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The Limits of a Broad VAT Cut: Pass-Through Heterogeneity and Welfare Interpretation*

Michael Barczay[†], Shafik Hebous[‡] and Tom Zimmermann[§]

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Abstract

This paper studies heterogeneity in the pass-through of Germany's temporary VAT reduction in July 2020. Using confidential product-level CPI data, we document substantial dispersion in consumer-price responses: nearly half of standard-rate products show no consumer-price change, while 30% exhibit full pass-through. Lower-income households experienced somewhat larger proportional price declines than higher-income households. Using an inverse-optimality consistency test, we show that, once the full revenue loss is considered, the reform cannot be rationalized by any progressive weighting of gains across income groups.

Keywords: VAT; Tax Incidence; Fiscal Stimulus; Pass-through

JEL Classification: H21, H22, H23

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1 Introduction

Temporary consumption tax cuts are a common response to large adverse shocks. Their intended mechanism is straightforward: by lowering consumer prices, they are meant to support private demand. Whether this happens in practice, however, is an empirical question. Price pass-through may be incomplete and uneven across products because of market structure, demand and supply elasticities, or pricing frictions.

Most of the existing literature either estimates the *average* pass-through for VAT reforms or studies narrowly defined sectors. While informative, this evidence leaves open whether pass-through differs systematically across products and households' consumption baskets. For example, price reductions might be larger for goods that account for a greater share of lower-income households' spending, potentially leading to unequal relative gains across the income distribution. Understanding the heterogeneity in pass-through is thus essential to assess both the effectiveness of broad-based VAT reforms as a demand stimulus and the policy's welfare implications.

We study Germany's temporary VAT reduction of July 2020, which lowered the standard rate from 19% to 16% and the reduced rate from 7% to 5%. Using confidential product-level CPI microdata from the Federal Statistical Office of Germany, we make three main contributions.

First, we document that pass-through was highly uneven across products. For standard-rate items, nearly half of observations show no price change, while about 30% exhibit complete pass-through. For reduced-rate items, the corresponding shares are roughly one quarter and 16%. Our average pass-through estimates are 54% for standard-rate goods and 126% for reduced-rate goods. Thus, going beyond both these averages and those reported by Fuest et al. (2025), we document substantial dispersion in product-level responses.

Second, we show that this heterogeneity also has a distributional dimension. When we aggregate product-level price changes to household consumption baskets, we find that lower-income households experienced somewhat larger proportional price reductions than higher-income households. Although the pattern is not fully monotonic at the very bottom, pass-through declines from about 68% for lower-income households with monthly income between €1,000 and €1,300 to about 59% for households with income above €5,000. Those findings complement

Bachmann et al. ([forthcoming](#)), showing that the price changes underlying demand responses vary systematically across products and income groups.

Third, we turn to a key policy question: is such a pattern sufficient to make the reform progressive overall? We develop an inverse-optimality consistency test based on group-specific gains relative to the fiscal cost of the reform. Under our preferred benchmark, which counts the full revenue loss of the reform, we find that the VAT cut cannot be rationalized by any progressive welfare schedule. Although lower-income households experience somewhat larger proportional price reductions, consumer gains are tilted toward richer households in euro terms because expenditure levels rise sharply with income.

Related Literature. Our paper relates to the literature on VAT pass-through. Using data on 70 commodity groups across 17 Eurozone countries, Benedek et al. ([2020](#)) find near-complete pass-through of standard-rate VAT changes and lower pass-through for reduced rates. Using monthly scanner data on durable goods in the EU, Buettner and Madzharova ([2021](#)) similarly find full pass-through of standard-rate changes on average. Most closely related to our setting, Fuest et al. ([2025](#)) study Germany’s temporary VAT cut using scanner data and estimate an average pass-through of about 70%. Our contribution is to move beyond the average response by documenting extensive heterogeneity across products and tracing its implications for distribution and welfare.

The paper also relates to work on reduced-rate VAT reforms, which often finds incomplete or asymmetric transmission. Kosonen ([2015](#)) studies a VAT cut for hairdressers in Finland and finds that producers and consumers roughly split the incidence. Benzarti et al. ([2020](#)) show that many firms kept prices unchanged after the same reform, and Benzarti and Carloni ([2019](#)) find only small price declines following the French restaurant VAT cut. In contrast, Harju et al. ([2018](#)) document an all-or-nothing response to restaurant VAT cuts in Finland and Sweden, and Gaarder ([2019](#)) finds full pass-through of reduced VAT rates on food in Norway. Our setting allows us to compare standard-rate and reduced-rate products within the same reform and link the resulting heterogeneity to household incidence. More recently, Benzarti et al. ([2024](#)) analyze a temporary VAT cut on food necessities during high inflation in Argentina. They show that pass-through can be asymmetric and persistent, and that the distributional consequences of the policy depend importantly on how price responses unfold across stores and households. Using a different

welfare framework, they find progressive welfare effects of the VAT cut despite larger absolute benefits for higher-income households. Our paper complements this evidence by showing that, for a broad temporary VAT cut in Germany, the welfare interpretation becomes less favorable once gains are evaluated relative to fiscal cost.

