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DELAYED FOR VALUE: THE INTERPLAY OF PERCEPTION, NEED, AND SELF-CONTROL IN A STRUCTURAL MODEL OF FRUGAL HOUSING ADOPTION

Fabian SIEMIATOWSKI

Poznań University of Economics and Business; Fabian.Siemiatowski@ue.poznan.pl,
ORCID: 0009-0005-8711-7475

Purpose: Housing affordability challenges in developed economies have increased the relevance of frugal innovation, a concept traditionally associated with resource-constrained contexts. This study examines the psychological and contextual determinants of willingness to adopt frugal housing solutions, focusing on the roles of perception of frugal innovation (PFIH), perceived need for affordable housing (PNAH), and delayed gratification tendency (DGT) in both deliberate (DGTHd) and impulsivity-related (DGTHi) forms.
Design/methodology/approach: Data were collected via an online survey with 360 adults from Germany, Great Britain, and Sweden, all with recent or upcoming housing decision experience. A Structural Equation Modeling (SEM) approach was applied in JASP to test direct, indirect, and moderating relationships. Moderation analyses for H5 were conducted in Jamovi using mean-centered predictors and interaction terms. One-way ANOVA with Tukey HSD post-hoc tests was performed in SPSS to explore between-country differences.
Findings: SEM results showed that PFIH significantly predicted willingness to adopt frugal housing, with DGTHd exerting a stronger effect than DGTHi. PNAH was not a significant predictor, suggesting that perceived affordability pressure alone may not translate into openness to frugal solutions. Moderation analyses did not support H5, as neither DGTHd nor DGTHi significantly altered the PFIH–WAFH relationship. ANOVA revealed significant between-country differences for PFIH, WAFH, DGTHi, and PNAH, with Great Britain scoring highest on most variables.
Research limitations/implications: The study is cross-sectional, limiting causal interpretation. Measurement invariance across countries was not tested, so mean differences should be interpreted with caution. Future research should adopt longitudinal designs and verify cross-cultural measurement equivalence.
Practical implications: Findings highlight the importance of promoting positive perceptions of frugal innovation and fostering long-term self-control in housing-related decision-making. These insights may guide policymakers, developers, and sustainability advocates in designing and communicating affordable housing solutions more effectively.
Social implications: Supporting frugal housing adoption in high-income contexts can contribute to sustainability goals, resource efficiency, and housing accessibility, potentially improving quality of life and reducing environmental impact.

Originality/value: This study extends frugal innovation research into developed economies' housing sectors, integrating psychological traits into adoption models and providing empirical evidence on both direct and moderating effects, while identifying cultural variation in key constructs.
Keywords: frugal innovation, housing affordability, delayed gratification, adoption intention.
Category of the paper: Research paper.

1. Introduction

Frugal innovation, a concept gaining popularity in both emerging and developed economies, focuses on creating affordable, sustainable, and high-quality solutions using minimal resources (Ratten, 2019; Tiwari et al., 2017). It encompasses a frugal mindset, process, and outcome, and is shaped by factors such as resource scarcity and institutional environments (Soni, Krishnan, 2014). While it has traditionally been associated with low-income consumers and emerging markets, recent socio-economic shifts have made it increasingly relevant in developed contexts as well (Agarwal, Brem, 2017). From a quality perspective, frugal innovations emphasize performance, conformance, and value-based efficiency (Hindocha et al., 2021; Sharma, Kumar, 2024).

In particular, the real estate sector has emerged as a promising field for applying frugal principles, driven by rising housing costs and increasing sustainability demands. This has triggered academic interest in the potential of frugal housing solutions that combine affordability with function (Zeschky et al., 2011). However, the theoretical and empirical frameworks to support this exploration remain fragmented (Bhatti, Ventresca, 2013; Mignenan, 2022). Moreover, not all organizations in resource-scarce environments develop frugal solutions for local needs (Rosário, Lima, 2021), further complicating the understanding of drivers and limitations.

At the same time, behavioral research highlights the role of psychological traits, notably Delayed Gratification Tendency (DGT), in shaping attitudes toward long-term, value-oriented decisions (Mischel et al., 1989; Duckworth, Gross, 2014). This raises an important but underexplored question: how do psychological predispositions interact with perceptions of frugal innovation to influence real consumer choices, especially in housing?

1.1. Problem Statement

Despite growing interest in frugal innovation as a response to housing affordability challenges, existing studies have rarely examined how consumers in developed economies perceive frugal housing solutions (Barnikol, Liefner, 2024). While prior research has emphasized functional and contextual aspects, the psychological mechanisms driving acceptance of such innovations remain underexplored.

In particular, the role of Delayed Gratification Tendency (DGT), a trait linked to long-term thinking and responsible decision-making, has not been adequately addressed in the context of frugal innovation (Dabić et al., 2022). Furthermore, existing models do not investigate how this trait might interact with consumers' perceptions, potentially shaping behavioral outcomes in nuanced ways (Im et al., 2003).

This study addresses these gaps by testing not only the direct effects of perception and personal values but also the moderating role of DGT in the relationship between perception of frugal innovation and willingness to adopt frugal housing.

1.2. Research Objectives

The research objectives translate the problem statement into concrete, testable tasks that guide the modeling and empirical strategy. They clarify how psychological and contextual factors will be operationalized and linked to the adoption of frugal housing.

The main objectives of this study are to:

1. Assess how consumers perceive frugal innovation in the real estate market.
2. Examine the extent to which consumers are willing to adopt frugal housing solutions.
3. Analyze the influence of Delayed Gratification Tendency (DGT) on both perception and behavioral intention regarding frugal housing.
4. Investigate how the perceived need for affordable housing (PNAH) shapes consumer preferences.
5. Test whether DGT moderates the relationship between perception of frugal innovation (PFI) and willingness to adopt frugal housing (WAFH).

Collectively, these objectives specify a coherent pathway from theory to measurement and testing. They also justify the integration of psychological traits (DGT) with contextual need (PNAH) within an extended TPB framework that emphasizes both direct and mediated mechanisms.

1.3. Research Questions and Hypotheses

The following research question guides this study:

How do consumers perceive frugal innovation in the real estate market, and how do psychological and contextual factors, including the ability to delay gratification, influence and shape their willingness to adopt frugal housing solutions? In particular, does delayed gratification tendency strengthen the effect of perception on behavioral intention?

Based on the literature, the study proposes the following hypotheses:

- H1: Delayed gratification tendency (DGT) positively influences perception of frugal innovation (PFI).
- H2: Perception of frugal innovation (PFI) positively influences willingness to adopt frugal housing (WAFH).

- H3: Delayed gratification tendency (DGT) positively influences willingness to adopt frugal housing (WAFH).
- H4: Perceived need for affordable housing (PNAH) positively influences willingness to adopt frugal housing (WAFH).
- H5: Delayed Gratification Tendency (DGT) moderates the relationship between Perception of Frugal Innovation (PFI) and Willingness to Adopt Frugal Housing (WAFH), such that the effect of PFI on WAFH is stronger among individuals with higher levels of DGT.

Hypothesis H5 introduces a moderation effect to the model, extending the original TPB framework with an interaction between behavioral and perceptual dimensions.

