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RESEARCH PAPER

Intrinsic Motivation in Consumer Demand: The Case of Organic Coffee

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Abstract

Classical microeconomic theory predicts that price increases reduce demand, yet empirical evidence suggests that intrinsic motivation and social preferences can lead to deviations from this pattern. This study examines how Italian consumers respond to price variations in organic and non-organic coffee, focusing on the role of intrinsic motivation. Using scanner data on Italian consumers from the Nielsen Household Panel, we estimate price elasticities of demand to assess whether consumer behavior aligns with conventional economic theory or is influenced by social norms. Our estimates of own and cross-price elasticities are consistent with the presence of intrinsic motivation effects, with organic coffee demand being less sensitive to price changes than conventional coffee. Our findings provide insights into how economic incentives interact with intrinsic motivation, offering implications for policy measures aimed at promoting sustainable consumption. While our analysis focuses on coffee, the empirical framework and testable hypotheses can be extended to other markets where ethical and environmental concerns shape consumer choices.

Keywords Intrinsic motivation · Social preferences · Asymmetric price elasticities · Scan data

JEL Codes D9 · D12 · D91

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1 Introduction

Classical microeconomic theory (Kreps 1997) posits a negative relationship between price and the quantity demanded of a good: an increase in price leads to lower demand, whereas a price decrease results in higher demand. This fundamental principle, encapsulated in the Law of Demand, generally assumes that behavioral responses to economic mechanisms - such as taxes and subsidies - are separable from social preferences. This "separability assumption" (Levitt and List 2007; Polanya-Reyes and Bowles 2012) implies that incentives influence behavior solely by altering the economic costs and benefits associated with an activity. However, empirical evidence suggests that explicit economic incentives, such as price changes, sometimes have limited or even counterproductive effects (Polanya-Reyes and Bowles 2012). Indeed, experimental research (Ellingsen and Johannesson 2008) has shown that extrinsic incentives (e.g., lower prices to encourage purchases) may "crowd out" intrinsic motivation, reducing consumers' willingness to act in accordance with their social or ethical values.

This study examines whether price changes induce the consumer responses predicted by standard economic theory or whether intrinsic motivation leads to deviations. Using Italian consumer data as a case study, we estimate the reactions to price variations in organic and non-organic coffee. We are concerned with consumers' revealed purchasing behavior with regard to organic coffee, and present results from unique data on Italian consumers' coffee consumption to investigate the effect of price on individual consumer purchases of organic coffee and equivalent non-organic products in actual retail establishments.

Our study offers two key findings. The first is that Italian consumers seem to value the ethical content of coffee: they are less responsive to changes in the price of organic coffee than to changes in the price of non-organic coffee.[1] The second is that the impact of non-organic coffee prices on organic coffee demand depends on income. Higher income consumers are more responsive to changes in the price of non-organic coffee possibly substituting organic coffee when the price of non-organic coffee rises, but for lower-income consumers the substitution is weaker as they are more directly constrained by budget considerations.

The impact of intrinsic motivation on consumer behavior is evaluated by comparing the cross-price elasticities of substitutable goods. Organic and non-organic coffee are likely close substitutes. If intrinsic motivation does not play a role, the cross-price elasticity of demand for organic coffee with respect non-organic coffee prices should be positive and symmetric with the elasticity of demand for non-organic coffee in response to changes in organic coffee prices. However, if motivation crowding occurs, this symmetry may break: we expect the price elasticity of demand for non-organic coffee with respect to organic coffee prices to be low, while the elasticity of demand

[1] In this paper, by "ethical" we refer specifically to product attributes linked to environmental and health-related concerns, such as organic certification, rather than to social fairness considerations as in the case of fair trade. While both "ethical" and "fair trade" consumption relate to consumer values, our focus is on environmentally sustainable attributes of products. For clarity, we use "ethical" and "sustainable/green" interchangeably in the context of organic coffee.

for organic coffee with respect to non-organic coffee prices could be larger in absolute value.

By estimating these elasticities, we aim to quantify the influence of intrinsic motivation on consumer decision-making. Using scanner data from the Italian module of the Nielsen Household Panel, we estimate demand functions for organic and conventional coffee[2], allowing us to derive both direct and cross-price elasticities. Comparing these elasticities provides insights into the role of social norms and intrinsic motivation in shaping consumption behavior, with important policy implications. For example, increasing the price of conventional coffee could generate a "double dividend": reducing consumption of the less sustainable option while boosting demand for organic alternatives. Achieving this outcome depends on an accurate understanding of price elasticities. While our analysis focuses on coffee, the framework can be extended to other pairs of substitutes where one alternative offers environmental or health-related benefits while the other does not.

The remainder of this article is structured as follows: Section 2 reviews the relevant literature and outlines the hypotheses to be tested; Section 3 describes the dataset and empirical strategy; Section 4 presents the results and discusses their implications. Finally, Section 5 concludes with policy recommendations and directions for future research.