Finally, our paper relates to work on the macroeconomic effects of tax changes. Bachmann et al. ([forthcoming](#)) analyze the German VAT cut using scanner data and a heterogeneous-agent New Keynesian (HANK) model, concluding that demand responses were stronger among consumers who perceived pass-through to be stronger. Our evidence complements this perspective by showing that pass-through itself varies systematically across products and income groups, with implications for both stabilization policy and distributional evaluation.

The remainder of the paper is organized as follows. Section [2](#) describes the data and measurement. Section [3](#) documents heterogeneity in product-level price responses. Section [4](#) studies household incidence across income groups and develops the inverse-optimality consistency test. Section [5](#) concludes.

2 Background, Data, and Definitions

From July 1 to December 31, 2020, Germany temporarily cut the standard VAT rate from 19% to 16% and the reduced rate from 7% to 5%.¹ The legislative proposal framed the reform as a rapid measure intended to strengthen purchasing power weakened by the COVID-19 pandemic and stimulate domestic demand (Deutscher Bundestag, [2020](#)). Presenting the measure in parliament, Finance Minister Olaf Scholz described it as “a very strong economic stimulus” that would “improve citizens’ purchasing power”. He argued that its temporary nature would encourage households to purchase immediately rather than postpone spending (Scholz, [2020](#), authors’ translation).

To assess the extent to which the reform translated into consumer price reductions—and thus had the potential to stimulate demand—we use confidential product-level price data collected by the German Statistical Office. These micro data underpin Germany’s official aggregate inflation

¹The reform’s movement through the legislative process was unusually fast: The government agreed on the reform on June 3, 2020, and parliament (and the state’s chamber both) approved the corresponding law on June 29, 2020. It entered into force on July 1, 2020.

measures and therefore reflect the entire consumption basket of German households.

The dataset comprises price quotes gathered from retailers and service providers across the entire country at monthly frequency, covering a broad range of goods and services. It includes information on product categories, outlets, time of collection, and precise transaction prices.

Expenditure data for welfare calculations in section 4.2 are obtained from the German Federal Statistical Office (Statistisches Bundesamt, 2025) and refer to the year 2023. Required information on household shares is likewise drawn from official statistics and obtained through Bundeszentrale für politische Bildung (2020), representing the distribution in 2018. Because the welfare exercise is conducted on broad income groups, modest differences in reference years are unlikely to be first-order for the qualitative ranking of gains across groups, and we combine the closest available official sources.² Summary statistics on income categories and household shares can be found in Table 3.

To assess the degree to which the VAT rate cut was transmitted to consumers, we construct two complementary measures. Our preferred measure is the seasonally adjusted price change, denoted $\Delta P_{jcs,l}^{SA}$, which captures the change in the consumer price of product j of category c in store s and municipality l between June and July 2020, net of usual seasonal movements. We additionally construct a pass-through rate, which normalizes the observed price change by the mechanical full-pass-through benchmark.

Let $P_{jcs,l,t}$ denote the consumer price and $p_{jcs,l,t}$ the corresponding pre-tax price. Stores of a chain are considered individual stores. Let $R_{jcs,l,t}$ denote the gross price ratio:

$$R_{jcs,l,t} \equiv \frac{P_{jcs,l,t}}{P_{jcs,l,t-1}} = \frac{(1 + v_t^j)p_{jcs,l,t}}{(1 + v_{t-1}^j)p_{jcs,l,t-1}}, \quad (1)$$

where v_t^j is the VAT rate applying to product j .

We compute the seasonally adjusted price change as the difference between the June–July price ratio in 2020 and the corresponding ratio in June–July 2019:

²The expenditure data classify the two lowest income groups as households with monthly income below €1,000 and between €1,000 and €1,300, whereas the household-share data use categories below €900 and between €900 and €1,300. As no finer breakdown of the underlying income distribution is available, we map these household-share categories to the corresponding expenditure groups, treating the €100 difference in the cutoff as negligible.

$$\Delta P_{jcsl}^{SA} = R_{jcsl,2020} - R_{jcsl,2019}. \quad (2)$$

This removes any price changes that commonly occur between June and July. The more negative ΔP_{jcsl}^{SA} , the stronger the consumer price response.

Under complete pass-through, holding the pre-tax price fixed, the consumer price change implied by the VAT reduction is

$$\Delta P_j^{\text{full}} = \frac{1 + v_{\text{Jul},2020}^j}{1 + v_{\text{Jun},2020}^j} - 1. \quad (3)$$

For products taxed at the standard rate, this equals $\frac{1+0.16}{1+0.19} \approx 0.9748$, implying a $0.9748 - 1 = -0.0252 = 2.52\%$ consumer price reduction. For products subject to the reduced rate, it equals $\frac{1+0.05}{1+0.07} \approx 0.9813$, implying a 1.87 % consumer price reduction.

We then define the pass-through rate as the observed price change divided by the mechanical full pass-through benchmark:

$$\rho_{jcsl,2020} = 100 \times \frac{\Delta P_{jcsl}^{SA}}{\Delta P_j^{\text{full}}}. \quad (4)$$

Thus, a value of $\rho = 100$ indicates complete pass-through and $\rho = 0$ indicates no price adjustment. While our preferred measure ΔP_{jcsl}^{SA} captures the actual consumer price change (the economically relevant object for incidence and welfare analysis), the pass-through rate ρ facilitates comparison across products subject to different statutory VAT rates.