1.4. Research Design and Literature Support

The study employs a quantitative, cross-sectional survey-based design. A structured questionnaire comprising 40 Likert-scale items was used to measure latent constructs: PFI, WAFH, DGT, and PNAH. The survey was distributed via Prolific to a diverse sample of participants involved in housing decisions in Great Britain, Germany and Sweden. Data analysis was conducted using Structural Equation Modeling (SEM) to assess both measurement and structural models. Additional moderation analyses were conducted using the Jamovi to test interactive effects. Anchoring these methodological choices in prior scholarship clarifies why each construct and analytic step is appropriate for the research question.

This research draws upon high-impact scholarly work from the fields of innovation management, psychology, housing studies, and behavioral economics. References include Ajzen's (1991) Theory of Planned Behavior, Mischel et al.'s (1989) delay of gratification studies, and recent reviews on frugal innovation in developed economies (Agarwal, Brem, 2017; Tiwari et al., 2017). The approach also aligns with established measurement and modeling practices in quantitative consumer research (Hair et al., 2017; Fornell, Larcker, 1981). The design and its literature support form a consistent rationale for the subsequent hypotheses and model estimation.

1.5. Behavioral Macroeconomics Perspective: Galor’s Theory

Galor's (2011) Unified Growth Theory offers a compelling macroeconomic perspective on the interplay between human behavior, technological progress, and long-term development. At its core, the theory emphasizes that the transition from stagnation to sustained economic growth has been historically driven by a population’s increasing ability to invest in the future, particularly through education, innovation, and capital accumulation (Galor, 2011).

A critical behavioral foundation for this transition is the tendency to delay gratification (Arbuthnott, 2010). According to Galor, societies that developed cultural and psychological predispositions favoring long-term benefits over short-term rewards were more likely to

experience technological advancement and improved living standards (Galor, Özak, 2016). This dynamic creates a feedback loop: as individuals invest in the future, they stimulate innovation, which in turn fosters further growth and opportunity (Galor, Özak, 2016).

In the context of frugal innovation, particularly in the housing sector, this perspective is highly relevant (Mbabil Dok-Yen et al., 2023). Individuals willing to accept minimalist, cost-efficient housing in the present for the sake of long-term financial stability and sustainability demonstrate behavioral traits aligned with those driving historical development patterns. Thus, delayed gratification at the consumer level can be interpreted as a microeconomic reflection of Galor's broader development mechanisms (Zandstra et al., 2013). Frugal innovation, which focuses on creating low-cost, sustainable solutions, can be seen as an enabler of this delayed gratification approach, particularly in developing countries where resource constraints are more prevalent (Rosca et al., 2018).

1.6. Research Gap and Contribution

Although frugal innovation has been widely studied in the context of affordability and sustainability, particularly in emerging markets (Costa et al., 2021, Agarwal, Brem, 2017), few studies have examined how consumers in developed economies perceive such innovations in the housing sector (Barnikol, Liefner, 2024). Existing models tend to focus on economic or functional determinants of housing adoption (Costa et al., 2021), while overlooking psychological traits that may influence decision-making.

Notably, the ability to delay gratification (DGT), a well-established predictor of long-term thinking, remains underexplored in the context of housing innovation. While previous studies have acknowledged the impact of DGT on financial or educational outcomes, its role in shaping how consumers evaluate and act upon innovation has not been tested empirically in this domain (Costa et al., 2021).

This study addresses the gap by:

1) Investigating how perception of frugal innovation (PFI) and DGT jointly affect housing choice intentions.
2) Introducing a moderated structural model, testing whether DGT strengthens the effect of PFI on WAFH.
3) Extending traditional adoption models by bridging behavioral psychology with innovation diffusion in a real-estate context.
4) Applying Structural Equation Modeling to capture both direct and interaction effects, offering a more nuanced understanding of decision drivers.
5) By doing so, the research contributes theoretically, methodologically, and practically, providing insights relevant for housing policy, sustainable design, and behavioral economics.

The study positions frugal housing adoption at the intersection of value perception and self-control. By combining moderated and mediated pathways within SEM, it offers a compact theoretical extension and an empirically grounded agenda for future, cross-cultural validation.

2. Theoretical Framework

This study is grounded in the Theory of Planned Behavior (TPB), which offers a robust framework for understanding how individuals form behavioral intentions based on attitudes, subjective norms, and perceived behavioral control (Ajzen, 1991). In the context of frugal housing, consumer perceptions of frugal innovation are conceptualized as attitudes, while the intention to adopt such housing options reflects behavioral intention. The model is extended by incorporating Delayed Gratification Tendency (DGT) as a psychological predictor and Perceived Need for Affordable Housing (PNAH) as a contextual factor.

2.1. Theory of Planned Behavior (TPB) and Delayed Gratification

The Theory of Planned Behavior (Ajzen, 1991) posits that human behavior is guided by behavioral intentions, which are influenced by attitudes toward the behavior, subjective norms, and perceived behavioral control. Fishbein and Ajzen (2010) further refined this theory by integrating reasoned action components. In this study, perceptions of frugal innovation (PFI) serve as the attitudinal component, while willingness to adopt frugal housing (WAFH) represents behavioral intention. Several studies have validated the effectiveness of TPB in predicting sustainable behavior (Armitage, Conner, 2001; Bamberg, Möser, 2007).

Building on this foundation, delayed gratification is introduced as a trait expected to influence both attitudes (PFI) and intentions (WAFH), shaping how individuals evaluate delayed benefits embedded in frugal solutions. Delayed Gratification Tendency (DGT) is incorporated into the model as a psychological trait that influences both attitudes and intentions. Classic research by Mischel et al. (1989) demonstrated that the ability to delay gratification is linked to long-term decision-making and self-control. The Delay of Gratification Inventory (Hoerger et al., 2011) provides a validated measure of this trait. Behavioral economists have further explored how individuals discount future rewards in favor of immediate gains (Loewenstein, Prelec, 1992; Ainslie, 1975; Frederick et al., 2002), which can affect adoption of cost-saving innovations.

TPB and DGT motivate the direct, indirect, and conceptually moderating pathways tested in the empirical model.

2.2. Frugal Innovation in Housing and Value-Based Influences

Frugal innovation refers to creating affordable, sustainable solutions under resource constraints (Tiwari et al., 2017). In the housing sector, it emphasizes functionality over luxury and aims to make housing accessible (Agarwal, Brem, 2017; Ratten, 2019). Recent literature calls for more research into frugal innovation in developed economies (Mignenan, 2022; Sharma, Kumar, 2024). Such innovations prioritize value-based quality and align with performance, conformance, and sustainability dimensions (Bhatti, Ventresca, 2013). Consistent with this conception, value- and norm-based theories clarify how broader beliefs translate into behavior and why affordability pressure should be modeled as contextual need alongside psychological predispositions.

To contextualize housing behavior, value-based theories such as the Value-Belief-Norm (VBN) Theory (Stern, 2000) and Schwartz's (1992) theory of universal values are relevant. These theories emphasize that personal values and beliefs shape social norms and behaviors. This supports the inclusion of PNAH, reflecting socioeconomic pressure and affordability perception. These elements provide the conceptual bridge to the subsequent summary and model integration.

