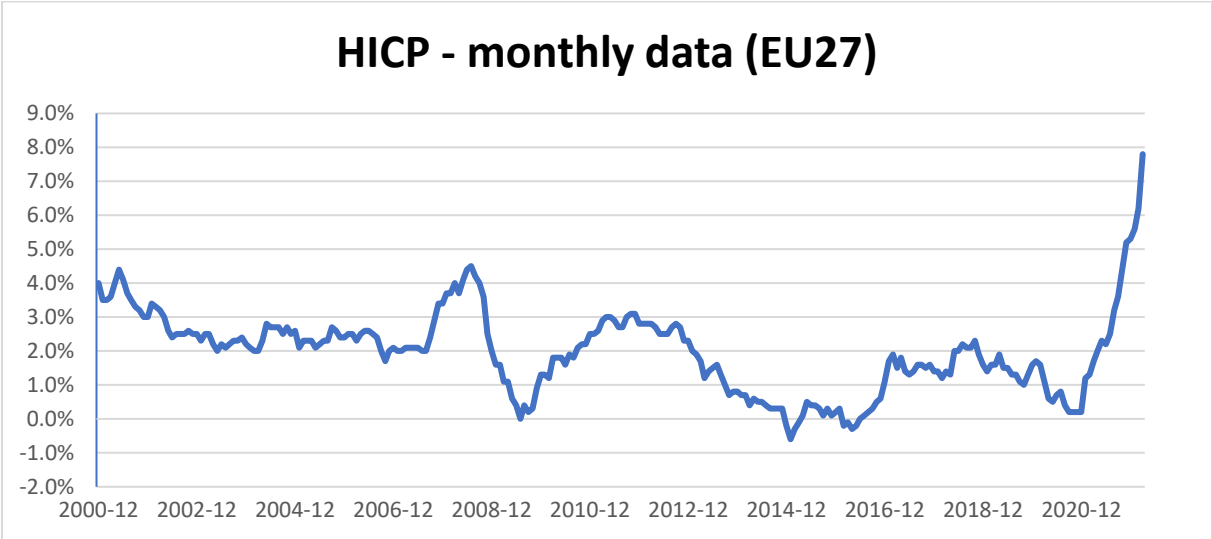
## Index

Background .....	4
Pigouvian taxes .....	6
In-kind redistribution.....	7
Targeting .....	11
Methods for targeting .....	11
Community-based targeting.....	11
Geographical targeting.....	12
Self-targeting.....	12
Means-testing.....	12
Types of costs associated with targeting .....	13
Administrative costs.....	14
Incentive costs.....	15
Political costs .....	15
Redistributive justice.....	16
Universal transfers.....	16
Elasticity of demand, fuel, and gas.....	17
Elasticities and Engel Curves .....	17
Empirical studies of elasticities of electricity and gasoline.....	18
VAT rate reductions .....	19
Tax incidence.....	19
Empirical examples of changes of the VAT rate.....	21
Analysis.....	22
References .....	27

# Background

As shown in figure 1, inflation in the 27 EU member states had a yearly average of 1.9 percent in 2001 to 2020. After a period of an inflationary rate below 1 percent, inflation started to rise in 2021. As of March 2022, inflation has reached a yearly rate of 7.8 percent.

Figure 1. Monthly HICP data in EU27 2000-2021



Note: From Eurostat (2022). HICP - monthly data (annual rate of change)

By the end of 2021, the European Central Bank (2021) identified three different causes to the high inflation. First, demand for consumption has grown as more European countries have lifted their pandemic restrictions. This has required companies to reinforce pre-pandemic supply chains, and companies have not been able to keep up the pace of increasing demand (European Central Bank, 2021). Secondly, world prices for energy have increased, partially due to environmental reasons such as droughts. Finally, inflation was very low in 2020, meaning price increases from 2020 to 2021 would be perceived as steep (European Central Bank, 2021).

Inflation continued to rise in 2022, due to the above-mentioned reasons, but also due to Russia invading Ukraine in February of 2022 (Ip, 2022). The war has created a shortage of natural gas, exacerbated the energy crisis and increased inflation even further.

European governments have since 2021 implemented policies to shield households from rising gasoline and electricity prices (Sgaravatti, Tagliapietra, & Zachmann, 2022). Implemented policies include tax reductions, price regulations and transfers.

In October 2021, Jean Castex, Prime Minister of France, announced the French government would pay 100 euros to low-income and middle-income earners to compensate for increasing energy prices (France 24, 2021). The premiums were paid to all people under the age of 16 residing in France with a gross income below 26,000 euro during the first ten months of 2021 (Direction de l'information légale et administrative, 2022).

In March 2022, Swedish Minister of Finance Mikael Damberg presented a package of measures to combat rising prices in fuel and electricity. The package included a payment of SEK 1000 to all car owners, with an additional SEK 500 being transferred to individuals in sparsely populated municipalities (Government Offices of Sweden, 2022a). All car-owners are eligible for the payments, including those who own electric cars (Government Offices of Sweden, 2022b). When asked why individuals with high incomes were entitled the cash transfers, Swedish prime minister Magdalena Andersson said targeting the cash transfers to certain individuals would entail a more time-consuming process (30 minuter, 2022).

Instead of giving handing out cash to individuals, the Irish government announced they would hand out a 100-euro credit for all households to pay their electricity bills (Gataveckaite, 2022). This was later increased to 200 euro (McNally, 2022).

Many European countries chose to reduce or remove their taxes on fuel (Sgaravatti, Tagliapietra, & Zachmann, 2022). Poland reduced the VAT on fuel and from 23 percent to 5 percent (gov.pl, 2022). The Netherlands have reduced the VAT on electricity from 21 percent to 9 percent, and the Czech Republic removed the VAT on electricity entirely (Sgaravatti, Tagliapietra, & Zachmann, 2022). Spain reduced the VAT on electricity from 21 percent to 5 percent, albeit only to households with “modest energy consumption” (BBC, 2022). Romania have reduced the VAT on electricity, but just like Spain, the government has restricted the VAT cut to households below a certain level of energy consumption (Sgaravatti, Tagliapietra, & Zachmann, 2022).

Using previous literature on the aforementioned policy measures, this paper aims to analyze the effectiveness of these measures, and why some governments choose to help all its citizens, while others focus on helping the poorest.