Table 1: *Summary Statistics*

	Standard Rate			Reduced Rate		
	Mean	Median	SD	Mean	Median	SD
Price change ΔP^{SA} (%)	-1.36	0.00	9.70	-2.36	-2.01	15.60
Pass-through rate ρ (%)	54	0	385	126	108	835
Nr. of price observations		83,640			65,576	
Nr. of outlets		16,044			4,594	

Notes: The price change ΔP^{SA} is the seasonally adjusted percentage change in consumer prices between June and July 2020. The values are reported in percent. The pass-through rate ρ divides the price change by the mechanical full-pass-through benchmark (-2.52% for standard-rate and -1.87% for reduced-rate goods), so that $\rho = 100\%$ corresponds to complete pass-through.

Table 1 reports summary statistics for the estimation sample, comprising 149,216 price observations in total, with 83,640 observations for standard-rate goods across 16,044 outlets and 65,576 observations for reduced-rate goods across 4,594 outlets. Between June and July 2020, the mean seasonally adjusted price change is -1.36% for standard-rate products and -2.36% for reduced-rate products, with substantial dispersion (standard deviations of 9.70 and 15.60). The median price change is zero for standard-rate items, suggesting that a large share of prices did not adjust. The median for reduced-rate items is -2.01% , close to the mechanical full-pass-through benchmark of -1.87% . Consistent with these patterns, the mean pass-through rate is 54% for standard-rate goods, while reduced-rate goods exhibit an average pass-through of 126%, implying over-adjustment. This contrast is also seen in median comparisons: the median pass-through is 0% for standard-rate products but 108% for reduced-rate products. The very large standard deviations (385 and 835) highlight pronounced heterogeneity across products, which we explore further in section 3.

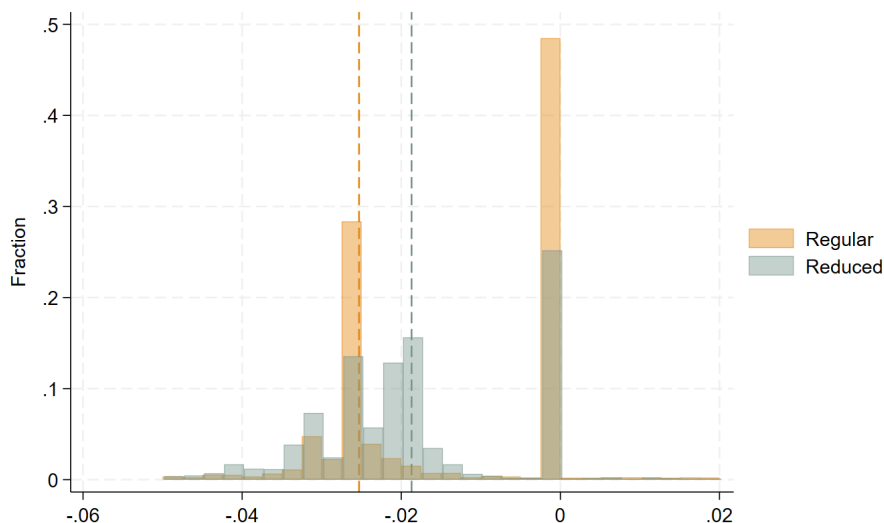
3 Price Changes across Products

Figure 1 shows the distribution of the seasonally adjusted price change ΔP_{jcsl}^{SA} for all products. The vertical dashed lines represent the expected price change under complete pass-through: -0.0252 for standard-rate and -0.0187 for reduced-rate products.

The distribution is wide and highly dispersed. A sizeable share of products clusters near the mechanical complete-pass-through benchmark, but many exhibit only partial adjustment, no change at all, or even price increases despite the statutory tax reduction. Among standard-rate products, prices are reduced one-for-one with the VAT cut for roughly 30% of items. At the same time, nearly half of standard-rate products exhibit no price change whatsoever, implying no observed pass-through to consumer prices. Only a small fraction displays a price response outside the neighborhoods of zero or complete pass-through. The pattern for reduced-rate products is qualitatively similar but less pronounced: approximately 25% exhibit no price change, and a considerable mass is located at the complete-pass-through benchmark.

The heterogeneity in pass-through is not driven by a small number of sectors: substantial dispersion remains within broad consumption categories. Table 2 reports the estimated pass-

Figure 1: *Distribution of Price Changes ΔP_{jcsl}^{SA} by VAT Rate*



Notes: Histograms show the seasonally adjusted product-level price change ΔP_{jcsl}^{SA} by VAT rate, defined as the June–July 2020 price change net of the corresponding change in 2019. Dashed lines denote complete-pass-through benchmarks (−2.52 percent for regular-rate and −1.87 percent for reduced-rate goods).

through by broad consumption category. Pass-through varies widely: The food, beverages, and tobacco category exhibits pass-through above 100%, while education, transport, information and communication, and restaurants and accommodation show substantially lower pass-through. These category-level estimates underlie the construction of income-group-specific price changes in Section 4.1.