2.3. Summary and Model Integration

This study proposes an extended Theory of Planned Behavior (TPB) model that incorporates both psychological and contextual factors influencing housing-related decision-making. The latent construct Delayed Gratification Tendency (DGT) is integrated as a personal trait shaping both the perception of frugal innovation and the intention to adopt frugal housing. Additionally, Perceived Need for Affordable Housing (PNAH) captures contextual pressures relevant to housing markets.

In contrast to the original TPB, this model introduces a moderating effect (H5), in which DGT strengthens the impact of perception (PFI) on adoption intention (WAFH). This reflects the idea that individuals more capable of delaying gratification are more likely to act on their positive evaluations of frugal innovation. The final structural model includes five hypotheses (H1-H5), covering direct effects and one interaction effect tested through a latent variable approach.

This integration enhances the theoretical contribution by bridging behavioral psychology with innovation diffusion and value-sensitive decision-making in housing markets.

3. Methodology

The study employs a quantitative, cross-sectional design (Fu et al., 2024) with Structural Equation Modeling (SEM) (Carvalho, Chima, 2014) to examine the proposed relationships among latent variables (Gunzler et al., 2021).

All statistical analyses were performed using a combination of JASP, Jamovi, and SPSS. This multi-software approach was adopted to ensure both methodological rigor and flexibility in testing the hypotheses. JASP was primarily used for exploratory and confirmatory factor analyses as well as structural equation modeling (SEM), due to its transparent output structure and alignment with psychometric standards. Jamovi was employed to test moderation effects, as it offers an intuitive implementation of interaction terms in latent models, which complements SEM results. Finally, SPSS was used for additional robustness checks, including ANOVA post-hoc comparisons across countries, which are more straightforward to execute and report in this environment. Using multiple platforms minimized the limitations of any single software, ensured reproducibility of results across tools, and allowed us to leverage the most suitable functionalities of each program.

3.1. Research Design

A quantitative approach was selected to test the hypothesized relationships within a structured SEM framework. The study is cross-sectional and exploratory, aiming to validate a conceptual model derived from the Theory of Planned Behavior and psychological constructs associated with decision-making and gratification delay.

To test the moderating effect of DGT on the relationship between PFI and WAFH (H5), an interaction term (PFI × DGT) will be created and included in the SEM model. This approach follows standard procedures for testing moderation in structural models (Hair et al., 2017). The interaction path will be evaluated for statistical significance. A significant positive path coefficient would confirm that the effect of PFI on WAFH strengthens with higher levels of DGT. In practice, the moderation hypothesis (H5) was tested using the latent interaction functionality available in Jamovi (two-stage approach), which allows for product-term creation between latent variables without the need for indicator-centering. Two interaction terms were created (PFIH × DGTHd and PFIH × DGTHimp) and entered as additional predictors of WAFH. The analysis was estimated with ML and robust standard errors, and significance was assessed at the 95% confidence level.

Conceptual model (Figure 1)

H1: SEM model: PFI ~ DGTd, PFI ~ DGTi
H2: SEM model: WAFH ~ PFI
H3: SEM model: WAFH ~ DGTd, WAFH ~ DGTi

H4: SEM model: WAFH ~ PNAH

H5 (moderation): SEM model: WAFH ~ PFI + DGT + PFI×DGTd, WAFH ~ PFI + DGT + PFI×DGTi

As shown in Figure 1, the structural model specifies the hypothesized relationships among the latent variables.

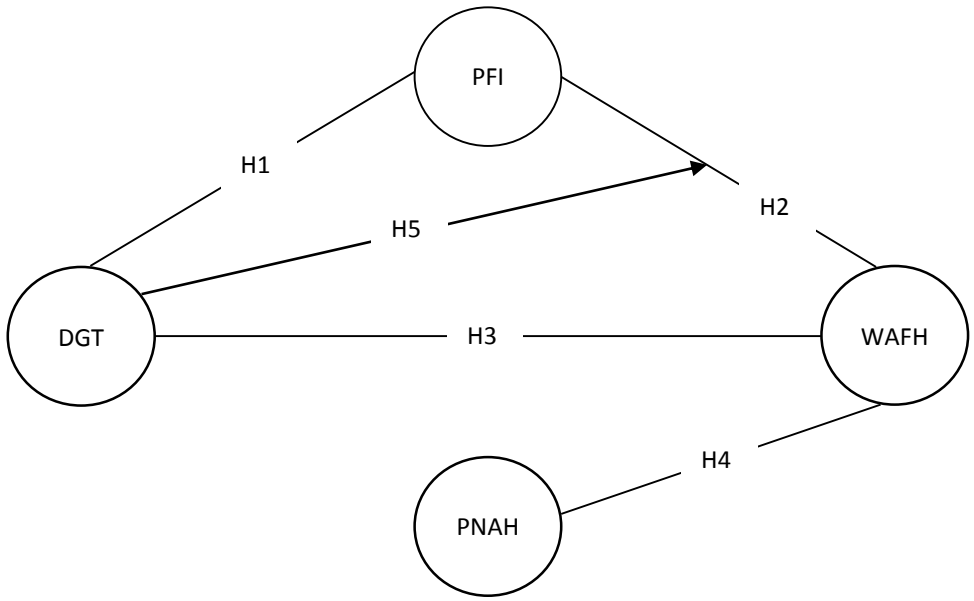

Figure 1. Conceptual model.

Source: own study.

The Figure 1 clarifies the role of DGT both as a direct antecedent and as a potential moderator of the PFIH–WAFH link. This visual specification complements the model syntax and prepares the ground for the subsequent estimation strategy.

3.2. Data Collection and Sampling

Data was collected using an online questionnaire distributed via the Prolific platform. The survey includes items measuring latent constructs: Perception of Frugal Innovation (PFI), Willingness to Adopt Frugal Housing (WAFH), Delayed Gratification Tendency (DGT), and Perceived Need for Affordable Housing (PNAH). Participants were selected using pre-screening filters to target individuals interested in or actively involved in housing-related decisions. The sample size is 360 respondents (N = 360), ensuring sufficient power for SEM analysis (Kline, 2015).

3.3. Research Sample and Data Collection

The data was collected using an online questionnaire distributed via Prolific (www.prolific.com), a crowdsourcing platform commonly used for academic research. The platform enables targeted recruitment based on predefined demographic and behavioral criteria.

The sample consisted of adult participants (aged 18+) from developed economies (Great Britain, Germany and Sweden), all of whom indicated that they are either currently involved in housing decisions or expect to make such decisions in the near future. Inclusion criteria also required participants to be proficient in English and have a minimum approval rate of 95% on the platform to ensure data quality.

A non-probability purposive sampling approach was employed to capture a diverse but relevant cross-section of potential housing decision-makers. Participants were compensated fairly according to Prolific's guidelines. Data collection was completed in July, 2025, resulting in a final sample of N = 360 valid responses after screening for attention and completion time.

Frequency Tables

Descriptive frequencies for age are reported in Table 1.

