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Hybrid Crowdfunding in Art Industry in Europe

Bachelor's thesis

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Declaration of Authorship

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Abstract

Crowdfunding is a new and popular way to fund startups, projects, or ideas by collecting small investments from a large pool of people. There are four types of crowdfunding, including the recently emerged hybrid crowdfunding. Hybrid crowdfunding is an up-and-coming model that blends features of different types of crowdfunding and has an opportunity to provide a mix of benefits in the form of mixed returns. The thesis analyses the potential of hybrid crowdfunding, combining equity-based and reward-based crowdfunding, to deliver clear informative signals from contributors to project creators in the art industry. Using a baseline model and its extension, based on an incentive-aligned truth-telling mechanism and the Becker-DeGroot-Marschak (BDM) method in conjoint analysis, the research shows that pre-buying and financial return incentives can be designed to accurately reflect contributors' willingness to pay (WTP) and ensure that the contributors are willing to join the mixed crowdfunding mechanism. This study provides a unique exploration of hybrid crowdfunding and paves the way for researchers to explore the phenomenon further.

JEL Classification	D26, G23, L26, M31
Keywords	Innovation, Crowdfunding, Creative work, Entrepreneurial finance, Marketing
Title	Hybrid Crowdfunding in Art Industry in Europe

Abstrakt

Crowdfunding je nový a oblíbený způsob financování startupů, projektů nebo nápadů prostřednictvím malých investic od velkého počtu lidí. Existují čtyři typy crowdfundingu, včetně nedávno vzniklého hybridního crowdfundingu. Hybridní crowdfunding je nastupující model, který v sobě spojuje rysy různých typů crowdfundingu a má příležitost poskytnout kombinaci výhod v podobě smíšených výnosů. Práce analyzuje potenciál hybridního crowdfundingu, který kombinuje crowdfunding založený na vlastním kapitálu a na odměnách, poskytovat jasné informační signály od přispěvatelů tvůrcům projektů v uměleckém průmyslu. Pomocí základního modelu a jeho rozšíření, založeného na motivačním mechanismu pravdivých informací a metodě Becker-DeGroot-Marschak (BDM) v konjunkturální analýze, výzkum ukazuje, že lze navrhnout pobídky před nákupem a finanční návratnost tak, aby přesně odrážely ochotu přispě-

vatelů platit (WTP) a zajistily, že přispěvatelé budou ochotni se do mechanismu smíšeného crowdfundingu zapojit. Navrhovaný mechanismus je velmi přímočarý, aplikovaný v základních nastaveních, což umožňuje jeho změnu přidáním různých nastavení, předpokladů a podmínek. Tato studie nabízí jedinečný průzkum hybridního crowdfundingu a vytváří základ pro budoucí výzkum, který by se tímto fenoménem zabýval hlouběji, například zkoumáním dlouhodobých důsledků hybridního crowdfundingu.

Klasifikace JEL	D26, G23, L26, M31
Klíčová slova	Inovace, crowdfunding, kreativní práce, podnikatelské financování, marketing
Název práce	Hybridní crowdfunding v uměleckém průmyslu v Evropě

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Acronyms

US United States

UK United Kingdom

KHM Kunsthistorisches Museum

BDM Becker-DeGroot-Marschak

WTP Willingness to pay

EU Expected utility

CDF Cumulative Distribution Function

PDF Probability Density Function

Chapter 1

Introduction

In today's market economy, attracting funds for business launch and development is crucial. Traditional financing methods are often inaccessible at the early stages of financing the projects and have drawbacks such as investor dependence, high costs, etc. Crowdfunding, a relatively new and increasingly popular model, offers a solution by raising small amounts from the pool of people through online platforms(Belleflamme et al., 2012). Crowdfunding offers possibilities for startups, firms, and growing companies(Leach and Melicher, 2009) that are not available through other funding mechanisms(Mollick, 2014), for example, digitization of the investment process, access to customers' feedback, testing of their ideas, and marketing strategy. The application of this modern alternative financing has found its way into multiple industries worldwide among entrepreneurs and investors because of its affordability and comprehensibility. Crowdfunding initially emerged with creative projects and has significantly evolved due to rapid technological advancements. Today, the art industry is still one of the most popular and profitable categories in the crowdfunding market, driving contributions to the arts, fostering innovation, connecting people globally and demonstrating substantial potential for future growth. There are four forms of crowdfunding that can be divided into two types: commercial (equity-based crowdfunding, loan-based crowdfunding) and noncommercial (reward-based crowdfunding, donation-based crowdfunding)(Massolution, 2015). Commercial projects provide private financial benefits in the form of money and equity. In contrast, noncommercial projects provide public benefits with an opportunity for non-financial rewards. Hybrid crowdfunding is the most recent but promising model that blends features of both and provides a mix of benefits in the form of mixed returns.