The large mass of unchanged prices overall and within categories is consistent with the temporary nature of the tax cut. For a tax change of known and short duration of only six months, the menu costs of repricing twice within half a year may lead some firms rationally to leave prices unchanged. Our estimates thus speak directly to an important class of VAT reforms: temporary tax cuts used in response to shocks.

4 Welfare Implications

4.1 Price changes across income groups

Uneven pass-through across products implies that incidence varies substantially across households depending on the composition of their consumption baskets. To assess the pass-through to

Table 2: *Pass-Through by Consumption Category*

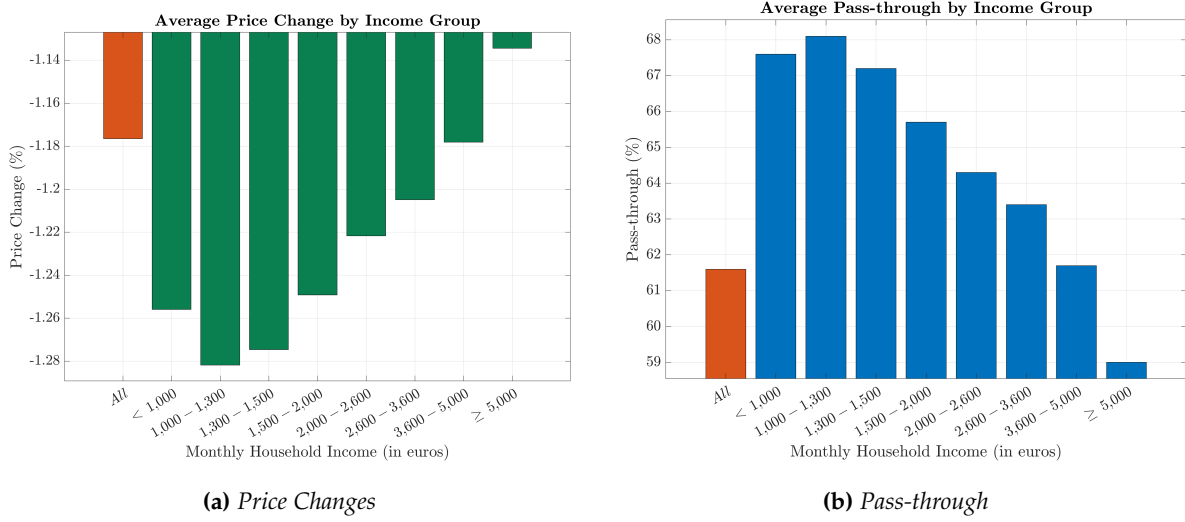
COICOP	Category	Pass-through (%)		SE	N
		Weighted	Unweighted		
1	Food and non-alcoholic beverages	127.6	140.2	4.5	45,530
2	Alcoholic beverages and tobacco	75.9	91.4	6.4	4,938
3	Clothing and footwear	89.1	93.8	5.7	3,537
4	Housing and energy	64.8	66.1	2.4	5,589
5	Furnishings and maintenance	85.5	84.3	2.6	11,310
6	Health	63.2	85.2	4.7	4,464
7	Transportation	-18.3	1.0	2.4	12,340
8	Communication	74.3	103.6	15.3	93
9	Recreation, sports, culture	91.0	64.6	4.2	8,409
11	Restaurants and accommodation	-1.3	6.6	3.8	5,365
12	Miscellaneous goods and services	50.3	66.1	3.3	13,001

Notes: Pass-through is measured as the ratio of the observed price change to the mechanical full pass-through benchmark, expressed in percent. A value of 100 corresponds to complete pass-through. “Weighted” uses country-wide expenditure shares; “Unweighted” uses simple averages. SE is the standard error of the unweighted mean. *N* is the number of product-level price observations. COICOP categories refer to “Classification of Individual Consumption According to Purpose”. Category 10 (Education) is missing since its VAT rate is 0. As the 0 rate was not changed, our pass-through measure cannot be computed.

different households, we aggregate the product-level price changes to household consumption baskets as follows. We first compute category-level price changes using country-wide expenditure shares. We then compute income-group-specific price changes by taking a weighted average across categories, where the weights correspond to the expenditure shares of each income group (see Section 2). This procedure implicitly assumes that households allocate spending identically across products within a given category; thus, our estimate likely understates the degree of heterogeneity across groups. For the category “Food, beverages, tobacco and similar items,” we combine subcategories using country-wide expenditure shares where the disaggregation in the income-level expenditure data does not correspond one-to-one to COICOP categories (Classification of Individual Consumption According to Purpose).