Table 1.
Frequencies for Age

Age	Frequency	Percent	Valid Percent	Cumulative Percent
25-34	143	39.7	39.7	39.7
35-44	101	28.1	28.1	67.8
45-54	52	14.4	14.4	82.2
55-64	25	6.9	6.9	89.2
Under 25	39	10.8	10.8	100.0
Total	360	100.0		

Source: own study.

The majority of respondents are between the ages of 25 and 34, making up nearly 40% of the sample. This is followed by the 35-44 age group, which accounts for about 28%. Younger individuals under 25 make up around 11%, while those aged 45-54 constitute 14%. Only a small portion, just under 7%, are aged 55-64. Overall, the sample is relatively young to middle-aged, with very few older participants.

Gender distribution is summarized in Table 2.

Table 2.
Frequencies for Gender

Gender	Frequency	Percent	Valid Percent	Cumulative Percent
Female	148	41.1	41.1	41.1
Male	209	58.1	58.1	99.2
Non-binary / Third gender	3	0.8	0.8	100.0
Total	360	100.0		

Source: own study.

Men represent the largest gender group in this study, comprising approximately 58% of respondents. Women follow at just over 41%, and a very small number of participants (0.8%) identify as non-binary or of a third gender. The gender distribution slightly favors male participants.

Educational attainment frequencies appear in Table 3.

Table 3.
Frequencies for Education level

Education level	Frequency	Percent	Valid Percent	Cumulative Percent
Bachelor's degree	138	38.3	38.3	38.3
Doctoral degree	19	5.3	5.3	43.6
Master's degree	106	29.4	29.4	73.1
Other	4	1.1	1.1	74.2
Primary school	1	0.3	0.3	74.4
Secondary school	48	13.3	13.3	87.8
Vocational training	44	12.2	12.2	100.0
Total	360	100.0		

Source: own study.

Most respondents hold a bachelor's degree (38.3%) or a master's degree (29.4%), indicating a highly educated sample overall. A smaller segment holds a doctoral degree (5.3%). Other education levels, such as secondary school (13.3%) and vocational training (12.2%), are present but less prominent. Only a few individuals reported primary school education or other categories. The data suggests that the sample is skewed toward those with higher education, particularly university degrees.

Employment status is detailed in Table 4.

Table 4.
Frequencies for Employment status

Employment status	Frequency	Percent	Valid Percent	Cumulative Percent
Full-time	278	77.2	77.2	77.2
Other	2	0.6	0.6	77.8
Part-time	57	15.8	15.8	93.6
Retired	1	0.3	0.3	93.9
Student	20	5.6	5.6	99.4
Unemployed	2	0.6	0.6	100.0
Total	360	100.0		

Source: own study.

The vast majority of participants are employed full-time, accounting for over three-quarters of the sample. Part-time workers make up about 16%, while students represent a modest 5.6%. Very few respondents are unemployed, retired, or fall into other employment categories. This indicates a sample composed predominantly of actively working individuals.

Self-reported current financial situation is presented in Table 5.

Table 5.
Frequencies for current financial situation

Current financial situation	Frequency	Percent	Valid Percent	Cumulative Percent
Above average	56	15.6	15.6	15.6
Average	111	30.8	30.9	46.5
Below average	28	7.8	7.8	54.3
Far above average	6	1.7	1.7	56.0
Far below average	6	1.7	1.7	57.7
Slightly above average	104	28.9	29.0	86.6
Slightly below average	48	13.3	13.4	100.0
Missing	1	0.3		
Total	360	100.0		

Source: own study.

Respondents most commonly rate their financial situation as average (30.9%) or slightly above average (29%). Only a small proportion consider themselves far above average (1.7%) or far below average (also 1.7%). About 13.4% perceive their situation as slightly below average, and 7.8% say it's below average. A modest 15.6% feel they are above average financially. One response is missing. Overall, the financial self-assessments suggest that most people feel they are doing at least reasonably well, with few extremes.

Gross monthly household income categories are shown in Table 6.

Table 6.
Frequencies for Gross monthly household income

Gross monthly household income	Frequency	Percent	Valid Percent	Cumulative Percent
$1000-2499	47	13.1	13.1	13.1
$2500-4999	113	31.4	31.5	44.6
$5000-7499	111	30.8	30.9	75.5
$7500+	46	12.8	12.8	88.3
<$1000	10	2.8	2.8	91.1
Prefer not to say	32	8.9	8.9	100.0
Missing	1	0.3		
Total	360	100.0		

Source: own study.

The most frequently reported household income falls within the $2500-4999 and $5000-7499 ranges, together representing over 60% of the sample. A smaller group earns less than $2500, and 12.8% report earning more than $7500. Only a small fraction earns below $1000. Interestingly, nearly 9% preferred not to disclose their income, and one response is missing. These figures reflect a predominantly middle- to upper-middle-income demographic.

While the sample was not statistically representative in the probabilistic sense, it was designed to be thematically relevant to the research objectives. Participants were selected based on their engagement with housing decisions, which aligns with the behavioral constructs examined in the model. As this study focuses on structural relationships rather than population estimates, the sampling approach is considered methodologically appropriate.

3.4. Research Instrument

The questionnaire consisted of 40 items rated on a 7-point Likert scale, ranging from 1 (Strongly Disagree) to 7 (Strongly Agree). Each latent construct was measured using 10 items adapted from validated sources in frugal innovation, behavioral psychology, and housing literature. Additionally, a demographic section collected information on age, gender, income, education, and housing status.

1) Perception of Frugal Innovation (PFI): This construct draws on the conceptual frameworks of Agarwal & Brem (2017), who explore the evolution and future trajectories of frugal innovation, and Tiwari, Kalogerakis & Herstatt (2017), who emphasize its relevance within developed economies. Additionally, Sharma & Kumar (2024) contribute insights into quality dimensions, particularly performance, conformance, and value-driven efficiency. The scale items were designed to reflect typical evaluations of innovation perception, perceived quality, value alignment, and sustainability within a value-based innovation framework.
2) Willingness to Adopt Frugal Housing (WAFH): The development of this construct was informed by Mignenan (2022), who advocates for greater sector-specific research in frugal innovation (particularly in housing, education, and agriculture), as well as Ratten (2019), who examines frugal innovation in the context of entrepreneurship and globalization. Behavioral intention items were inspired by the Theory of Planned Behavior (Ajzen, 1991), particularly in capturing readiness, social influence, and perceived control over adopting frugal housing solutions.
3) Delayed Gratification Tendency (DGT): The items measuring DGT are based on established psychological tools such as the Delay of Gratification Inventory (Hoerger et al., 2011) and the Grit Scale (Duckworth et al., 2007), which assess long-term persistence and impulse control. Foundational theoretical grounding comes from Mischel et al. (1989), whose Marshmallow Test remains a seminal reference in the study of self-control and future-oriented behavior. The construct was adapted to capture individual tendencies toward long-term planning and impulsivity in the housing context.
4) Perceived Need for Affordable Housing (PNAH): This construct was informed by existing frameworks on housing affordability stress, including indices developed by the OECD and UN-Habitat. Additional references include Eurostat reports on housing and life satisfaction in Europe. Several items were adapted from empirical work on housing stress and affordability burden, particularly the studies by Stone, Burke, & Ralston (2011), which offer a multidimensional perspective on cost-related housing pressures.