2 Literature and Hypotheses

In this section, we briefly review the literature most directly related to our study and then present the hypotheses to be tested.

2.1 Literature

Our research contributes to three related streams of literature.

First, we build on empirical studies estimating the price elasticity of demand for organic and conventional coffee. Revealed preference studies using quantity and expenditure data provide mixed results. For example, Arnot et al. (2006) found that fair trade coffee buyers were less price-sensitive than buyers of other coffee products, whereas Galarraga and Markandya (2004) and Yinjin and Bateman (2021) reported higher elasticities for “green” or fair trade/organic coffee, largely due to limited product assortments. These mixed findings leave open the question of whether ethical content itself, rather than market structure, shapes consumer price responsiveness.

Second, we connect to experimental evidence showing that consumers respond positively to sustainability labels on coffee. Field experiments by Hainmueller et al. (2015) and Buell and Kalkanci (2020) demonstrate that adding fair trade or environmental attributes boosts sales independent of price. While these studies highlight willingness to pay for ethical attributes, they do not provide revealed preference evidence on how such intrinsic motivations affect substitution patterns between organic and conventional coffee.

[2] Throughout the paper, we use "conventional coffee" and "non-organic coffee" interchangeably.

Third, we contribute to the literature linking intrinsic motivation and price elasticity of demand. Motivation crowding theory (Frey and Jegen 2002) suggests that when intrinsic motivation is strong, external incentives (such as price changes) matter less, leading to more inelastic demand. Evidence from charitable giving (Peloza and Steel 2005) and professional services (Ash and McLeod 2015) supports this view, but applications to consumer goods remain limited. No study has directly examined whether intrinsic motivations for ethical consumption (such as organic coffee) translate into asymmetric substitution patterns.

Taken together, our study fills a gap by combining revealed preference data with a focus on Italian consumers, a context that has not been studied before. We contribute to the literature by providing new evidence on the relative own-price elasticities of organic versus non-organic coffee by estimating their substitution patterns, thereby testing whether ethical products are perceived as close substitutes, and by linking intrinsic motivations for ethical consumption to asymmetric cross-price elasticities, offering a novel behavioral interpretation of elasticity estimates.

2.2 Hypotheses

Let $\varepsilon_{1,1}$ denote the own-price elasticity of demand for organic coffee; $\varepsilon_{2,2}$ that for conventional coffee; $\varepsilon_{1,2}$ the cross-price elasticity of organic coffee with respect to the price of conventional coffee; and $\varepsilon_{2,1}$ the reverse. We test the following hypotheses:
$\boldsymbol{H}_1$: $|\varepsilon_{1,1}| < |\varepsilon_{2,2}|$. Demand for organic coffee is less price-responsive than demand for conventional coffee.
$\boldsymbol{H}_2$: $\varepsilon_{1,2} > 0$ and $\varepsilon_{2,1} > 0$. Organic and conventional coffee are substitutes.
$\boldsymbol{H}_3$: $\varepsilon_{1,2} > \varepsilon_{2,1}$. Substitution is asymmetric: when the price of conventional coffee rises, consumers shift more strongly to organic coffee than vice versa, consistent with intrinsic motivations among organic buyers.
Hypothesis H_1, checks that both own-price elasticities ($\varepsilon_{1,1}$; $\varepsilon_{2,2}$) are negative, in accordance with the Law of Demand. However, it is expected that the own-price elasticity of organic coffee to be lower in absolute value than that of conventional coffee, as intrinsic motivations influence the intensity of the price response.
Hypothesis H_2, examines the cross-price elasticity between organic coffee ($\varepsilon_{1,2}$) and conventional coffee ($\varepsilon_{2,1}$). We expect organic coffee and conventional coffee to be substitutes (i.e. cross-price elasticities > 0).
Hypothesis H_3 tests whether the cross-price elasticity between organic and conventional coffee is asymmetric. Our prior is that an increase in the price of conventional coffee will elicit a more pronounced response than the reverse scenario. When the price of conventional coffee rises, consumers tend to shift more decisively towards purchasing organic coffee. However, due to intrinsic motivations, this response is weaker when the price of organic coffee rises, as organic coffee consumers are less likely to switch to conventional coffee.

3 Data and Empirical Strategy

3.1 Data

We use scanner data from the Nielsen household panel provided by the Istituto di Studi per i Mercati Agricoli (ISMEA) (ISMEA-Nielsen 2024). The data combines two complementary sources: the Market Track, which records quantities and expenditures from approximately 9,000 modern distribution points, and the Household Purchasing Panel, based on weekly surveys of about 9,000 Italian families. Both sources use stratified random sampling procedures to ensure representativeness of the national population. Expansion coefficients are applied to align the panel with the population universe.[3]

Our sample is extracted from the Household Purchasing Panel and contains monthly data on aggregated quantities (kg) and expenditures (Euro) for organic and conventional coffee, by seven family types, from January 2019 to April 2024. We also observe the number of purchasing households for each category in each month. The seven family types (Pre-families, New families with young children, Maturing families, Established families, Post families, Older couples, Older singles) represent the sectional dimension of the panel and are defined to capture demographic and life-cycle heterogeneity. The final dataset includes 455 observations across approximately 20 variables. Table 1 describes the main variables used in the analysis.