Figure 2 illustrates systematic heterogeneity across the income distribution. Although all eight income groups experience a reduction in consumer prices, the magnitude varies. The proportional price reduction peaks at 1.29% for households with monthly income between €1,000 and €1,300 and then declines monotonically with income, reaching 1.15% for households above €5,000. The poorest group (below €1,000) experiences a slightly smaller proportional reduction of 1.26% than

Figure 2: Price Changes and Pass-through by Income



Notes: The left panel shows the average price change ΔP^{SA} by income group; the right panel shows the corresponding pass-through rate ρ . Both are constructed by first computing product-level price changes associated with the VAT reduction and aggregating them to the 12 expenditure categories using country-wide average consumption shares at the product level. These category-level price changes are then combined into an income-group-specific average using the expenditure weights reported by the German Statistical Office for eight income groups (Statistisches Bundesamt, 2025). This procedure assumes that households differ only in the composition of spending across the 12 broad categories, while using the same country-wide product weights within each category for all income groups. For the category Food, beverages, tobacco and similar items, we form a composite using national expenditure weights for Food and non-alcoholic beverages and Alcohol and tobacco. Using simple unweighted averages to aggregate product-level price changes to category price changes yields a very similar pattern across income groups.

adjacent groups, reflecting the exceptionally high housing expenditure share (approximately 51%) of this group, a category with modest price adjustment. From the second income group onward, the proportional benefit declines strictly with income: the corresponding pass-through rates fall from 68.1% to 59.0% between the €1,000–€1,300 and the €5,000-and-above brackets.

A key factor underlying this gradient is the differing expenditure shares across broad consumption categories. Lower-income households devote roughly 19% of their spending to food, beverages, and tobacco, a category experiencing comparatively strong price reductions, while this share falls to about 13% for high-income households. By contrast, housing constitutes the largest expenditure share across all groups, with the share declining steeply from about 51% for the poorest to 31% for the richest households. Since housing experienced modest price adjustment, this compositional difference partially offsets the food channel for the very poorest group while reinforcing the overall declining pattern for higher-income brackets. These results echo Fuest et al. (2025), though we find slightly lower pass-through rates, likely reflecting the fact that their paper focuses on goods sold in supermarkets, which on average display stronger pass-through.

4.2 Welfare Interpretation: A Consistency Test

Section 4.1 concerns proportional price changes and pass-through rates across household consumption baskets. These proportional gains need not translate into a pro-poor allocation of gains per euro of fiscal cost, because expenditure levels rise sharply with income. A household that experiences a slightly smaller proportional price reduction may still receive a much larger gain in euro terms if its underlying expenditure is substantially higher. As a result, the ranking of gains in euro terms may differ substantially from the ranking of percentage price changes. We therefore study a natural welfare question: Do the observed price reductions line up more closely with a government that values gains to lower-income households more than gains to higher-income households?

We evaluate the reform using an inverse-optimality consistency test. The question asked is whether the observed incidence pattern is consistent with a government that places greater welfare weight on lower-income households, or whether the same evidence points in a different direction once the reform is evaluated more broadly.³

³Appendix A.1 reports a complementary inverse-optimality exercise that maps the observed group-level incidence

4.2.1 Group Gains per Euro of Fiscal Cost

Let $g = 1, \dots, G$ index income groups ordered from poorest to richest. Let Γ_g denote the estimated pass-through of the VAT reform into the cost of the consumption basket of income group g . Let E_g denote baseline household expenditure in group g on VAT-affected goods, and let μ_g denote the share of households in income group g .

Under a first-order index-number approximation, the VAT-induced change in the log cost of group g 's basket is $d \ln P_g = \Gamma_g d\tau$, where $d\tau < 0$ denotes the statutory VAT change. A small proportional reduction in the cost of the basket generates a first-order monetary gain:

$$\Delta c_g \approx -E_g d \ln P_g = -E_g \Gamma_g d\tau. \quad (5)$$

Weighting the household-level gain by the household shares yields the household-share-weighted gain for group g :

$$B_g \equiv \mu_g \Delta c_g \approx -\mu_g E_g \Gamma_g d\tau. \quad (6)$$

Empirically, $\Gamma_g d\tau$ is the change in the log cost of the basket, which for the small price changes we study is closely approximated by the observed basket price change ΔP_g^{SA} estimated in Section 4.1; the table below therefore computes $B_g = \mu_g E_g |\Delta P_g^{SA}|$ directly from the measured price changes.

Let C denote the fiscal cost of the reform under a given benchmark. The key sufficient statistic is the gain accruing to each income group per euro of fiscal cost:

$$m_g \equiv \frac{B_g}{C}. \quad (7)$$

The object m_g measures how many euros of gain accrue to income group g for each euro of fiscal cost. Its empirical ranking is not determined by pass-through rates alone, but also by differences in expenditure levels and household shares across income groups.

into implied relative welfare weights. It yields the same qualitative conclusion as the main text, but the reduced-form consistency test used here is more flexible because it does not require committing to a tighter structural mapping from observed incidence to welfare weights.

4.2.2 Government Objective and Local Desirability

Consider the reduced-form government objective

$$\Delta W^{gov} = \sum_{g=1}^G \omega_g B_g - \lambda C, \quad (8)$$

where $\omega_g \geq 0$ is the social marginal welfare weight on one euro accruing to income group g , and $\lambda > 0$ is the marginal value of one euro of public funds. Normalizing $\lambda = 1$, the reform is locally desirable if and only if

$$\sum_{g=1}^G \omega_g m_g \geq 1. \quad (9)$$

This is the basic inverse-optimality restriction. On its own, however, it is too permissive: many welfare-weight vectors may satisfy it. We sharpen the exercise by restricting attention to economically meaningful classes of welfare weights.