Measures and Item Reduction Procedure

The initial version of the questionnaire consisted of 40 items designed to assess four latent constructs. To ensure psychometric robustness, an Exploratory Factor Analysis (EFA) was conducted using the Principal Axis Factoring method with Oblimin rotation in JASP. This process led to a substantial reduction in the number of items, guided by clear criteria: items with factor loadings below 0.50, items showing significant cross-loadings (above 0.30), and those contributing to low Average Variance Extracted (AVE) values were excluded from further analysis.

The EFA results revealed a stable and theoretically coherent factor structure. Specifically, the construct of Delayed Gratification Tendency (DGTH) exhibited a two-dimensional structure. The first dimension, labeled DGTH_dl (long-term control), captures forward-looking self-discipline, planning, and frugality. The second, DGTH_imp (impulsiveness), reflects emotional and reactive tendencies in housing-related decisions. This latter scale was preserved in its original (non-reversed) orientation, consistent with its conceptual definition.

The remaining constructs (Perception of Frugal Innovation in Housing, Willingness to Adopt Frugal Housing, and Perceived Need for Affordable Housing) confirmed a unidimensional structure, with no significant semantic overlap or error covariances detected.

Following EFA and subsequent validity checks, the final structure retained:

- PFIH: 7 items,
- WAFH: 7 items,
- DGTH_dl: 4 items,
- DGTH_imp: 4 items,
- PNAH: 7 items.

Model fit and construct validity were further evaluated using Structural Equation Modeling (SEM), yielding satisfactory results across key indices such as CFI and RMSEA. Additional tests for convergent and discriminant validity (e.g., AVE, composite reliability) are underway, as well as planned multi-group invariance tests across countries. Descriptive labels and item directions were also reviewed to ensure interpretative clarity.

Each of the retained constructs was examined for consistency with its original conceptual definition. The analysis confirmed strong theoretical alignment:

- PFIH (Perception of Frugal Innovation in Housing) captures respondents' beliefs about the value, utility, and societal relevance of economically and resource-efficient housing innovations. All items focus on quality, adaptability, resource efficiency, and alignment with sustainability, indicating high construct validity.
- WAFH (Willingness to Adopt Frugal Housing) reflects behavioral intentions and readiness to engage with frugal housing solutions. The selected items tap into personal efficacy, social support, environmental awareness, and willingness to invest in learning and implementation, supporting psychological coherence.

- DGTH_dl (Long-Term Gratification) reflects the capacity for delayed reward in housing contexts. The items emphasize planning, self-regulation, saving behavior, and goal orientation, fully aligned with the construct's theoretical foundations.
- DGTH_imp (Impulsiveness) measures housing-related impulsivity, such as emotional decisions, cultural pressure, and susceptibility to short-term incentives. Despite the non-reversed scale, all items clearly reflect barriers to self-control, supporting high conceptual accuracy.
- PNAH (Perceived Need for Affordable Housing) captures subjective financial and structural housing stress. Items represent different dimensions of cost burden (rent, heating, location), infrastructure-related disadvantages, and emotional strain, offering a comprehensive and multidimensional picture of housing need.

The refined measurement model reflects both theoretical consistency and empirical clarity, forming a robust foundation for subsequent structural modeling and hypothesis testing.

3.5. Reliability and Validity

To ensure measurement quality, the model will undergo both reliability and validity checks prior to structural analysis. Internal consistency will be assessed using Cronbach's alpha ($\alpha \geq 0.70$), and will be calculated for all constructs. Convergent validity will be evaluated via Average Variance Extracted (AVE ≥ 0.50).

The latent interaction term (PFI × DGTHdl and PFI x DGTHimp), introduced to test the moderating effect of Delayed Gratification Tendency, will not be evaluated through traditional CFA criteria. Instead, its role will be assessed by examining the significance of its structural path to WAFH in the SEM model. This reflects best practice for testing moderation in SEM and latent variable modeling (Hair et al., 2017).

3.6. Data Analysis – Structural Equation Modeling

To evaluate the hypothesized measurement and structural model, Structural Equation Modeling (SEM) was conducted using JASP and Jamovi. The model included five latent variables (PFIH, WAFH, DGTHi, DGTHd, PNAH) and tested both direct and moderating effects through interaction terms. To address Hypothesis 5 concerning moderation, additional analyses were conducted using the General Linear Model – Moderation module in Jamovi. This approach enabled estimation of interaction effects between the perception of frugal innovation (PFIH) and the two subdimensions of delayed gratification tendency (DGTHd, DGTHimp) on willingness to adopt frugal housing (WAFH). Both interaction terms (PFIH × DGTHd and PFIH × DGTHimp) were tested. The resulting coefficients were not statistically significant, suggesting no moderation effect.

The model syntax defined all latent constructs based on their corresponding observed indicators. Interaction effects were specified as product terms (e.g., PFIH * DGTHd) and included in the structural path model. All latent variables were allowed to correlate, and exogenous covariates were fixed.

The model was estimated using the Maximum Likelihood (ML) method with Full Information Maximum Likelihood (FIML) to handle missing data. Confidence intervals were set at 95%. Factor scaling was based on factor loadings, and the default model test and information matrix were used. Standard errors were calculated with default settings. The path diagram included standardized parameter estimates, and residuals (covariances and variances) were also available for further diagnostic checks.

The structural model will include five hypothesized relationships (H1-H5). In addition to direct effects (H1-H4), moderation analysis will be conducted to test H5. Specifically, an interaction term (PFI × DGTHdl and PFI × DGTHimp) will be created using the two-stage approach available in JASP and Jamovi. This term will be added to the model as a predictor of WAFH to assess whether DGT strengthens the effect of PFI on WAFH.

To test the hypothesized moderation effect (H5) between perception of frugal innovation (PFIH) and willingness to adopt frugal housing (WAFH) by delayed gratification tendency (DGT), moderation analyses were conducted in Jamovi. Both deliberate self-control (DGTHd) and impulsivity-related self-control (DGTHi) were examined as potential moderators, using mean-centered variables and interaction terms. Additionally, exploratory one-way ANOVA with Tukey HSD post-hoc tests was performed in SPSS to identify possible differences in key constructs between respondents from Germany (DE), Great Britain (GB), and Sweden (SE).

Model Fit

The structural model demonstrated acceptable fit to the data: $\chi^2(368) = 807.8$, $p < .001$. While the Comparative Fit Index (CFI = 0.858) did not exceed the conventional threshold of 0.90, other indicators support the model's adequacy. The Root Mean Square Error of Approximation (RMSEA = 0.058; 90% CI = [0.052, 0.063]) and the Standardized Root Mean Square Residual (SRMR = 0.065) both fall within the recommended range of < 0.08, suggesting acceptable model fit (Hair et al., 2017).

Reliability and Convergent Validity

Internal consistency was satisfactory across latent constructs, with Cronbach's α exceeding the 0,70 threshold for all scales, except for the long-term DGT subscale (DGTHd: α = 0.661), which may reflect its shorter length. Average Variance Extracted (AVE) values ranged between 0.34 and 0.45, indicating moderate convergent validity (Fornell, Larcker, 1981).