We complement Nielsen data with monthly Consumer Price Index (2015=100) series from ISTAT (ISTAT 2024b), as well as average monthly temperature and humidity for Italy (VisualCrossing 2024). As a proxy for disposable income, we use average monthly current consumption expenditure by family type from ISTAT (ISTAT 2024a), harmonized to match Nielsen's family-type categories.[4]

A key feature of the dataset is the substantial variability across family types and over time in both the intensity and composition of coffee purchases as shown in Figures 1 and 2. This heterogeneity is crucial for testing our hypotheses, as it allows us to examine whether demographic structures and economic conditions translate into systematically different demand responses for organic versus conventional coffee.

Table 2 provides summary statistics for the pooled data. The average aggregated quantity of organic coffee purchased per month is about 6% of the average aggregated quantity of conventional coffee purchased. At the household level, organic purchases represent around 43% of conventional purchases, confirming that organic coffee remains a niche product in Italy. Figure 1 shows monthly per-household quantities by family type, while Figure 2 reports corresponding expenditures.

Both Figure 1 and 2 suggest a decreasing trend in conventional coffee consumption and an increasing trend in organic coffee consumption. New Families are the largest consumers of conventional coffee, while Maturing Families show the strongest demand for organic coffee. Per-household expenditures indicate an initial increase in

[3] Further details on sampling and weighting procedures, including Neyman's allocation and the ratio estimator, are reported in Appendix A.

[4] The correspondence between Nielsen and ISTAT classifications, and the procedure for projecting 2023–2024 values, are described in Appendix B.

Table 1 Description of variables used in the analysis

Outcome variables	Definition	Source
Quantity of organic coffee (**qb**)	Total purchased quantity (kg) of organic coffee (all types) per month	Nielsen Hourehold Panel (ISMEA)
Quantity of conventional coffee (**qnb**)	Total purchased quantity (kg) of non-organic coffee (all types) per month	Nielsen Household Panel (ISMEA)
Expenditure on organic coffee (**sb**)	Total expenditure (Euro) on organic coffee	Nielsen Household Panel (ISMEA)
Expenditure on conventional coffee (**snb**)	Total expenditure (Euro) on conventional coffee	Nielsen Household Panel (ISMEA)
# purchasing households organic (**nfamb**)	Number of households purchasing organic coffee each month	Nielsen Household Panel (ISMEA)
# purchasing households conventional (**nfamnb**)	Number of households purchasing conventional coffee each month	Nielsen Household Panel (ISMEA)
Consumer Price Index (**NIC**)	Consumer Price Index for the entire nation (2015=100)	ISTAT
Humidity level (**avgu**)	Average monthly humidity level	VisualCrossing website
Temperature level (**avgt**)	Average monthly temperature in Celsius degrees level	VisualCrossing website
# purchases (**n_atti**)	Total number of coffee purchases per month	Nielsen Household Panel (ISMEA)
Current consumption expenditure (**sp_fissa**)	Average monthly household current consumption expenditure in Italy (Euro)	ISTAT
Unit Value of organic coffee (**pb**)	(Expenditure/quantity) as a proxy of unit price of organic coffee	Nielsen Household Panel (ISMEA)
Unit Value of conventional coffee (**pnb**)	(Expenditure/quantity) as a proxy of unit price of conventional coffee	Nielsen Household Panel (ISMEA)

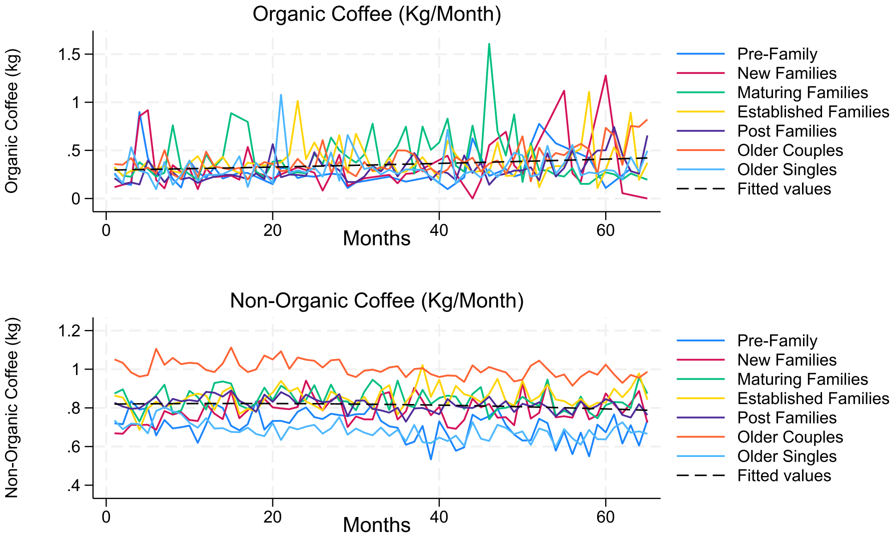

Fig. 1 Per-household quantity purchased (kg/month) by family type.