4.2.3 A Boundary Test for Progressivity

For any $R \geq 1$, define the class of progressive welfare weights

$$\Omega^P(R) = \left\{ \omega \in \mathbb{R}_{++}^G : \omega_1 \geq \omega_2 \geq \dots \geq \omega_G, \sum_{g=1}^G \mu_g \omega_g = 1, \frac{\omega_1}{\omega_G} \leq R \right\}. \quad (10)$$

For a given R , define the maximal welfare value of the reform over the class $\Omega^P(R)$ as

$$V^P(R) \equiv \max_{\omega \in \Omega^P(R)} \sum_{g=1}^G \omega_g m_g. \quad (11)$$

The reform can be rationalized by a progressive welfare schedule with a dispersion of at most R if and only if $V^P(R) \geq 1$. This leads to the summary statistic

$$R_p^* \equiv \inf \left\{ R \geq 1 : V^P(R) \geq 1 \right\}. \quad (12)$$

To assess whether the reform could also be rationalized by welfare weights tilted toward richer

households, define the corresponding class of weakly regressive schedules

$$\Omega^R(R) = \left\{ \omega \in \mathbb{R}_{++}^G : \omega_1 \leq \omega_2 \leq \dots \leq \omega_G, \sum_{g=1}^G \mu_g \omega_g = 1, \frac{\omega_G}{\omega_1} \leq R \right\}. \quad (13)$$

For this class, define

$$V^R(R) \equiv \max_{\omega \in \Omega^R(R)} \sum_{g=1}^G \omega_g m_g. \quad (14)$$

The reform is rationalizable by a weakly regressive welfare schedule with dispersion at most R if and only if $V^R(R) \geq 1$. When discussing magnitudes, we report forced-dispersion calibrations in which the relevant endpoint ratio is imposed as an equality: $\omega_1/\omega_G = R$ for progressive schedules and $\omega_G/\omega_1 = R$ for regressive schedules.

4.3 Evaluation

Table 3 presents the data inputs and our main results. We discuss its implications in detail below.

Table 3: *Inputs and Outputs of the Boundary Test*

Income Group	μ_g	E_g (€)	$ \Delta P_g^{SA} $	PT (%)	$ \Delta P_g^{full} $	B_g	m_g
<1 k	0.049	1,121	0.0126	67.64	0.0187	0.694	0.013
1 k–1.3 k	0.084	1,280	0.0129	68.25	0.0189	1.377	0.026
1.3 k–1.5 k	0.045	1,459	0.0128	67.32	0.0191	0.830	0.016
1.5 k–2 k	0.118	1,717	0.0125	65.85	0.0191	2.532	0.048
2 k–2.6 k	0.135	2,090	0.0123	64.42	0.0191	3.436	0.065
2.6 k–3.6 k	0.178	2,591	0.0121	63.53	0.0191	5.564	0.105
3.6 k–5 k	0.169	3,273	0.0118	61.92	0.0191	6.535	0.123
>5 k	0.222	4,760	0.0115	59.07	0.0194	11.977	0.226
Total	1.000	2,784		62.11		32.946	0.621

Notes: μ_g is the share of households in income group g . E_g is monthly household expenditure on VAT-affected goods (EUR). $|\Delta P_g^{SA}|$ is the absolute observed basket price change. PT is the pass-through rate ρ , estimated independently from product-level data and aggregated to income groups using expenditure weights. $|\Delta P_g^{full}|$ is the group-specific full-pass-through benchmark, constructed as $|\Delta P_g^{full}| = |\Delta P_g^{SA}| / (\text{PT}_g / 100)$; it reflects each group's expenditure-weighted mix of standard-rate ($-0.03/1.19 = -0.0252$) and reduced-rate ($-0.02/1.07 = -0.0187$) goods. $B_g = \mu_g \cdot E_g \cdot |\Delta P_g^{SA}|$ is the household-share-weighted consumer gain for group g . $m_g = B_g / C$ is the gain per euro of fiscal cost, where $C = \sum_g \mu_g E_g |\Delta P_g^{full}|$. The total row reports the household-share-weighted average for E_g , aggregate pass-through—total consumer gains divided by the full revenue loss—for PT, and sums for B_g and m_g .

Full Fiscal Cost

Our main benchmark defines fiscal cost as the full mechanical revenue loss from the VAT cut. This benchmark evaluates consumer gains against the full revenue loss. The resulting gains per euro of fiscal cost sum to

$$\sum_{g=1}^G m_g = 0.62, \quad (15)$$

which mirrors the average pass-through rate of roughly 62%.⁴ Because this sum falls short of one, equal welfare weights do not satisfy the local desirability condition.

More importantly, the group-level gains m_g rise with income overall, with the exception of the second poorest group, whose gain is elevated by its comparatively large household share (8.4%, versus roughly 5% for its immediate neighbors) rather than by materially higher pass-through. The poorest group captures only $m_1 = 0.013$ per euro of fiscal cost, while the richest captures $m_8 = 0.226$, a factor of roughly 17. This gradient is driven not primarily by differences in pass-through rates, which vary only modestly across groups, but by the large differences in expenditure levels, which range from €1,121 per month for the poorest group to €4,760 for the richest.