On average, over half the price of gasoline and diesel in the European Union consists of taxes (Benjamin & Giraldo Hurtado, 2019). The first fuel taxes were aimed at lowering the importance of petroleum imports and increasing state revenues but are now generally imposed to decrease greenhouse gas emissions. Emissions can be cut by people driving less and

changing their old vehicles to more fuel-efficient alternatives (Benjamin & Giraldo Hurtado, 2019; Sterner, 2007).

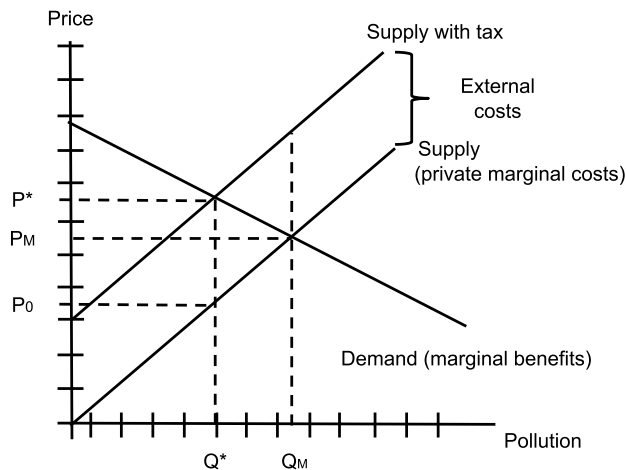
Blake & Bulman (2022) conclude the poorest 20 percent of households in each European country are more affected by rising electricity prices than the richest 20 percent. As for rising gasoline prices, this is not always the case. In several European countries, high-income households spend a larger share of their earnings on transport than low-income households. This can according to Blake & Bulman (2022) be attributed to the fact that richer households are more likely to own a car. Both rising electricity prices and rising gasoline prices are more damaging to households living in rural areas and small towns than to households in cities.

The NGO Transport & Environment (2022), argues against gasoline tax cuts, partially because the richest spend more money on gasoline than the poorest. Their calculations show that the richest ten percent of Europe's population on average spend 1249 euro per year on transport fuels, eight times more than the poorest ten percent, who on average only spend 162 euro per year. Further calculations show that on average, proposed fuel tax cuts in EU member states would save the richest ten percent 123 euro, while the poorest ten percent would only save 16 euro. Belgium and Cyprus are the European countries where the differences in benefits from a tax break, between the richest and the poorest, are the smallest. The top decile is calculated to save 110 euro, while the bottom decile would save 20 euro, which is more than five times less. The largest differences can be found in Hungary, where the richest ten percent save 22 times more than the poorest ten percent.

## Pigouvian taxes

Gasoline taxes and electricity taxes can be considered forms of Pigouvian taxes. A Pigouvian tax is a tax on an activity, equal to the external damage it causes, meaning the polluters pay for their own pollution (Harris & Roach, 2018).

Figure 2. A market with a Pigouvian tax



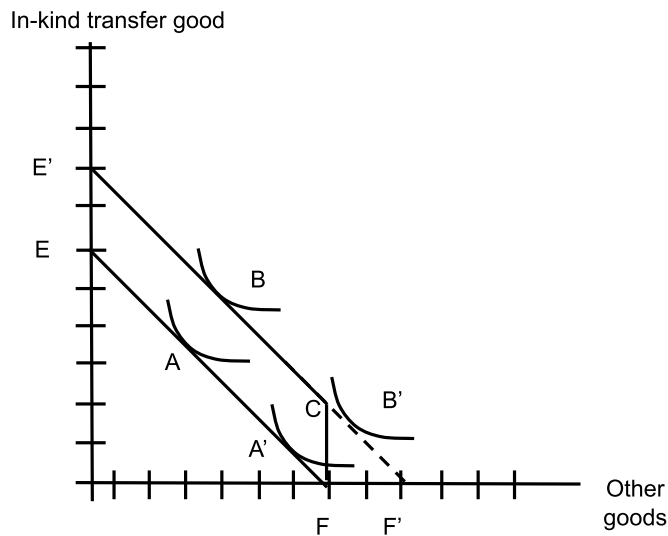
Note: From Harris, J. M., & Roach, B. (2018). *Environmental and Natural Resource Economics: A Contemporary Approach*

Figure 2 shows the effects of a Pigouvian tax. In a market without Pigouvian taxes, supply, which is the private marginal cost for an individual, meets demand, and the quantity of polluting goods sold is  $Q_M$ . Adding external costs for pollution to the supply curve, creates a curve called the social marginal cost curve. In a market with a Pigouvian tax, the tax is equal to the external costs, and shifts the demand curve to line up with the social marginal cost curve. The sold quantity of polluting goods decreases from  $Q_M$  to  $Q^*$ , and the price increases from  $P_M$  to  $P^*$  (Harris & Roach, 2018).

### In-kind redistribution

The concept of redistributing resources through other means than cash, such as food stamps and electricity bill coupons, is called in-kind redistribution (Hashimzade, Myles, & Black, 2017). This limits the spending options to a predetermined set of goods and services.

Figure 3. Consumption bundles in-kind versus cash transfers



Note: From Currie, J., & Gahvari, F. (2008, June). Transfers in Cash and In-Kind: Theory Meets the Data.