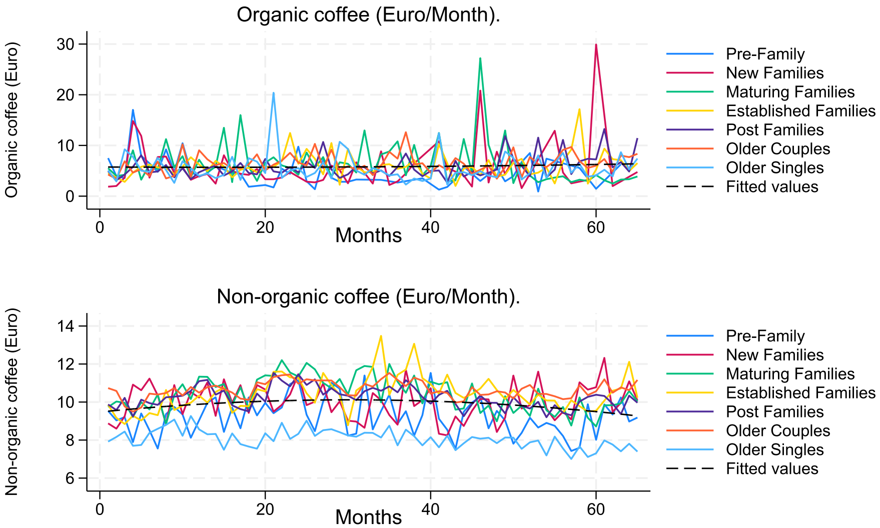

Fig. 2 Per-household expenditure (Euro/month) by family type.

conventional coffee spending, followed by a decline after October 2020, coinciding with the extension of COVID-19 restrictions.

Household heterogeneity is also notable: some groups, such as Pre-Families and Maturing Families, display more pronounced fluctuations in conventional coffee consumption than others, suggesting greater sensitivity to external shocks. This variability across groups is central to our identification strategy, as it allows us to explore how demographic structures condition demand responses.

Table 2 Descriptive Statistics – pooled data

ISMEA-NIELSEN data

Variables	**Descriptive Statistics** Mean	Std. Deviation	Min	Max
Quantity purchased (kg/month) of organic coffee (**qb**)	8.144,254	5.999,591	0,000	31.000,000
Quantity purchased (kg/month) of conventional coffee (**qnb**)	1.477.321,000	1.154.790,000	329.000,000	4.702.000
Real expenditure (Euro/month) organic coffee (**rsb**)	134.290,300	98.573,080	2.528,108	490.734,000
Real expenditure (Euro/month) conventional coffee (**rsnb**)	17.300.000,000	12.100.000,000	3.963.071,000	47.700.000,000
Number of families purchasing organic coffee (**nfamb**)	23.166,000	15.030,000	971,000	75.847,000
Number of families purchasing conventional coffee (**nfamnb**)	1.735.709,000	1.133.433,000	439.346,000	4.280.662,000
Per-household quantity purchased (kg/month) organic coffee (**qpcb**)	0,351	0,193	0,000	1,607
Per-household quantity purchased (kg/month) conventional coffee(**qpcnb**)	0,813	0,112	0,534	1,112
Per-capita expenditure (Euro/month) organic coffee (**spcb**)	6,665	3,815	1,167	38,721
Per-capita expenditure (Eur/month) conventional coffee (**spcnb**)	11,197	1,504	7,872	15,947
Real per-capita expenditure (Euro/month) on organic coffee (**rspcb**)	5,871	3,182	0,912	29,923
Real per-capita expenditure (Euro) on conventional coffee (**rspcnb**)	9,866	1,144	7,007	13,481
Real unit price of organic coffee (**rpb**)	18,185	6,737	5,444	73,368
Real unit price of conventional coffee (**rpnb**)	12,213	1,168	9,445	17,454

ISTAT and Visual Crossing data

Variables	**Descriptive Statistics** Mean	Std. Deviation	Min	Max
Consumer Price Index for the entire Nation (NIC, 2015=100)	113,669	9,915	103,600	130,400
Aggregated real current consumption expenditure (Euro/Month) (**rsp_fissa**)	3.010.449,000	704.635,000	1.675.092,000	4.353.241,000
Average humidity level (**avgu**)	75,577	8,072	56,907	87,071
Average temperature level (Celsius degree/Month) (**avgt**)	16,885	6,390	7,169	27,686