Construct reliability and convergent validity are summarized in Table 7.

Table 7.
Construct Reliability and Convergent Validity

Latent Variable	Coefficient α	AVE
PFIH	0.790	0.357
WAFH	0.800	0.382
DGTHd	0.661	0.342
DGTHi	0.760	0.449
PNAH	0.807	0.398
total	0.805	

Source: own study.

SEM Path Estimates

Structural path analysis confirmed all hypothesized relationships except one. Direct paths from DGT (both long-term and impulsivity) to PFIH and WAFH were statistically significant, as was the path from PFIH to WAFH. However, the effect of Perceived Need for Affordable Housing (PNAH) on WAFH was non-significant.

Standardized structural path estimates are listed in Table 8.

Table 8.
Structural Path Estimates

Path	Std. estimate	Std. Error	z-value	p	95% CI
DGTHd → PFIH	0.603	0.069	8.776	< .001	[0.468, 0.738]
DGTHi → PFIH	0.234	0.074	3.177	.001	[0.090, 0.378]
PFIH → WAFH	0.421	0.068	6.201	< .001	[0.288, 0.555]
DGTHd → WAFH	0.471	0.084	5.607	< .001	[0.306, 0.635]
DGTHi → WAFH	0.198	0.075	2.652	.008	[0.052, 0.345]
PNAH → WAFH	–0.015	0.058	–0.263	.793	[–0.128, 0.098]

Source: own study.

All structural paths were statistically significant except for PNAH → WAFH, suggesting that subjective need for affordable housing did not directly translate into adoption intention. The strongest predictors of WAFH were PFIH and long-term DGT.

Indirect and Total Effects

Mediation analysis showed that PFIH significantly mediated the effect of both DGT dimensions on WAFH. The indirect effect was notably stronger for the long-term DGT subscale.

Indirect and total effects are reported in Table 9.

Table 9.
Indirect and Total Effects

Path	Type	Std. estimate	z-value	p
DGTHd → PFIH → WAFH	Indirect	0.254	5.649	< .001
DGTHi → PFIH → WAFH	Indirect	0.099	3.009	.003
DGTHd → WAFH	Total	0.725	11.392	< .001
DGTHi → WAFH	Total	0.297	3.817	< .001

Source: own study.

The results confirm that PFIH serves as a significant mediator between DGT and WAFH, highlighting the central role of perception in translating future-oriented psychological traits into housing adoption intentions.

Path diagram

The structural equation model (SEM) specified in the analysis examined the relationships between five latent variables: Perception of Frugal Innovation in Housing (PFIH), Willingness to Adopt Frugal Housing (WAFH), Delayed Gratification - Deliberate (DGTHd), Delayed Gratification - Impulsive (DGTHi), and Perceived Need for Affordable Housing (PNAH). The diagram (Fig. 1) presents both the measurement model (with observed indicators and factor loadings) and the structural paths among the latent constructs.

Each latent variable was defined by a set of observed indicators with high standardized loadings (all > 0.48, $p < .001$), confirming the adequacy of the measurement model. The structural paths in the diagram illustrate the hypothesized directional relationships between the constructs.

Specifically, DGTHd and DGTHi were found to significantly predict both PFIH and WAFH, with PFIH acting as a partial mediator. In addition, PNAH was included as a control variable influencing WAFH, though its effect was not statistically significant ($p = .793$).

The estimated structural model with standardized coefficients is presented in Figure 2.

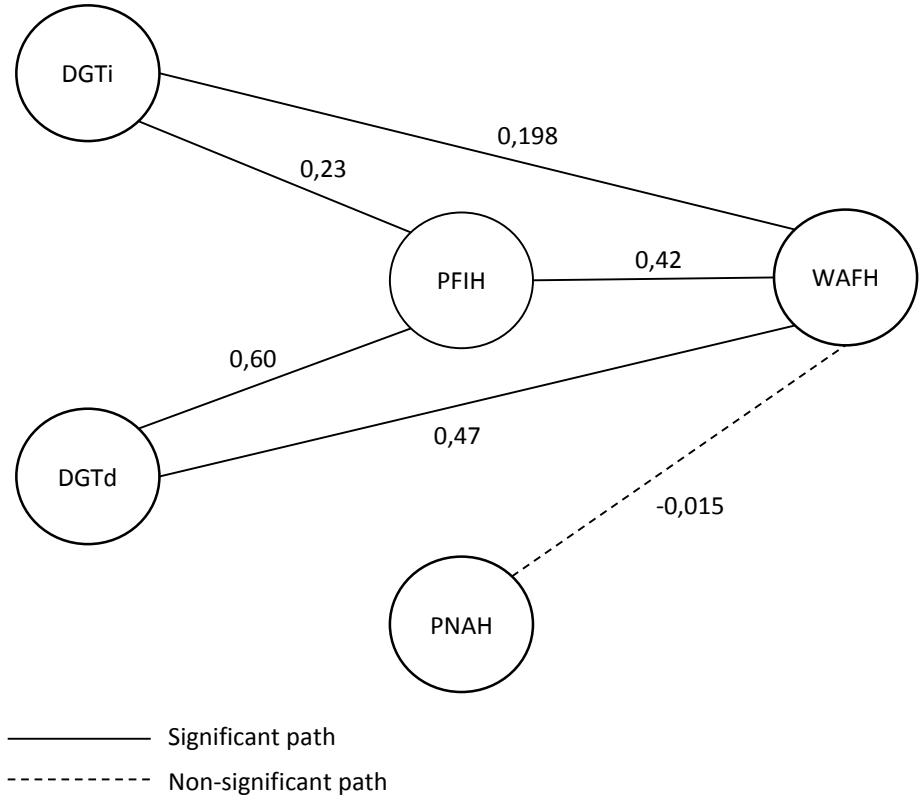

Figure 2. SEM Path diagram.

Source: own study.

All direct and indirect paths displayed in the diagram were standardized estimates. Solid lines represent statistically significant paths ($p < .05$), while non-significant paths are displayed as dashed or thinner arrows. The model fit indices (CFI = .858, RMSEA = .058, SRMR = .065) indicated an acceptable fit to the data. Full parameter estimates, including indirect and total effects, are reported in Table 9.

3.7. Ethical Considerations

The study adheres to ethical standards for online research. Participants were informed about the purpose of the study, the voluntary nature of participation, and data confidentiality. Informed consent was obtained before starting the questionnaire. No personal data was collected.

4. Results

4.1. Structural Model Fit

The structural equation model (SEM) demonstrated an acceptable overall fit, although some indices remained below ideal thresholds. Specifically, the RMSEA was 0.058 (90% CI: [0.052, 0.063]), and the SRMR was 0.065, both within acceptable bounds. However, the CFI (0.858) and TLI (0.844) fell slightly short of the conventional 0.90 cut-off, suggesting potential areas for model refinement. Despite these limitations, all factor loadings were statistically significant ($p < .001$), and the standardized values exceeded 0.48, confirming convergent validity of the indicators.