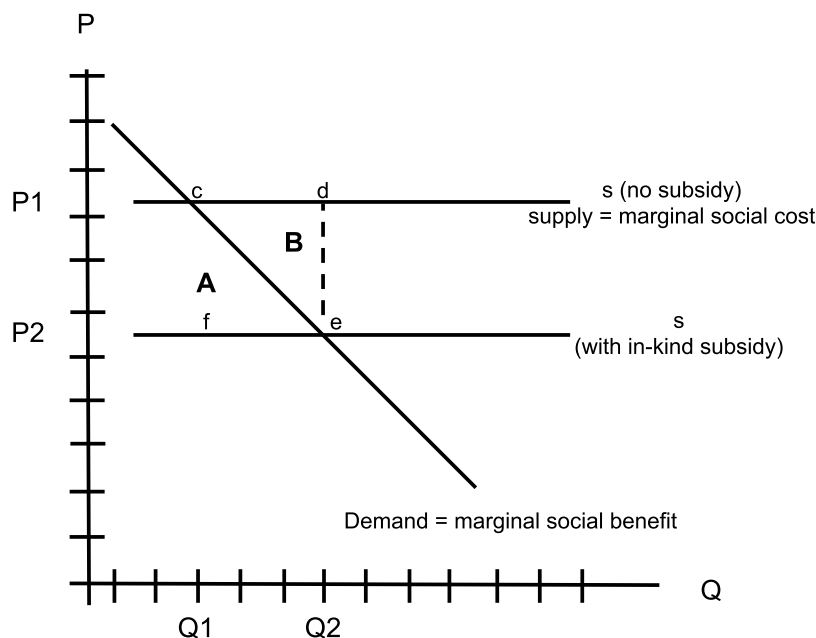
The notion that cash transfers are at least as beneficial for recipients as in-kind transfers is broadly agreed among economists (Aaron & von Furstenberg, 1971; Currie & Gahvari, 2008; Moffitt, 1989). Figure 3 illustrates how in-kind distributions effects the utility of a recipient in a model. The model assumes the existence of a composite good and a good which is provided through in-kind transfers. Consumption of good any good redistributed in-kind is shown on the y-axis. Consumption of all other goods is shown on the x-axis. The line EF shows the budget constraint for the recipient before a cash transfer or an in-kind transfer. The line E'F' shows the budget constraint after a cash transfer. If instead, the individual receives an in-kind transfer, its budget constraint will be E'CF. The recipient with the indifference curve A is indifferent towards which type of transfer they will receive. Once a transfer has occurred, the said individual will reach a higher level of utility through the indifference curve B. An individual with an indifference curve initially at A' can however, only reach a higher level of utility, such as indifference curve B', through a cash transfer.

Assuming the market is efficient, the marginal benefits of sold goods and services are equivalent to their marginal social costs (Tabor, 2002). This means private and external costs of an activity in the market are as large as its benefits (Hashimzade, Myles, & Black, 2017). As producers will produce more of the goods redistributed in-kind in favor of production of other goods, in-kind transfers are said to decrease economic efficiency. The smaller the



elasticity of demand is, the greater will the loss of efficiency be, assuming consumption and production does not come with any positive externalities (Tabor, 2002).

Figure 4. Excess burden spawned by in-kind transfers



Note: From Tabor, S. R. (2002). *Assisting the Poor with Cash: Design and Implementation of Social Transfer Programs*

Figure 4 shows how in-kind transfers can spawn a deadweight loss on a market level. Area A, the area below the demand curve, represents the value of an in-kind transfer to the recipient. Area A+B is the total fiscal cost of the subsidy. Area B is the excess cost of the in-kind transfer over the recipient's value of the in-kind transfer. Incentives to replace the in-kind transfer with a cash transfer increase the larger area B is.

A case for in-kind transfers can be made under the assumption that ongoing investments are below the optimal social level (Gentilini, 2016). In-kind transfers can then influence the behavior of people, who are assumed to be uninformed, to increase their consumption of a certain good. (Gentilini, 2016)

Cunha, De Giorgi, & Jayachandran (2019) examine the differences in price effects between cash transfers and in-kind transfers. Both types of transfers are said to, through an income effect, increase demand for normal goods. In-kind transfers can however increase supply if they consist of actual products and not vouchers. This supply effect can decrease prices of the in-kind goods. The case which Cunha, De Giorgi, & Jayachandran (2019) studies is a program

of food assistance in rural Mexico. Prices before and after the program were measured in food stores, most of which were independent. Surveys were conducted to measure the expenditure of the households.

Citizens in some villages received in-kind transfers of food, while others received cash transfers of similar value. In the villages that received in-kind transfers, prices decreased with 3.7 percent. Cunha, De Giorgi, & Jayachandran (2019) note that this price effect persists after 22 months, suggesting that any change in the market structure has reversed the price decrease. They also suggest the income effect cannot explain the differences between the cash transfer markets and the in-kind transfer markets by its own, due to the differences being too large. Instead, the difference is thought to be the result of an increase of supply in the villages given in-kind transfers. The food products not provided by the in-kind transfers did not change in prices differently from the cash transfer markets.

Hoynes & Whitmore Schanzenbach (2009) examine how The Food Stamp Program (FSP) impacts food consumption in the United States. They state that previous studies have generally compared the consumption of food stamp recipients with non-recipients with similar characteristics. Recipients are however more likely to be inclined to increase their food consumption in the first place. In a literature review, Fraker (1990) shows the median FSP study concludes that the marginal propensity for consumption (MPC) of food is 3.8 times higher for food stamps than for cash transfers. The MPC is defined as the proportion of additional income consumed by the recipient (Hashimzade, Myles, & Black, 2017). Hoynes & Whitmore Schanzenbach (2009) noted that the FSP was introduced at different times for different counties and used this to analyze the consumption effects instead of comparing recipients with non-recipients.

Results show that 5 percent of the recipients are constrained, meaning the food stamp benefits exceed their food consumption level (Hoynes & Whitmore Schanzenbach, 2009). The recipients reduce their cash spending on food expenditures, albeit not on a statistically significant level. Statistically significant however, is the finding that recipients increase their total food expenditures. Hoynes & Whitmore Schanzenbach (2009) also find the MPC food to be higher for food stamps than for cash transfers, but that the results are close. This difference in results compared to earlier studies can be explained by the research design, which finds a lower MPC food for food stamps. Hoynes & Whitmore Schanzenbach (2009) conclude consumption choices are minimally distorted by providing food stamps instead of cash transfers.

Slesnick (1996) analyzed in-kind benefits through data from the Consumer Expenditure Surveys (CEX) in the United States from the early 1960s to the early 1990s. The data from the CEX includes out-of-pocket household expenditures. It does not include insurances provided by employers or housing subsidies, both considered to be types of in-kind transfers. Together with data commodity prices and household characteristics, Slesnick (1996) calculates the average deadweight loss of in-kind transfers, the deadweight lost being the difference in monetary value between a cash transfer and an in-kind transfer. If the voucher is equivalent to a cash transfer, the deadweight loss is zero. He finds that the deadweight losses from in-kind transfers of food and capital services are insignificant, meaning they are about as efficient as cash transfers. In-kind transfers of energy, including electricity and gasoline, are examined as well. Energy transfers are found to be inefficient in eradicating poverty.