3.2 Empirical Strategy

We estimate separate empirical demand equations for organic and conventional coffee of the form:

$$lnq_{it}^{j} = \alpha_0 + \beta_1 lnpo_{it} + \beta_2 lnpno_{it} + \beta_3 y_{it} + \mathbf{x}_{it}^{'}\boldsymbol{\gamma} + v_i + d_t + u_{it} \tag{3.1}$$

where $j = 1, 2$ denotes organic and conventional coffee, respectively; lnq_{it}^{j} is the log of per-capita quantity purchased; $lnpo_{it}$ and $lnpno_{it}$ are real prices; y_{it} is disposable income; x_{it} includes additional controls; v_i and d_t are family-type and month fixed effects. We adopt a log–log specification so coefficients can be read as elasticities. The parameters of interest are the own- and cross-price elasticities, β_1 and β_2.

We estimate the model using both separate OLS regressions and Seemingly Unrelated Regressions (SUR), which improve efficiency by allowing correlation in error terms across the two demand equations (Zellner and Huang 1962). SUR exploits potential correlation between the error terms of the organic and conventional demand equations, thereby improving efficiency of the estimated elasticities. The GLS estimator is implemented using the feasible iterative procedure standard in the SUR literature.

3.3 Unit Values

In the absence of transaction-level prices, we use unit values (expenditure divided by quantity) as proxies. This approach may introduce quality-related endogeneity (Deaton 1988), (Deaton 1990), (Deaton 1997), (Gibson and Rozelle 2005). We address this in two ways: (i) aggregation reduces individual-level quality variation, and (ii) panel fixed effects (family-type and month) control for unobserved heterogeneity. Further details on the use of unit values as price proxies are reported in Appendix C. We implement multi-way fixed effects following Correia (2016), clustering standard errors at the month level.

4 Results

Our key findings are that demand for conventional coffee is substantially more price elastic than demand for organic coffee; cross-price effects are stronger following a change in the price of non-organic coffee; demand responses depend on income. In what follows we detail the results of our two sets of estimates (equation-by-equation and SUR).

4.1 Equation-by-equation estimates

We estimate three specifications of the log–log demand equation and report them in Table 3:

Model (1): pooled OLS without accounting for the bi-dimensional panel structure;
Model (2): Least Squares Dummy Variables (LSDV) with family-type dummies;

Model (3): Multi-Way Fixed Effects (MWFE) with family-type and month fixed effects.

Model (3) is our preferred specification because it simultaneously absorbs unobserved heterogeneity across family types and time shocks that may be correlated with prices and other covariates, delivering more credible elasticity estimates.

Since we work with panel data, fixed effects are natural to control for time-invariant heterogeneity by household type and for month-specific shocks. This is especially convenient given our use of unit values as price proxies. For Model (2), we include the following covariates: the logarithm of the CPI (`ln_nic`); the logarithm of average monthly temperature and humidity (`ln_avgt`, `ln_avgu`); a summer dummy (`d_estate`); the interaction `d_estate#c.ln_avgu`; and year dummies. To account for multiple high-dimensional fixed effects we implement the MWFE estimator proposed by Correia (2016) and Guimarães and Portugal (2010) using *reghdfe* (Correia 2023). Standard errors are clustered at the month level in Model (3) to allow for within-month correlation across households.

Table 3 shows that, in the organic coffee equation, the own-price elasticity is negative and significant, while the cross-price elasticity with respect to the price of non-organic coffee is positive and significant at the 5% level, implying substitution between the two products. The cross-price elasticity is larger in absolute value than the own-price elasticity ($|0.232| > |0.121|$): a 1% increase in the price of non-organic coffee raises organic coffee demand by 0.23%, whereas a 1% increase in the organic coffee price lowers organic coffee demand by 0.12%.

Turning to conventional coffee (column (6) of Table 3), demand is more price elastic in absolute value than for organic coffee ($|0.201| > |0.125|$). The cross-price elasticity with respect to the price of organic coffee is positive but close to zero (0.009), indicating that, while the two products are substitutes, increases in the organic price generate almost no increase in non-organic demand. This muted response is consistent with ethical considerations attached to organic consumption that dampen purely price-driven substitution.

4.2 SUR Estimates

Equation-by-equation estimates implicitly assume no contemporaneous correlation between equation errors. Given the substitutability of the two coffee categories, this assumption may be restrictive. We therefore estimate the system via Seemingly Unrelated Regressions (SUR) (Zellner and Huang 1962), (Zellner 1962), (Zellner 1963). Table 4 reports the results and, in the last row, Breusch–Pagan tests of residual independence. Standard errors are clustered at the month level.