4.2. Regression Path Coefficients

Key regression paths revealed strong and statistically significant relationships:

- PFIH - DGTHd: $\beta = 0.603$, $p < .001$.
- PFIH - DGTHi: $\beta = 0.234$, $p = .001$.
- WAFH - PFIH: $\beta = 0.421$, $p < .001$.
- WAFH - DGTHd: $\beta = 0.471$, $p < .001$.
- WAFH - DGTHi: $\beta = 0.198$, $p = .008$.
- WAFH - PNAH: $\beta = -0.015$, $p = .793$ (ns).

These results confirm that both long-term and impulsive forms of delayed gratification significantly influence both the perception of frugal housing innovations and willingness to adopt such solutions. PFIH acts as a significant mediator, and PNAH was not a significant predictor in the final model. For the moderation hypothesis (H5), neither interaction term was statistically significant (PFIH × DGTHd: $\beta = 0.0103$, $p = .818$; PFIH × DGTHimp: $\beta = -0.0310$,

p = .463). Simple slope analysis confirmed that the positive relationship between perception (PFIH) and intention (WAFH) remained stable across low, medium, and high levels of both DGT dimensions, indicating no evidence for a moderating effect.

4.3. Indirect and Total Effects

- DGTHd - PFIH - WAFH: β = 0.254, p < .001.
- DGTHi - PFIH - WAFH: β = 0.099, p = .003.
- Total effect (DGTHd - WAFH): β = 0.725.
- Total effect (DGTHi - WAFH): β = 0.297.

These findings emphasize the mediating role of perception and the dominant impact of long-term delayed gratification (DGTHd) on behavioral intention.

The hypothesized moderation effect (H5) was not supported. In Jamovi moderation models, the interaction term PFIH × DGTHd was non-significant (β = 0.010, p = .818), as was PFIH × DGTHi (β = −0.031, p = .463). This indicates that the strength of the relationship between perception of frugal innovation and willingness to adopt frugal housing was not contingent on respondents' level of delayed gratification, whether deliberate or impulsivity-related.

4.4. Between-country differences

An additional one-way ANOVA was conducted to explore potential differences between respondents from Germany (DE), Great Britain (GB), and Sweden (SE) across all latent constructs. Post-hoc Tukey HSD tests revealed significant differences for PFIH, WAFH, DGTHi, and PNAH.

Specifically, GB respondents scored significantly higher than DE respondents in PFIH (p < .001), while GB also outscored SE in PFIH (p < .001). For WAFH, GB respondents reported higher willingness to adopt frugal housing than SE respondents (p = .004). In terms of impulsivity-related delayed gratification (DGTHi), DE scored significantly lower than GB (p = .002) but higher than SE (p = .044), with GB also scoring significantly higher than SE (p < .001). Finally, PNAH was significantly higher in GB compared to DE (p = .033) and SE (p < .001). No significant between-country differences were observed for deliberate self-control (DGTHd).

Post-hoc comparisons across countries are summarized in Table 10.

Table 10.
ANOVA Post-Hoc Results Summary

Variable	Significant Pair	Mean Difference	p-value
PFIH	GB > DE	0.429	< .001
PFIH	GB > SE	0.417	< .001
WAFH	GB > SE	0.374	.004
DGTHi	GB > DE	0.544	.002
DGTHi	SE > DE	0.388	.044

Cont. table 10.

DGTHi	GB > SE	0.931	< .001
PNAH	GB > DE	0.377	.033
PNAH	GB > SE	0.545	< .001

Source: own study.

One-way ANOVA with Tukey HSD post-hoc tests revealed significant between-country differences for four constructs. GB respondents scored significantly higher than DE in PFIH and DGTHi, and higher than SE in PFIH, WAFH, DGTHi, and PNAH. SE respondents scored higher than DE in DGTHi. No significant differences were found for DGTHd.

5. Discussion

This study explored the behavioral and psychological determinants of frugal housing adoption in the context of developed economies. The findings support and extend the Theory of Planned Behavior (TPB), demonstrating that psychological traits, particularly Delayed Gratification Tendency (DGT), play a central role in shaping both perception and willingness to adopt frugal housing solutions. This dual influence highlights that perception does not act merely as a parallel predictor, but as a psychological filter through which self-control traits exert much of their effect on adoption intentions. The structural model suggests that while both dimensions of DGT directly influence WAFH, a substantial portion of their predictive power is channelled indirectly via PFIH. Contrary to our expectations in H5, the moderation analyses using Jamovi did not reveal significant interaction effects for either form of delayed gratification. This suggests that while both deliberate and impulsivity-related self-control are individually important predictors, they do not significantly alter the link between perception and willingness to adopt frugal housing.

Importantly, DGTH_dł (representing deliberate, long-term self-control) emerged as a stronger predictor than DGTH_imp (impulsivity-related self-control), confirming its direct and indirect influence on adoption intention. Individuals with higher DGTH_dł scores were more likely to perceive frugal innovation positively ($\beta = 0.603$, $p < .001$) and to express willingness to adopt it ($\beta = 0.471$, $p < .001$). This emphasizes the relevance of future orientation and value-based thinking in decision-making processes.

In line with Hypothesis 3, Perception of Frugal Innovation (PFIH) was found to significantly predict Willingness to Adopt Frugal Housing (WAFH) ($\beta = 0.421$, $p < .001$), underscoring the cognitive dimension of behavioral intention. Moreover, mediation analysis revealed significant indirect effects of DGTH_dł and DGTH_imp on WAFH through PFIH, indicating that perception serves as the primary pathway linking psychological traits to behavioral intention. This finding has theoretical implications: it suggests that interventions aimed at increasing adoption of frugal housing should focus less on altering economic need or

raw behavioral control, and more on shaping positive cognitive appraisals of the innovation itself. In other words, the perception construct functions as a cognitive gateway — if individuals do not value or trust frugal housing, even high self-control may not translate into adoption.

Hypothesis 4, however, was not supported. The Perceived Need for Affordable Housing (PNAH) showed no significant direct effect on WAFH (β = -0.015, p = .793). This result challenges the assumption that economic constraints directly motivate openness to frugal solutions, suggesting instead that affordability pressure may be filtered through psychological and identity-related factors, or even counteracted by them. The lack of a direct effect for PNAH may also reflect cross-national variation in how affordability pressure is experienced and internalized. Without establishing measurement invariance across the three country samples, it is unclear whether PNAH is conceptualized consistently. This limitation suggests caution in generalizing the null finding beyond the present sample.

The exploratory ANOVA results indicated that perceptions and intentions related to frugal housing, as well as certain psychological traits, vary between countries. For example, GB respondents consistently demonstrated higher PFIH, WAFH, DGTHi, and PNAH compared to at least one other group. However, since measurement invariance was not tested, these differences should be interpreted cautiously, as they may partly reflect measurement bias rather than substantive cultural variation.