## Targeting

Transfers can be either universal or targeted. A universal transfer is a transfer available to everyone, without any conditions (Coady & Le, 2020) . One example of such transfer is universal basic income.

By targeting transfers, transfers are concentrated to individuals who benefit the most (Grosh, 1994). This is not only cost effective, but also desirable from a fairness perspective (Devereux, et al., 2017).

## Methods for targeting

Targeting can be either broad or narrow. A typical example of broad targeting is money spent on free education (van de Walle, 1998). This benefits everyone, but especially those belonging to vulnerable groups. As this type of targeting can be expensive, policy makers might instead favor narrow targeting, defined as targeting concentrated to a specific group (van de Walle, 1998). Narrow targeting can either be based on so called indicator targeting, where individuals with certain characteristics are included in the program, or self-targeting, where individuals in need opt into the program themselves (van de Walle, 1998).

## Community-based targeting

When implementing community-based targeting, the government reaches out to an intermediary agent, such as a community group, to engage with the transferring scheme. For example, the agent can participate in the process of identifying recipients or in the delivery

process (Conning & Kevane, 2001). Community-based targeting can be a favorable method of targeting if the intermediary agent has more accurate information about the households, thus reducing administrative costs and potential errors of exclusion.

### Geographical targeting

The advantage with geographical targeting includes the fact that such targeting has little impact on the behavior of households, as moving to a different area can be difficult (Bigman & Fofack, 2000). This method is also seen as easy to implement and sets up a clear criterion for who should receive the payment (Bigman & Fofack, 2000).

### Self-targeting

To accurately target the correct recipients, policy makers can strive for self-targeting, meaning everyone identifies themselves as either needing or not needing, and then either applies for the transfer or not (Currie & Gahvari, 2008). To keep this practice cost effective, two methods can be implemented to dismiss people who are not in need of the transfer, from opting in. The first method is to discourage people from opting in by offering transfers with a low value. In case of cash transfers for the poor, fewer non-poor people would opt in the smaller the transfer is. If a self-targeting transfer system involves in-kind transfers, the policy makers can choose to offer a low-quality good. Offering a low-quality can however create a deadweight loss (Currie & Gahvari, 2008). The second method is to implement a cost for accessing the transfer. For instance, having a time-consuming bureaucratic system will discourage people who do not need the transfers from applying (Devereux, 1999).

### Means-testing

Another way of targeting is by performing a means-test. In such test, individual or household income and wealth is measured to target those who need the transfer (Hashimzade, Myles, & Black, 2017; Grosh, 1994). If measured income and wealth is considered hard to verify, a proxy means-test can be performed instead. A proxy means-test checks for income and wealth as well as for other poverty indicators. This can for example be location, occupation, and family characteristics (Grosh, 1994).

Besley (1990) compares the costs of means-testing with costs of universal transfers through a numerical approach. The model fulfills two axioms proposed by Sen (1976). The first axiom is the monotonicity axiom, saying the poverty measure increases if the income of an individual below the poverty line decreases. The second axiom is the transfer axiom, saying the poverty

measure increases if income is transferred from an individual below the poverty line to someone who is richer. Besley's model does however not fulfil the transfer sensitivity axiom. This axiom says that if a transfer from a poor individual with income  $x_i$  to a poor individual with income  $x_i + h$  takes place, the size of the poverty increase decreases the larger  $x_i$  is (Foster, Greer, & Thorbecke, 1984; Kakwani, 1980). In other words, Besley (1990) makes the assumption that poverty increases if a poor individual transfers income to a richer individual, but does not consider the income distribution among the poor.

When not fulfilling the transfer sensitivity axiom, Besley (1990) points out three important terms determining whether means-testing should be favored to universal transfers or not. Firstly, the leakage rate, which is the fraction of rewards in a universal transfer scheme, that goes to individuals who do not receive any rewards from a means-tested scheme. This includes non-poor individuals, but also poor individuals who might have been missed by the program. Secondly, there is the mean income difference, which shows how much a universal transfer scheme increases the mean income among the poor, compared to their original mean income. Finally, there is the mean deficiency from the poverty line under means-testing, among the individuals below the poverty line who do not participate in a means-tested program.

Making assumptions that fulfill the transfer sensitivity axiom, Besley (1990) points out the importance of  $\sigma_u^2$  and  $\sigma_r^2$ , the first term being the income variance among poor individuals in a universal transfer program, and the second term being the income variance among the poor who do not receive any transfers in a means-tested program. A larger  $\sigma_u^2$  increases the likelihood of a means-targeted system being more desirable, while a larger  $\sigma_r^2$  makes it more likely for a universal transfer system to be preferable. Besley (1990) concludes that his models deem means-targeted systems preferable to universal systems, unless inequality among the group below the poverty line who do not participate in such system, is significantly high.

### Types of costs associated with targeting

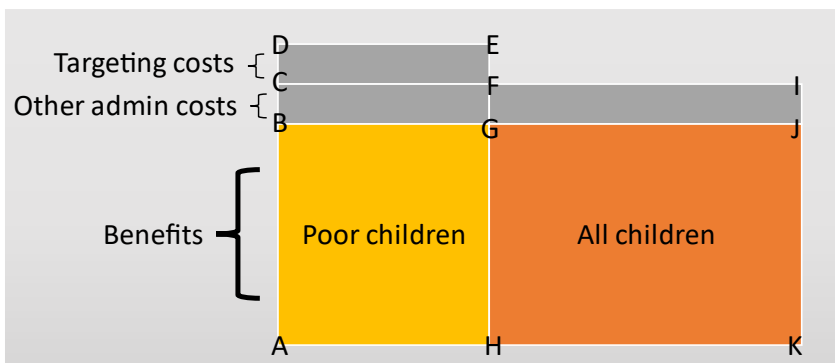
Grosh (1994) identifies three types of costs associated with targeting transfers: administrative, incentive, and political costs.

## Administrative costs

A perfect identification of who should and who should not receive the transfer, would lead high administrative costs (Grosh, 1994). Using a more general mechanism to sort between the two groups would reduce the administrative costs but increase the risk that deserving people would miss out on the transfer. Grosh (1994) argues the administrative costs of a transferring program should decrease the smaller the proposed transfers per individual are. Administrative costs of 5 dollars per person might be reasonable for a 100-dollar transfer, but not for a 10-dollar transfer.