The SUR estimates largely confirm the equation-by-equation results while improving efficiency; where contemporaneous correlation across equations is present, SUR is warranted, but once family-type and month fixed effects are included, the gains vanish and estimates coincide with the MWFE results.

In rows (1) and (4), we use a common, parsimonious specification for both equations, including only `ln_rpb`, `ln_rpnb`, and `ln_sp_fissa`. Consistent with Table 3, conventional demand is more price elastic than organic demand ($|0.372| > |0.135|$).

Table 3 Equation-by-equation estimates of organic and conventional coffee demand

	Organic coffee			**Non organic coffee**		
	OLS	LSDV	MWFE	OLS	LSDV	MWFE
	(1)	(2)	(3)	(4)	(5)	(6)
Log_price_organic	−0.125***	−0.121***	−0.125***	0.012**	0.007*	0.009**
	(0.019)	(0.019)	(0.020)	(0.006)	(0.004)	(0.004)
Log_price_conventional	-0.034	0.184	0.232**	−0.435***	−0.214***	−0.201***
	(0.068)	(0.121)	(0.111)	(0.022)	(0.021)	(0.019)
Log_expenditure	0.077***	0.252	0.331	0.166***	0.011	-0.010
	(0.029)	(0.315)	(0.216)	(0.008)	(0.082)	(0.079)
Log_CPI	0.326	0.506	-	-0.085	0.064	-
	(0.463)	(0.450)		(0.118)	(0.082)	
Covid	No	No	No	0.014*	0.014*	No
				(0.008)	(0.005)	
Log_humidity	0.059	0.071	-	0.043	0.057	-
	(0.120)	(0.120)		(0.034)	(0.022)	
Summer	1.512	1.162	-	0.044	0.110	-
	(1.024)	(1.033)		(0.323)	(0.231)	
Summer#log_humidity	-0.359	-0.380	-	-0.014	-0.028	-
	(0.244)	(0.246)		(0.077)	(0.055)	
Constant	-1.861	-4.506	-2.527	0.539	0.440	1.149*
	(2.515)	(3.634)	(2.758)	(0.642)	(0.751)	(0.619)
Month FE	No	No	Yes	No	No	Yes
Year FE	Yes	Yes	No	Yes	Yes	No
Family type FE	No	Yes	Yes	No	Yes	Yes
$\#Obs$	407	407	407	407	407	407

Notes: Robust Standard Errors in parentheses under coefficients for models (1)-(2)-(4)-(5).
Standard errors clustered at the Month level for models (3) and (6).
$* = p < 0.10$; $** = p < 0.05$; $*** = p < 0.01$

Cross-price elasticities remain small: for organic demand, the effect of the conventional price is not statistically different from zero (-0.049, $se = 0.045$); for conventional demand, the effect of the organic price is positive but close to zero (0.015, $se = 0.006$). Income elasticities are positive, significant, and below one in both equations, indicating necessities. The Breusch–Pagan test does not reject independence here, so the efficiency gains from SUR are limited.

Rows (2) and (5) allow richer, equation-specific covariates. For organic demand we add `ln_CPI` and the interaction `log_price_conventional # log_expenditure`; for conventional demand we add humidity, COVID-19 and summer dummies, and `ln_CPI`. Results are in line with Table 3. The positive and significant interaction term in the organic demand equation suggests that the (cross-)price effect of conventional coffee on organic demand strengthens with income. In other words, higher-income consumers are more likely to substitute organic for conventional coffee when the price of conventional coffee rises. By contrast, for lower-income consumers, changes in the price of conventional coffee have a smaller impact on organic demand, while income itself exerts a more direct influence on their purchasing decisions. This suggests that the price of non-organic coffee might not have a strong or direct effect on organic coffee demand for all consumers, but its impact varies depending on income levels. In this specification the Breusch–Pagan test rejects independence at the 5% level, supporting the use of SUR.

Finally, columns (3) and (6) add family-type and month fixed effects, mirroring columns (3) and (6) of Table 3. Once these fixed effects are included, we cannot reject residual independence; correspondingly, SUR estimates coincide with the equation-by-equation MWFE estimates. The preferred elasticities remain: $\varepsilon_{11} = -0.125$, $\varepsilon_{22} = -0.201$, $\varepsilon_{12} = 0.232$, and $\varepsilon_{21} = 0.009$.

Our preferred results (columns (3) and (6) in Tables 3 and 4) are summarized in Table 5 and confirm the three hypotheses in Section 2.2. First, organic demand is less responsive to own-price changes than conventional demand: $|\varepsilon_{1,1}| = 0.125 < |\varepsilon_{2,2}| = 0.201$. Second, the two coffee types are substitutes, with positive cross-price elasticities: $\varepsilon_{1,2} = +0.232$ and $\varepsilon_{2,1} = +0.009$. Third, cross-price elasticities are asymmetric: the response of organic demand to conventional prices is larger than the response of conventional demand to organic prices, $\varepsilon_{1,2} = +0.232 > \varepsilon_{2,1} = +0.009$, consistent with intrinsic preferences for environmental and health attributes.