Hypothesis 5 proposed a moderation effect of Delayed Gratification Tendency on the link between perception (PFIH) and adoption intention (WAFH). To test Hypothesis 5, a moderation analysis was conducted in Jamovi using the latent interaction procedure. Neither the deliberate (DGTHd × PFIH) nor the impulsivity-related (DGTHimp × PFIH) interaction reached statistical significance (β = 0.0103, p = .818; β = -0.0310, p = .463). This suggests that the strength of the perception–intention link does not depend on individual differences in delayed gratification. The absence of a significant interaction term in both DGTH_dl × PFIH and DGTH_imp × PFIH models suggests that delayed gratification does not alter the strength of the perception–intention link. This outcome, confirmed using the latent interaction procedure in Jamovi, implies that while self-control influences both perception and intention, its role is largely additive rather than conditional. This nuance is important for theory building, as it points to perception's stability as a driver of intention across varying levels of self-control.

While the findings provide a coherent picture of the psychological mechanisms underlying frugal housing adoption, the cross-sectional nature of the data limits causal inference. Additionally, the study did not test for measurement invariance across the three national subsamples (UK, Germany, Sweden). Future research should assess whether the role of perception as a mediating channel holds consistently across different cultural and policy contexts, as cultural norms may shape both the salience of delayed gratification and the framing of frugal housing.

These findings align with macro-behavioral perspectives such as Galor's theory, which links individual psychological traits to broader socioeconomic development trends. The strong role of self-control and value perception, over mere financial constraint, suggests that innovation adoption in housing is driven by deeper psychological mechanisms rather than reactive economic need.

The cross-sectional nature of the study limits causal interpretation, and measurement invariance across countries was not tested, which should be addressed in future research. Nonetheless, this study provides novel empirical evidence for the psychological pathways shaping frugal housing acceptance and highlights the importance of integrating behavioral traits into sustainability-related adoption models.

6. Conclusions

This research contributes to a deeper understanding of frugal innovation adoption by emphasizing the psychological underpinnings of consumer decision-making in housing markets. The integration of DGT into the TPB framework proved to be theoretically and empirically fruitful, with both direct and mediated effects demonstrated.

Key conclusions:

1) Delayed Gratification Tendency (DGT), particularly the dimension related to long-term self-control and planning, emerged as a robust predictor of both perception of frugal innovation (PFIH) and behavioral intention (WAFH). This finding supports psychological theories of future orientation and highlights the pivotal role of self-regulation in high-stakes decision-making. Individuals capable of postponing immediate gratification were not only more likely to perceive frugal solutions as valuable but also more willing to adopt them. The results reinforce the idea that adoption of minimalist or cost-efficient housing solutions is not merely reactive but cognitively mediated and future-oriented. While the hypothesized moderation effect (H5) was not supported, the strength of both direct and mediated pathways underscores that DGT acts primarily as an independent driver of willingness to adopt, rather than as an enhancer of the perception–intention link.
2) Perception of Frugal Innovation (PFIH) emerged as the primary channel through which psychological traits, particularly delayed gratification, are translated into behavioral intention. The strength of this mediating path indicates that much of the psychological influence on adoption operates indirectly, being fully filtered through cognitive appraisal of the benefits, quality, and utility of frugal housing. This finding aligns with theories of value-based decision-making and underscores the importance of shaping public narratives around frugal housing not as a compromise, but as a rational, future-

oriented, and meaningful choice. The lack of moderation observed in Jamovi reinforces this interpretation, pointing to perception as a stable and universal mechanism that operates regardless of individual differences in self-control.

3) Perceived Need for Affordable Housing (PNAH), although intuitively relevant, did not show a significant direct effect on adoption intention within the model. This somewhat counterintuitive finding suggests that structural or contextual stress, such as financial pressure, may not be sufficient to motivate behavioral change unless accompanied by supportive psychological predispositions and positive innovation appraisal. It also raises questions about the efficacy of purely economic framing in housing policies and supports the integration of psychological insights into housing design and communication strategies.
4) The study's model offers a cross-disciplinary contribution by integrating constructs from behavioral psychology (self-control, delay discounting), innovation studies (value perception), and housing research. The application of Structural Equation Modeling (SEM) allowed for testing both direct and indirect effects, offering a more nuanced understanding of adoption mechanisms than traditional models. This integrated approach could be further extended to other domains of sustainable consumption, such as energy use, mobility, or food behavior, where frugal or minimalist innovations are gaining attention.

Practical implications:

- Redefine frugality as aspirational, not compensatory. To increase broader appeal, frugal housing should be framed not as a compromise, but as a smart, responsible, and socially progressive choice. This reframing may help counteract the cultural bias equating minimalism with deprivation, especially among consumers prone to impulsivity.
- Contextualize affordability pressures in public narratives. While perceived need for affordable housing alone did not predict adoption intention, it remains a relevant contextual stressor. Communication that connects affordability concerns to the value proposition of frugal housing may help reframe urgency into action, especially in younger and economically vulnerable demographics.
- Design policies that reward forward-thinking behavior. Incentives and subsidies should be aligned with behaviors that reflect delayed gratification, such as long-term tenancy, low-impact material choices, or energy-saving investments. Such policies would both reinforce individual self-regulation and foster systemic adoption of sustainable housing.

Limitations and future research:

- The study employs a cross-sectional design, which restricts the ability to draw causal inferences. While the structural equation model demonstrates strong associations between constructs, longitudinal research would be necessary to confirm whether individuals who exhibit high levels of delayed gratification actually follow through with frugal housing choices over time. Furthermore, the study did not test for measurement

invariance across countries, leaving open the possibility that constructs such as PNAH or DGT may function differently in the UK, Germany, and Sweden. Future research should employ multi-group SEM to verify whether the observed relationships hold consistently across cultural and policy contexts.

- The sample, although thematically relevant and demographically diverse, was collected through a non-probability online platform and limited to developed economies. This may constrain the generalizability of findings, especially across different cultural, socioeconomic, or policy environments. Future studies could use representative samples or cross-cultural designs to explore potential measurement invariance and moderating effects of cultural norms or housing systems.
- The latent construct of Delayed Gratification Tendency (DGT) was measured through adapted self-report scales and factor-analyzed into two subdimensions: long-term planning and impulsivity. While this allowed for more nuanced modeling, future research might benefit from using complementary behavioral tasks or longitudinal experimental data to validate these dimensions.
- Although the perceived need for affordable housing (PNAH) was hypothesized to influence adoption intentions, it did not show a significant direct effect in the tested model. This suggests the need to revisit the operationalization of contextual stressors or explore more complex mediating pathways (e.g., financial anxiety, trust in institutions).
- The moderation hypothesis concerning DGT was not fully tested due to model constraints and technical warnings in the SEM procedure. Future studies should explore moderated or multi-group SEM models, possibly comparing groups with high vs. low self-control, or countries with different welfare and housing systems. Due to its cross-sectional design, this study cannot establish temporal causality between psychological traits and behavioral intentions. Longitudinal or experimental research would be necessary to confirm directionality and stability of the observed effects.
- While the study examined cross-country differences, the analyses were exploratory and did not include formal measurement invariance testing. Therefore, cross-cultural interpretations should be made with caution, as observed mean differences may reflect both substantive variation and potential measurement bias. Future research should explore multi-group SEM or invariance testing procedures to confirm the robustness of the model across national contexts.
- The study employed a cross-sectional design, which limits the ability to draw causal inferences. Future research should consider longitudinal designs to capture changes over time.
- Measurement invariance across countries was not tested, which constrains the interpretation of observed mean differences between national samples.

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