Administrative costs for cash transfer programs are generally lower than for other types of transfers (Grosh, Ninno, Tesliuc, & Ouerghi, 2008). The administrative costs for food stamps are relatively low, yet higher than costs for cash transfers, as food stamps still require production costs for coupons and costs for the procedures retailers to exchange food stamps for money from the government. In school feeding programs, administrative costs range between 10-55 percent of the program cost. Meanwhile, administrative costs for cash transfer programs range between 2-10 percent. (Grosh, Ninno, Tesliuc, & Ouerghi, 2008). In a literature review by Devereux et al. (2017), the authors find similar numbers in other cash transfer studies. They conclude that targeting does not lead to high administrative costs.

Figure 5. Conceptualizing targeting costs



Note: From Grosh, M., Ninno, C. d., Tesliuc, E., & Ouerghi, A. (2008). *From Protection to Promotion: The Design and Implementation of Effective Safety Nets*.

Figure 5 illustrates the cost difference between a target program compared to a universal program. The targeted program has a higher administrative to total cost ratio, due to there being extra targeting costs. Grosh et al. (2008) disclose the figure might underestimate the value of lowering exclusion errors.

Houssou & Zeller (2011)

### Incentive costs

An incentive cost can occur if targeting mechanisms prompt unproductive behavior. Incentive costs can take many different forms, including the labor-leisure choice problem. Such problem can occur if the cash transfer policy includes a cut-off point. For instance, if a 10-dollar check is given to everyone with a salary less or equal to 100 dollars, people earning between 100 and 109 dollars would be better off if they worked less, as they could earn the same income while gaining more leisure time (Grosh, 1994). This individual gain is correspondent to a loss for society as a whole. Grosh (1994) also mentions the case of food programs where food is distributed to children who have a certain nutritional status, could create incentives for parents to underfeed their children to receive food. This is an example of a so-called moral hazard problem (Hashimzade, Myles, & Black, 2017).

Another potential incentive cost is the one of allocation. This occurs if the transfer includes geographical criteria, such as limiting transfers to residents in specified areas. This creates an incentive for people to relocate to the benefited location (Grosh, 1994). If a program aims to help poor in rural areas, and rich people relocate to those areas, costs for the program will increase despite there not being a need for it.

### Political costs

Lastly there are political costs. Grosh (1994) argues that programs targeting the middle class will gain wider support than programs targeting the poor and will therefore have a bigger budget. This can however lead to a sort of spillover effect, a large budget for the middle class implies a larger budget for the poor compared to when the middle class gets nothing.

Grosh (1994) concludes that when voters does not personally benefit from the program, they are more likely to support programs with accurate targeting, to keep the taxpayer costs as low as possible. Tabor (2002) suggests that the middle class might need to feel the transferring program benefits them in some way for the politicians to implement it, as the poorest groups have a weaker political influence. However, as Grosh, Ninno, Tesliuc, & Ouerghi (2008) point out, being included in the program is not necessarily a precondition for an individual to support it. If the middle-class perceives the program will decrease the risk of political turbulence and increasing criminality, they have incentives to support it. And even if

individuals do not experience such benefits, they still might support programs based on their idea of social justice (Grosh, Ninno, Tesliuc, & Ouerghi, 2008).

Programs might also be supported by the suppliers of goods. On several occasions, food programs imposed by the US government have been supported by lobbyists from the farming industry, as they can sell redundant farm commodities (Grosh, 1994). Food lobbying groups in the US have lobbied against removing the eligibility of soda in the SNAP, the biggest food stamp program in the country (Simon, 2012).

## Redistributive justice

Devereux (2016) mentions three principles of redistributive justice, all opposing each other. The first principle is the principle of equity, which says those who contribute to the system should also receive more. The second principle is the principle of equality, saying all citizens are entitled to the same benefits. The third principle is the principle of need, meaning those who are well-off should support those who are vulnerable. Devereux (2016) advocates for each principle to be applied to different types of programs. The equality principle should be applied to essential social services, the equity principle should be applied to social insurances, and the principle of need should be applied to social assistance.

## Universal transfers

If targeting transfers is considered too difficult and too expensive, one could make a case for universal transfers instead (Devereux, 2016). Universal transfers can, unlike targeted transfers, guarantee that all people needing the transfer will receive it. Some critics of targeted transfer point out that only universal transfers can help the poor without stigmatizing them. Proponents of universal targets argue a sense of solidarity is created when everyone, not just certain groups, is included in the program. And while universal transfers at first seem to lack an inequality reducing effect, they are paid using tax money, meaning they do redistribute money from the richest to the poorest.

A common criticism against universal transfers is that they allocate resources inefficiently (Devereux, 2016). When discussing universal basic income, Birnbaum (2019) names this argument the target-inefficiency objection. Basic income does not only grant resources for those who need them, but also for people who do not. Related to inefficient resource allocation, Birnbaum (2019) also mentions the unfairness objection. This objection says that a base income will transfer resources to recipients who do not deserve them. The idea is that



people should take responsibility for their own actions, and that the state should not guarantee income for its citizens.

## Elasticity of demand, electricity and gasoline

### Elasticities and Engel curves

The elasticity of demand for goods shows how changes in income affect the demand for said good. Inelastic demand is defined as an elasticity of demand below 1. That means a decrease in price of a good will lead to a less-than proportional increase in demand (Hashimzade, Myles, & Black, 2017).

Figure 6. Engel curves representing normal and necessity goods



Note: From Azaman, A., Tariq, M., & Khan, F. (2019). The Effects of Social Protection Program on Food Consumption and Poverty in Khyber Pakhtunkhwa, Pakistan.

Engel curves show how consumption of goods relate to income levels (Hashimzade, Myles, & Black, 2017). Figure 5 shows the Engel curves of a normal good and a necessity good. The x-axis shows the income of an individual, while the y-axis shows the purchased quantity. A household with low expenditures, will spend a large fraction of their income on necessities, and they will spend more on necessities the higher the income is. After reaching a certain income level, however, increases in expenditure of necessities will be very small. Expenditure for normal goods will always increase proportionally to income (Azaman, Tariq, & Khan, 2019).