Because household-level gains (Δc_g) rise monotonically with income, progressive welfare weights, which tilt toward poorer households, can only reduce the welfare value relative to equal weights. The maximization over the progressive class of weights never reaches one, so no progressive welfare schedule can rationalize the reform and R_p^* does not exist in any economically meaningful finite sense. Regressive weights can compensate for the pass-through shortfall by concentrating weight on groups with high household-level gains. Under the forced-dispersion calibration, the welfare value reaches one when $\omega_G/\omega_1 \approx 96$. In other words, a planner would need to value a marginal euro accruing to the richest group roughly 96 times as much as a marginal euro accruing to the poorest group in order to rationalize the reform under the full-fiscal-cost benchmark.

This benchmark is our preferred one because it evaluates the VAT cut as an actual use of public resources. Under that criterion, the reform is not only unable to pass the local desirability

⁴This basket-level figure is the expenditure-weighted average of the product-level rates reported in Section 2: it lies above the 54% recorded for standard-rate goods and below the 126% for reduced-rate goods, because household spending is dominated by standard-rate items.

condition under equal weights; it is also incompatible with any progressive welfare weighting. The combination of incomplete pass-through and much larger spending levels at the top of the income distribution implies that the reform performs poorly as a redistributive use of fiscal resources.

Consumer Gains Only

To isolate the distributional question from the aggregate pass-through shortfall, we also consider an alternative benchmark that defines fiscal cost as the total gains actually received by consumers:

$$C = \sum_{g=1}^G B_g. \quad (16)$$

Under this definition, the gains per euro of fiscal cost sum to one by construction:

$$\sum_{g=1}^G m_g = 1. \quad (17)$$

Equal welfare weights therefore satisfy the local desirability condition exactly.

The ranking of gains across groups, however, is preserved. The poorest group receives $m_1 = 0.021$ of total consumer gains, while the richest receives $m_8 = 0.364$. The consumer gains tilt toward richer households.

The forced-dispersion calibration makes the distributional content of this ranking transparent. Any degree of imposed progressivity, with $\omega_1/\omega_G > 1$, reduces the welfare value below one because it shifts weight toward low- m_g groups. At a ratio of 10, the welfare value falls to 0.85. Conversely, any degree of imposed regressivity raises the welfare value above one because it amplifies the already large gains accruing to the highest-expenditure groups. At $\omega_G/\omega_1 = 1000$, the welfare value rises to approximately 1.64.

This second benchmark answers a different question from the first. It no longer asks whether the reform is a good use of public funds overall, because the aggregate pass-through shortfall has been normalized away. Instead, it asks how the consumer gains that did occur are distributed across households. The answer is again unfavorable to a progressive interpretation: even conditional on reaching consumers, the gains are concentrated toward richer households in euro terms.

4.4 Interpretation

Taken together, the two benchmarks point in the same direction. Under the full-fiscal-cost benchmark, the VAT cut does not satisfy the local desirability condition under equal welfare weights, and no progressive welfare schedule can rationalize it. Under the consumer-gains benchmark, equal weights hold only by construction, yet the gains that do reach households are still tilted toward richer groups in absolute euro terms. The two exercises therefore differ in emphasis rather than in sign: the first highlights the inefficiency of the VAT cut as a use of fiscal resources, while the second highlights the weak distributional targeting of the consumer gains themselves.

These results also clarify why heterogeneous pass-through is central to the policy interpretation of the reform. Heterogeneous pass-through does shift proportional incidence somewhat toward lower-income households, but that shift is too small to offset the much steeper gradient in expenditure levels across the income distribution. The key lesson is that a mildly pro-poor pattern in proportional incidence is insufficient to make a broad VAT cut progressive once gains are evaluated in euros per euro of fiscal cost. Indeed, if pass-through were uniform across income groups at the average rate of 65%, the richest-to-poorest ratio of gains per euro of fiscal cost would rise only from about 17 to 19, indicating that heterogeneous pass-through shifts incidence somewhat toward poorer households but only modestly relative to the expenditure gradient.

The broader implication is that a broad VAT cut is, at best, a blunt redistributive instrument. It may generate slightly larger proportional gains for lower-income households, but it does not perform well either as a use of public resources or as a way of allocating consumer gains across households. A targeted transfer to poorer households would satisfy the local desirability condition under much weaker assumptions and would direct a much larger share of the fiscal cost toward the intended beneficiaries. For that reason, we interpret the welfare evidence in this paper not as revealing a progressive reform, but as showing the limits of broad-based consumption tax cuts as redistributive policy tools.

5 Conclusion

This paper studies the heterogeneous incidence of Germany's temporary VAT reduction using confidential, high-frequency product-level price data covering the full household consumption basket. While existing work emphasizes average pass-through, our analysis shows that the pricing response was highly uneven. Nearly half of standard-rate products and about a quarter of reduced-rate products exhibit no price change, while a sizable minority adjust prices almost exactly one-for-one with the statutory reduction. Aggregate estimates therefore mask a fundamentally non-uniform pattern, with important implications for both distributional effects and the effectiveness of consumption tax cuts as stabilization tools.