Overall, changes in own price have a smaller effect on organic purchases than on conventional purchases. As the conventional price rises, consumers switch relatively quickly away from conventional coffee; by contrast, organic purchasers are less price responsive. The near-zero cross-price elasticity of conventional demand with respect to the organic price further indicates limited switching back to conventional when organic prices increase. In short, while organic consumers in our sample are less price responsive than conventional consumers, the share “abandoning” organic in response to price increases appears small. Cross-price elasticities point to relatively strong loyalty to organic products and suggest that persuading habitual organic buyers to revert to non-organic products is difficult.

Table 4 SUR estimates of organic and conventional coffee demand

	Organic coffee			**Non organic coffee**		
	(1)	(2)	(3)	(4)	(5)	(6)
Log_price_organic	−0.135***	−0.131***	−0.125***	0.015**	0.012*	0.009**
	(0.016)	(0.016)	(0.019)	(0.006)	(0.006)	(0.004)
Log_price_conventional	-0.049	−6.324*	0.232**	−0.373***	−0.431***	−0.201***
	(0.045)	(3.366)	(0.109)	(0.020)	(0.015)	(0.019)
Log_expenditure	0.084***	−1.914*	0.331	0.147	0.161***	-0.010
	(0.027)	(1.056)	(0.335)	(0.007)	(0.007)	(0.077)
Log_CPI	-	0.169**	-	-	−0.244***	-
		(0.067)			(0.022)	-
Log_price_conventional#log_expenditure	-	0.80*	-	-	-	-
		(0.429)				
Covid	-	-	-	-	0.031***	-
					(0.005)	
Log_humidity	-	-	-	-	0.066***	
					(0.025)	
Summer	-	-	-	-	−0.013**	
					(0.006)	
Constant	0.143	15.002*	−2.605	0.333***	1.220***	1.098*
	(0.260)	(8.295)	(2.688)	(0.070)	(0.165)	(0.602)
Family type FE	No	No	Yes	No	No	Yes
Month FE	No	No	Yes	No	No	Yes
Breusch–Pagan test $p - value$	0.139	0.015	0.183	0.139	0.015	0.183
$\#Obs$	407	407	407	407	407	407

Notes: Standard errors clustered at the Month level for all models.
$* = p < 0.10$; $** = p < 0.05$; $*** = p < 0.01$

Table 5 Own and cross-price elasticities

	$\varepsilon_{i,i}$	$\varepsilon_{i,j}$
Organic coffee	−0.125***	+0.232**
Non organic coffee	−0.201***	+0.009*

Notes: $* = p < 0.10$; $** = p < 0.05$; $*** = p < 0.01$

5 Conclusions

This paper develops and tests hypotheses on the relationship between intrinsic motivations and price elasticity of demand, using scanner data on Italian households' purchases of organic and conventional coffee. The evidence suggests that consumers value the ethical attributes of coffee: they are less responsive to price increases in organic coffee than in conventional coffee, and substitution between the two types of coffee is asymmetric. Consumers tend to shift toward organic coffee when conventional prices rise, but remain relatively loyal to organic coffee when its price increases.

We also find that income interacts with price sensitivity in shaping demand for organic coffee. Higher-income consumers appear more responsive to changes in the price of conventional coffee, substituting into organic alternatives when relative prices shift, whereas lower-income consumers' choices are more directly constrained by budget considerations. This highlights the importance of considering both ethical motivations and income heterogeneity when analyzing demand for socially or environmentally motivated goods.

While the study has limitations-including the use of aggregated scanner data and unit values as proxies for prices-its contribution lies in advancing the discussion on how intrinsic motivations affect demand elasticity. Existing work in behavioral and identity economics has shown that consumers with strong pro-social or ethical motivations often exhibit lower price elasticity for products such as organic, fair trade, or charity-related goods, and theories such as Andreoni (1990), Akerlof and Kranton (2000), and Benabou and Tirole (2006) provide strong foundations. Yet there is still no single, widely accepted model that explicitly formalizes this relationship. By proposing and empirically testing a structured set of hypotheses, this paper contributes to filling that gap: it identifies the mechanisms-such as asymmetric substitution patterns and income-related heterogeneity-that a theoretical model should account for. In this way, the study provides both empirical evidence and a conceptual framework that can guide the development of a more comprehensive theory. A deeper understanding of this link can also help policymakers and firms design strategies that reflect consumers' ethical concerns alongside their economic constraints.

Appendix A: Sampling and Expansion Procedures

Nielsen's Market Track and Household Purchasing Panel adopt a stratified random sampling design to ensure national representativeness of households and modern distribution points.