## Empirical studies of elasticities of electricity and gasoline

According to Cialani & Mortazavi (2018), demand for energy can be explained by the current supply of energy, the price of energy, income, and multiple other factors such as environmental factors. Using data from 29 European countries between 1995 and 2015, they concluded that the short term, demand for electricity is very insensitive to prices. Increasing electricity prices with 1 percent corresponds households decreasing their electricity consumption with 0.045 percent. Cialani & Mortazavi (2018) also find the elasticity of demand to be low in the long term. They conclude that to decrease electricity consumption, price increases have to be very large.

Cialani & Mortazavi (2018) also examine how increasing incomes effect household electricity consumption. Electricity is deemed to be a normal good and necessary good. It is a normal good because increasing incomes are shown to increase demand, albeit less than proportional. It is a necessary good as the price elasticity is low, meaning households keep consuming despite price increases (Cialani & Mortazavi, 2018).

Demand of electricity being inelastic to price changes is confirmed by further studies. Liu et al. (2021) analyze energy prices in 30 Chinese provinces between 2007 and 2016. They conclude that consumption of electricity among households does not seem to vary significantly depending on the price of electricity. Instead, they find a positive correlation between income and electricity consumption. Electricity consumers cannot change their behavior in any significant way in the short term, but they have the means to do so in the long run through the use of electricity-saving appliances (Liu, et al., 2021).

Labandeira, Labeaga, & López-Otero (2017) show in a meta-analysis including over 400 papers on price elasticities of energy demand between 1990 and 2016 that on average, the average elasticity is -0.21 in the short run, and -0.61 in the long run. The measured energy products were electricity, natural gas, gasoline, diesel, and heating oil. Gasoline is estimated to be the most elastic product (Labandeira, Labeaga, & López-Otero, 2017). Highly developed countries are found to have a lower price elasticity of energy demand in the long run compared to developing countries.

Brons, Nijkamp, Pels & Rietveld (2008) conclude in a meta-analysis including 312 elasticity observations that the short run price elasticity of gasoline is -0.36. In the long run, price elasticity is -0.81. They find American, Canadian, and Australian consumers to be particularly insensitive to price changes. As for possible explanations to why, the authors mention high

incomes, low gasoline prices, sparse population, and primitive public transport infrastructure. Having high incomes and low prices also contribute to the low price sensitivity among those consumers. Brons, Nijkamp, Pels, & Rietveld (2008) conclude “fuel taxes alone would not be very effective in reducing the external costs of road transport”.

While there is a large literature on the price elasticity of gasoline, Davis & Kilian (2011) point out there is not much literature on the effectiveness of gasoline taxes as a tool reduce carbon emissions. They point out that the demand for gasoline is endogenous, meaning increased demand for gasoline leads to price increases. This can lead to conclusion that the price elasticity for gasoline is close to zero. Davis & Kilian (2011) point out that changes in the tax rate will lead to a more persistent price change, unlike short-run fluctuations.

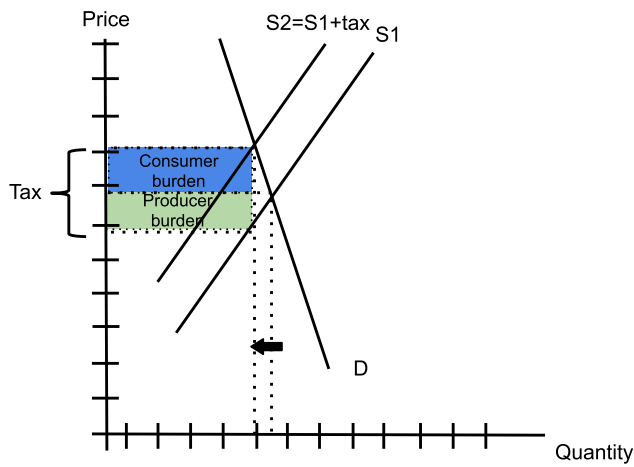
Using data on gasoline consumption in the United States between 1989 and 2008, Davis & Kilian (2011) find that the short run response on a ten cent tax increase, lowers emissions in the US by 0.48 percent. The authors suggest a gasoline tax can reduce emissions more in the long run for a wide variety of reasons, including individuals moving nearer their workplace, drivers changing vehicles to more energy-efficient ones, and cities building systems of mass transit. Davis & Kilian (2011) point out that estimates are based on small tax changes, and that no increase larger than 10 cents has been observed, making it harder to draw conclusions on larger tax increases.

## VAT rate reductions

### Tax incidence

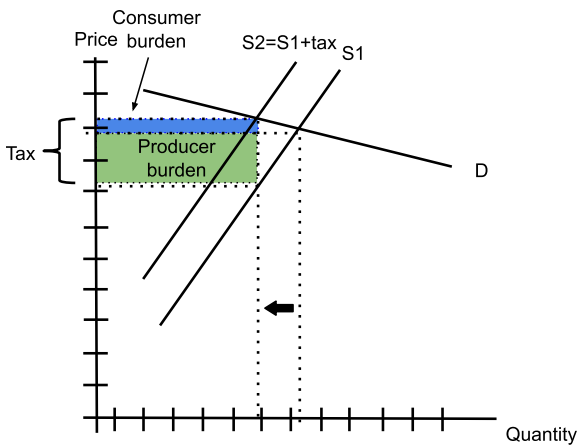
The incidence of a tax is how the burden of the tax is distributed between economic agents. Aside from formal incidence, meaning who legally pays the tax, there is also an economic incidence. The economic incidence refers to how the excess burden of a tax is distributed. The elasticity of demand of a taxed product is said to be decisive on how the economic incidence is distributed. If a product has a high elasticity of demand, the tax burden shifts to the suppliers, while if the product has a low elasticity of demand, the burden falls on the consumers (Hashimzade, Myles, & Black, 2017). Demand being more elastic, makes it easier for consumers to substitute the product for others, thus putting the tax burden on the suppliers (Rosen & Gayer, 2014). Figures 7 and 8 show how a unit tax, a tax consisting of a fixed amount per unit, effects a market of an inelastic good and an elastic good, respectively (Rosen & Gayer, 2014; Pettinger, 2017).