When aggregated to household consumption baskets, these heterogeneous price responses translate into modest distributional differences in proportional terms. Lower-income households experience somewhat larger percentage price reductions than higher-income households, with pass-through declining from roughly 68% for lower-income households to about 59% for the highest-income group. But that pattern does not carry over to gains measured in euros per euro of fiscal cost. Under our main benchmark, which counts the full mechanical revenue loss from the reform, the VAT cut does not satisfy the local desirability condition under equal welfare weights, and no progressive welfare schedule can rationalize it. Even under an alternative benchmark that considers only the gains actually received by consumers, those gains remain tilted toward richer households in absolute terms because expenditure levels rise sharply with income.

Our findings also speak to the stabilization rationale that motivates temporary VAT cuts. The policy is meant to support demand by lowering consumer prices, but that channel operates only insofar as prices actually fall. The limited pass-through that we document implies that a substantial part of the intended price stimulus never materialized, while the price reductions that did occur varied across products and households. To the extent that household demand responds to observed price changes (Bachmann et al., [forthcoming](#)), incomplete pass-through weakens the demand response, while heterogeneous pass-through makes that response uneven across products and households. Heterogeneous pass-through is thus relevant not only for distribution but also for the effectiveness of consumption tax cuts as countercyclical instruments.

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A Appendix

A.1 Complementary Inverse-Optimality Exercise

This appendix reports a complementary inverse-optimality exercise that maps the observed group-level incidence into implied relative welfare weights. It yields the same qualitative conclusion as the main text: the observed incidence pattern is not consistent with welfare weights tilted toward lower-income households. We present it as a complement rather than as the main-text framework because it requires a tighter structural mapping from observed incidence to welfare weights, whereas the reduced-form consistency test in the main text is more flexible and more closely aligned with the level of aggregation in the data.

Consider $G = 8$ income groups, indexed by $g = 1, \dots, G$, ordered from poorest to richest. Let μ_g denote the household share of group g , E_g its baseline expenditure, and $\delta_g < 0$ the observed price reduction for that group's consumption basket. Households are hand-to-mouth, so baseline real consumption equals expenditure. Preferences are isoelastic, with utility

$$u(c) = \frac{c^{1-\sigma}}{1-\sigma}, \quad (18)$$

for $\sigma \neq 1$, and $u(c) = \log c$ for $\sigma = 1$, where $\sigma > 0$ is the curvature parameter. The government is assumed to choose group-specific price reductions to maximize

$$W = \sum_{g=1}^G \alpha_g \mu_g u\left(\frac{E_g}{1+\delta_g}\right), \quad (19)$$

subject to a budget constraint on the fiscal cost of those reductions:

$$\sum_{g=1}^G \mu_g E_g (-\delta_g) \leq B. \quad (20)$$

For an interior solution, the first-order conditions imply welfare weights of the form

$$\alpha_g = \lambda E_g^\sigma (1 + \delta_g)^{2-\sigma}, \quad (21)$$

where λ is the shadow value of public funds. Relative welfare weights are therefore

$$\frac{\alpha_g}{\alpha_1} = \left(\frac{E_g}{E_1}\right)^\sigma \left(\frac{1+\delta_g}{1+\delta_1}\right)^{2-\sigma}. \quad (22)$$

This expression shows that the implied weights reflect both expenditure differences and differences in observed price reductions. In our data, expenditure varies much more across groups than price reductions do. Expenditure rises from €1,121 for the poorest group to €4,760 for the richest, whereas proportional price reductions vary only modestly across the income distribution. As a result, the implied relative welfare weights are increasing in income for the values of σ considered below.

Under the baseline calibration $\sigma = 2$, the price-change term in Equation (22) drops out and the implied weights depend only on expenditure levels:

$$\frac{\alpha_g}{\alpha_1} = \left(\frac{E_g}{E_1} \right)^2. \quad (23)$$

This implies

$$\frac{\alpha_8}{\alpha_1} = \left(\frac{4760}{1121} \right)^2 \approx 18. \quad (24)$$

Thus, the richest group would receive an implied welfare weight roughly eighteen times as large as the poorest group. This qualitative conclusion is robust to alternative values of σ : at $\sigma = 1$, the implied ratio is approximately 4.2, while at $\sigma = 3$ it rises to roughly 76.

This appendix exercise therefore reinforces the main-text result. Although lower-income households experienced somewhat larger proportional price reductions, those differences are too small to overturn the much larger expenditure differences across groups. Under the tighter structural mapping imposed here, the observed incidence pattern again points away from a progressive interpretation of the reform. The appendix exercise yields a lower implied weight ratio ($\alpha_8/\alpha_1 \approx 18$ at $\sigma = 2$) than the main-text calibration ($\omega_G/\omega_1 \approx 96$). Two differences account for the gap. First, the main-text exercise must overcome the aggregate pass-through shortfall ($\sum_g m_g = 0.62$), whereas the appendix exercise rationalizes only the pattern of price changes across groups without requiring that total consumer gains justify the fiscal cost. Second, the appendix embeds concave utility, so that a euro accruing to a poorer household receives a higher marginal utility weight, partially offsetting the expenditure gradient. The main-text exercise is linear in gains and contains no such offset. Consistent with this explanation, the sensitivity to σ confirms this channel: the implied ratio rises from 4.3 at $\sigma = 1$ to 76 at $\sigma = 3$, approaching the main-text

ratio because stronger diminishing marginal utility requires increasingly larger explicit welfare weights on richer households to rationalize the observed allocation.