To minimize sampling error, Nielsen applies Neyman's disproportionate allocation formula, which gives greater weight to strata with higher variability (i.e., larger standard deviations). This procedure ensures that subgroups with more heterogeneous purchasing behavior are adequately represented in the sample.

After sampling, the collected data are expanded to the reference population by applying expansion coefficients. Aggregate estimates are then calculated using a ratio estimator, which exploits an auxiliary variable (Nielsen Business Turnover) to improve precision and reduce bias. The combined use of stratification, disproportionate allocation, and ratio estimation allows for efficient inference at the national level while preserving representativeness.

Appendix B: Harmonization of Family-Type Classifications

The family-type classification used by Nielsen differs from that of ISTAT, which provides the source for household consumption expenditure. To construct a consistent proxy for income, we established a correspondence between the two classifications. Nielsen distinguishes seven categories (Pre-Families, New Families, Maturing Families, Established Families, Post Families, Older Couples, Older Singles). ISTAT uses broader typologies (e.g., households with/without children, age of reference person, number of members).

We mapped Nielsen's categories onto ISTAT's using age and presence of children as key criteria. For example, Nielsen's "New Families" (children under 6) were matched with ISTAT's "households with children aged 0–5." Similarly, "Older Singles" were matched with ISTAT's "single-person households, reference person 65+."

Table 6 illustrates the process: the left column contains the NIELSEN household categorization, including both the family category name and its corresponding description. The right column, on the other hand, lists the ISTAT household categories (along with their respective identification codes), selected to best represent the corresponding NIELSEN categories.

For 2023, ISTAT data provided only aggregate average expenditure values. To recover family-type specific expenditures, we used historical average expenditure shares by family type over 2012–2022. For the first four months of 2024, a linear projection of the historical series was applied, ensuring continuity with earlier trends.

Appendix C: Unit Values and Robustness Checks

C.1 Unit Values as Price Proxies

Following Deaton (1988), Deaton (1990), and Deaton (1997), we acknowledge that unit values (expenditure divided by quantity) may be endogenous due to household-specific quality choices or measurement error.[5] In our setting, two features mitigate these concerns. First, our expenditure and quantity data, and the unit values we com-

[5] For example, higher income households might choose higher-quality products, making unit values endogenous to income or expenditure.

Table 6 NIELSEN and ISTAT Household types

NIELSEN Categories	ISTAT Categories
Pre-Families: single individuals under 35 or couples with main shoppers under 35 without children	[SMB_18_34] Single person aged 18-34 and [COUP_WH_C_PR18_34] Couple without children with reference person aged 18-34.
New Families: Families with young children ($\leq$ 6 years old)	[COUPF_W1C] Couple with 1 child, [COUPF_W2C] Couple with 2 children, [COUPF_W3GEC] Couple with 3 or more children, [1MINCH] Family with 1 minor child, [2MINCH] Family with 2 minor children, [3MINCH] Family with 3 minor children, [ATL_1MINCH] At least one minor child.
Maturing Families: Families with children under 17, not all young ($\leq$ 6 years old), or all older (aged 11-17).	[COUPF_W1C] Couple with 1 child, [COUPF_W2C] Couple with 2 children, [COUPF_W3GEC] Couple with 3 or more children, [OTHER1] Other types, [1MINCH] Family with 1 minor child, [2MINCH] Family with 2 minor children, [3MINCH] Family with 3 minor children, [ATL_1MINCH] At least one minor child.
Established Families: Families with older children (aged 11-17).	[COUPF_W1C] Couple with 1 child, [COUPF_W2C] Couple with 2 children, [COUPF_W3GEC] Couple with 3 or more children, [OTHER1] Other types.
Post Families: single individuals aged 35-54 or families with main shoppers aged 35-54 without children under 18.	[SMB_35_64] Single person aged 35-64, [OTHER1] Other types.
Older Couples: Families with main shoppers over 55 without children under 18.	[COUP_WH_C_PRGE65] Couple without children with reference person aged 65 or older, [OTHER1] Other types.
Older Singles: Single individuals over 55.	[SMB_GE65] Single person aged 65 or older.

pute, are aggregated. If individual variations cancel out in our data, unit values can approximate price trends at the aggregate level. Aggregation across households within family types reduces quality heterogeneity. Second, we use panel data and fixed effects models. Crucially, we control for both month and family type fixed effects using the feasible and computationally efficient estimator of linear models with multiple levels of fixed effect (multi-way FE, Correia (2016)) that absorbs time-invariant unobserved heterogeneity and controls for both month and family-type fixed effects.

Standard errors are clustered at the month level to allow for arbitrary serial correlation and heteroskedasticity.

C.2 Robustness Checks

As a robustness check, we re-estimate the model using the monthly national-level Consumer Price Index (2015=100) for coffee as an alternative price measure. Results are broadly consistent with those obtained using unit values, confirming that our findings are not sensitive to the choice of price proxy.

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Conflict of interest None

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