Figure 7. Taxing a product with low elasticity of demand



Note: From Pettinger, T. (2017). *Effect of tax – depending on elasticity.*

Figure 8. Taxing a product with high elasticity of demand



Note: From Pettinger, T. (2017). *Effect of tax – depending on elasticity.*

Adding a tax on the supply side will shift the supply curve to the left, as seen in both figures. In figure 7, with a steeper demand curve, the consumers will take most of the tax burden. In figure 8, where the demand curve is flatter, the tax burden instead falls on the producers.

Literature on tax burdens in oligopolistic markets suggest that under certain demand conditions, the tax pass-through rate is greater than one. Analyzing the gasoline and diesel markets in the United States, Marion & Muehlegger (2011) find not only that the burden of gasoline and diesel taxes falls on the consumers, but that the tax pass-through rate is greater than one. As for federal diesel taxes, a one cent tax increase leads to consumer prices increasing with 1.1 cents on average.

## Empirical examples of changes of the VAT rate

Warwick et al. (2022) researched the use of preferential VAT rates in several low and middle-income countries. They define preferential VAT rates as reductions of VAT rates of specific goods consumed by the poor households. They conclude that much of the benefits of lowered VAT rates favors richer households, as households that can afford to spend more cash also will save more through a lower VAT. For a preferential VAT rate to benefit the poor more than rich, it must concern a good that is consumed more by the poor than by the rich in absolute terms (Warwick, et al., 2022). To combat poverty, the authors advocate for cash transfers and universal transfers rather than preferential VAT rates.

Temporary VAT rate reductions have rarely been used (Fuest, Neumeier, & Stöhlker, 2020). There are however a few empirical examples of such measures.

Rising gasoline prices in the US Midwest, caused by a supply shortage of refined gasoline, led to the governments of Indiana and Illinois to temporarily suspend their sales taxes on gasoline (Doyle & Samphantharakc, 2008). The posted gasoline prices were required to show taxes, meaning consumers buying gasoline would be aware of the tax cut. The pass-through rate of the VAT rate cut was observed to be 70 percent, while the following tax increase had a pass-through rate to consumers of 80-100 percent (Doyle & Samphantharakc, 2008).

The United Kingdom temporarily reduced the standard VAT rate in 2008, in order increase consumer spending. This was a policy measure taken against the financial crisis (Crossley, Low, & Sleeman, 2014). The reduction from 17.5 percent to 15 percent was maintained for 13 months and included most commodities (Blundell, 2009). The standard VAT rate also applies to petrol and diesel (GOV.UK, n.d.) Blundell (2009) suggested the temporary VAT rate cut would lead to a decrease in prices, which in turn would be exactly offset by a rise in consumer expenditure. Chirakijja, O'Dea, Crossley, & Lührmann (2009) noted that consumer expenditure rose immediately after the VAT rate was reduced, which implied consumers had been notified by the wide publicization of the tax cut.

In 2014, the Belgian government reduced the VAT on electricity for households from 21 percent to 6 percent (Hindriks & Serse, 2022). The reduction was reversed the following year. The tax cut was found to, on average, increase demand for electricity by 2.35 percent. The increased demand is positively correlated with sunlight hours. While demand for electricity increased during spring and summer, electricity consumption stayed at the pre-tax cut levels

during winter. Hindriks & Serse (2022) suggest this is due to winter being colder and darker, making electricity more essential during that time of year than in the summer months.

The reduced VAT rate for electricity was entirely shifted to the electricity consumer prices. Hindriks & Serse (2022) propose three reasons to why it did. Firstly, Belgium had a competitive market for electricity. Secondly, the tax cut was broadly advertised through media channels. Thirdly, electricity producers chose their prices through formulas, which would have to be modified to keep the tax incidence from shifting to the consumers. This could have been considered too costly.

As a response to the negative economic effects caused by the coronavirus pandemic, in 2020 the German government temporarily reduced the VAT rate from 19 percent to 16 percent, and the VAT rate on food and beverages was cut from 7 percent to 5 percent (Fuest, Neumeier, & Stöhlker, 2020). The tax cut was set to reduce prices and thus increase consumption (Montag, Sagimuldina, & Schnitzer, 2020). Studying supermarket prices, Fuest, Neumeier, & Stöhlker (2020) conclude the tax cut was almost entirely passed on to consumers.

The authors also find the pass-through rates differ between different fuel products, diesel being the fuel product with the highest pass-through rate at 83 percent. Diesel drivers drive more than gasoline drivers and are therefore more inclined to search for higher prices. Montag, Sagimuldina, & Schnitzer (2020) suggest this puts pressure on fuel stations to lower their prices, which means passing through the VAT rate cut to the consumers. Standard gasoline, also referred to as E5, has a lower pass-through rate than gasoline with an ethanol share of 10 percent, named E10. E10 is cheaper than E5 and compatible with almost all vehicles compatible with E5, yet E5 remains a more popular choice. Montag, Sagimuldina, & Schnitzer (2020) conclude E10 consumers are thus more price sensitive than E5 consumers. E10 also has the second highest pass-through rate at 61 percent. E5 has a pass-through rate of 40 percent.

## Analysis

Nearly all literature on in-kind transfers and cash transfers concerns either developing countries or vulnerable groups in developed countries. In addition, little literature on in-kind transfers concerns energy. The absence of such literature can be explained by the measures being quite extraordinary. It can therefore be hard to predict exactly how these measures will affect consumption.

According to economic theory, cash transfers are at least as good as in-kind transfers for the recipients. It is said that transfers in-kind can create market distortions. Cunha, De Giorgi, & Jayachandran (2019) have shown that in-kind transfers can decrease the price of the transferred good through a supply effect but does not distort the prices of non-supplied goods. The in-kind transfers used to compensate for rising energy prices mostly take the form of vouchers and can therefore not increase the current supply. Nevertheless, it is likely the finding that in-kind transfers do not distort prices of other goods still holds.

The consumption effect of food stamps has been studied on multiple occasions, but as Hoynes & Whitmore Schanzenbach (2009) point out, method errors might have overstated the consumption effect of food stamps. They find the MPC for food to be higher for food stamps than for cash transfers, but that the difference is not as big as previously thought.

Slesnick (1996) focuses on excess burdens created by providing in-kind transfers instead of cash transfers. He shows that there is little difference in efficiency between in-kind transfers of food and capital services, and cash transfers. He does however find transfers of gasoline and electricity to be inefficient in poverty reduction. Unfortunately, energy transfers are not the main focus of his paper, and he does not examine what makes energy transfers ineffective. As concluded by other studies, the elasticity of demand for both gasoline and electricity is low, albeit gasoline being more elastic. According to Tabor (2002), a small elasticity of demand will lead to a greater excess burden. While this might support Slesnick's findings on energy transfers being inefficient, it does not explain why they differ from food transfers, as food is considered a necessity good as well. Overall, there is evidence that in-kind transfers do not lead to large efficiency losses, but that it might not be the case for energy transfers.

Several governments limit their policy measures to only include those below a certain income level, which requires some kind of means-based testing. Whether to use means-based transfers or universal transfers, depend according to Besley's (1990) models on leakage rate, the mean income difference, and income variances. A universal transfer system is preferred if there are large inequalities between poor recipients and poor non-recipients. Such problem be solved by, for instance, automatically applying an electricity credit to the recipient's electricity bill. Such system can reduce, or even eliminate, exclusion errors despite not being a universal system.

The proposal by the Swedish government to financially support car owners is composed by two separate parts. Firstly, there is a geographical targeted part. The government is giving an

extra SEK 500 to car-owners living in certain geographical areas. Secondly, there is the main part of giving SEK 1000 to all car owners, regardless of where they live. This is a targeted, rather than universal, transfer, as it only applies to people who own a car. However, it shares some properties with universal transfers. Unlike many targeted transfer systems, it does use any sort of means-based testing. All recipients receive the exact same amount of money, similar to how base income works.

The prime minister of Sweden said the government decided to implement a policy measure consisting of more universal type of transfers, due to targeted transfers being time-consuming. One way to interpret this decision, is by considering a time-consuming process to be costly by itself. If time is considered targeting cost, then the costs of a targeted transfer system might exceed the costs of something more comparable to a universal transfer system. But when it comes to monetary costs, earlier studies have proven that administrative costs of transferring systems are generally small, in particular for cash transfer systems. It is possible that a more universal system can receive more support by the general public, and thus be implemented easily. But there are little reasons not to implement some sort of means-testing.

Another policy measure imposed by several European countries is to lower the VAT rates on transport fuels. In absolute terms, studies show reducing the VAT rate benefits the better-off households more than the poor. Temporary lowering the VAT rates is a rarely used policy measure, but it has been done in a few European countries in the last 15 years. Empirical examples show that just like VAT tax increases are passed on to consumers, VAT rate decreases can too be passed on to consumers. The electricity VAT cut in Belgium and the diesel VAT cut in Germany are examples of this. The German example shows however, that it is not completely certain such tax cut actually gets passed on to consumers. Only 40 percent of the tax cut on E5 gasoline was passed on to consumers, likely due to E5 consumers being less price elastic than consumers of other transportation fuels. In summary, studies suggest that VAT cut decreases can successfully decrease prices for consumers. However, this appears not to be the case for E5 gasoline. Lowering gasoline taxes might therefore be a blunt instrument for compensating rising costs for households. Transport & Environment (2022) estimate lowering these taxes saves more money for the rich than the for poor.

As households in small towns and rural areas are more vulnerable to rising electricity and fuel prices, it makes sense for governments to use geographical targeting when setting up transferring systems. To my knowledge, few policy measures that use geographical targeting have been implemented, however.



For a self-targeting transfer system to work, it needs to keep people who are not in need of the transfers from opting in. This can be done by offering a low-value transfer, reducing the incentives for non-needing people to opt in. The obvious problem with this measure is that it lowers the value of transfers to those who actually need the transfers. If the self-targeting transferring system involves in-kind goods rather than cash, transfers can be fixated to those who really need them by reducing the quality of the in-kind goods. This is not an applicable measure for electricity vouchers, as electricity cannot differ in quality.

Studies on the elasticity of demand on electricity and gasoline conclude small changes in prices do not significantly impact the demand of these goods in the short run. The elasticities of demand for fuels are larger in the short run, and larger for gasoline than for electricity. In the short term, changing behavior regarding household use of electricity and gasoline can be hard. This can be one explanation to why changes in electricity prices have a small impact on electricity consumption, while electricity use is highly correlated with the levels of income. High income is suggested as a reason why North American and Australian gasoline consumers are particularly insensitive to gasoline price changes. People living in high income countries are also less price sensitive in the long run than people in low and middle-income countries when it comes to usage of energy sources in general.

Davis & Kilian (2011) have shown that gasoline taxes can reduce emissions. The reductions are however small in the short term. The effectiveness of larger tax increases is hard to conclude. I could not find any literature that examines the link between electricity taxes and emissions. This could likely be due to emissions being different depending on the source of electricity. Still, there are studies on the elasticity of demand for electricity proving that changes in electricity prices need to be large for reducing consumption. The temporary VAT cut studied by Hindriks & Serse (2022), caused an increase in electricity consumption, but only during spring and summer. The low elasticities of demand for electricity and gasoline suggest smaller, one-off cash and in-kind transfers, and smaller tax cuts, likely will not increase emissions by a large amount. Still, one could argue that such measures set bad precedents for the future.

## Conclusions

This paper has examined policy measures taken by governments in Europe to compensate households for increasing prices of gasoline and electricity. This includes in-kind transfers, cash transfers and VAT rate cuts. Studies suggest that cash transfers and in-kind transfers can lead to similar outcomes, but that it might differ for in-kind transfers of energy. Cash transfers can therefore appear to be a preferable way of compensating households. VAT reductions have successfully decreased prices of electricity and transport fuels. There are however caveats concerning transport fuels, as reducing taxes on E5 gasoline has benefited producers over consumers in the past.

While some governments have applied measures which directly benefit a large share of their populations, other have focused on helping the poorest. Transfers, both in-kind and cash, appear to be better for helping the poor compared to VAT rate cuts. Literature discussed in this paper suggests that targeting is a small expense for transferring programs, especially cash transfer programs. If the rationale behind the policy measures is to help the most vulnerable households, means-testing will likely help them as much as a universal transfer.

Most literature shows that the price elasticity of demand for electricity and gasoline is low. Small increases of gasoline taxes and decreases of electricity taxes have changed consumer behavior, but not by sizeable amounts. Still, it is hard to predict how such measures will affect pollution in the long term.

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