Beyond raising capital, crowdfunding serves as a powerful marketing and market research tool, aiding innovation and collaboration(Gerber and Hui, 2013; Miglo, 2016; Burtch et al., 2013). Effective marketing through crowdfunding reduces capital costs, links project creators with investors, generates publicity and enhances the chances of timely project funding. We can outline marketing strategy as one of the evident advantages of crowdfunding. Estrin et al. (2018) describe this feature of the crowdfunding mechanism as an opportunity for entrepreneurs to find the right moment and buzz, in other words, to get the audience's attention. As mentioned by Agrawal et al. (2014), hybrid crowdfunding potentially offers a clear informative signals about contributors' preferences and demand to investors due to the combined incentive structure – pre-buying and potential financial returns. These clearer signals can lead to a reduction of information asymmetry and better marketing strategies(Miglo, 2022; Connelly et al., 2011).

The objective of this thesis is to analyze the potential and working process of mixed crowdfunding – a combination of equity-based and reward-based crowdfunding – to deliver clear informative signals from contributors to project creators in art industry. For this purpose, the baseline model will be built along with necessary calculations and graphs. First, a baseline model will be based on an incentive-aligned truth-telling mechanism and the Becker-DeGroot-Marschak (BDM) method (Becker et al., 1964) as in studies by Ding and Eckel (2006). The mechanism defines an incomplete information game between the principal and the consumer where the former is unsure about (but wants to know) the preferences and demand for the good of the latter. Thus, according to the BDM mechanism, the consumer's stated Willingness to pay (WTP) will be compared to the randomly drawn price (x) and, depending on the result, the allocation rule for the good will be applied. The model will be considered in reward-based crowdfunding setting to show that the pre-buying mechanism can accurately reflect contributors' informative signals in three different cases. In extension, we will study cases with measurement errors and consumer product uncertainty.

After analysing the Becker-DeGroot-Marschak (BDM) model and its extensions, an extension of the BDM mechanism will be proposed to link it with hybrid crowdfunding in order to show that combined incentive structures (pre-buying and financial returns) indeed provide accurate signals of contributor's preferences. The mechanism will involve three steps: elicitation the investor's WTP, consideration the consumer's payment (ex-ante) as a combination of the

loan and advanced selling (i.e. a mix of financial and consumption benefit), and application of the modified allocation rule for the good (the structure of the ex-post payment) such that both incentive-compatibility condition and participation condition are met.

The study will try to prove that hybrid crowdfunding can enhance the quality of investors' informative signals, reduce information asymmetry, and improve marketing strategies. It will highlight the potential for hybrid crowdfunding to become a recognized financing method in art industry and other sectors. However, as hybrid crowdfunding is a still developing phenomenon, there is a significant lack of literature on this topic. This study undertakes a novel exploration of yet emerging concept of hybrid crowdfunding, addressing a gap in the literature and paving the way for future research to investigate its long-term implications and crowdfunding development.

This thesis is structured as follows: Chapter 2 and Chapter 3 focus on the existing literature. Chapter 2 defines definitions of crowdfunding and its different types, and explains the evolution of the concept, particularly in the art industry. Chapter 3 reviews existing literature on hybrid crowdfunding and its potential as a marketing and market research tool. In Chapter 4, a baseline model is developed to analyze the incentive-aligned truth-telling mechanism in reward-based crowdfunding using the BDM method. Chapter 5 focuses on the application of the BDM procedure in hybrid crowdfunding. The chapter includes theoretical and practical applications, showing that the hybrid model can provide accurate informative signals to investors. Chapter 6 discusses the results and suggests areas for future research and development. Chapter 7 summarizes the findings of the thesis.

Chapter 2

Definitions

In the this chapter, the definitions of crowdfunding and its different types are provided. The development of this phenomenon in the art industry is also covered.

2.1 Crowdfunding

According to Ordanini et al. (2011), crowdfunding is a way of raising funds through the collective cooperation of people for the implementation and support of early-stage entrepreneurial ventures. These ventures include new potential ideas, projects, startups, organizations, and businesses with little operating history or are in their development (Leach and Melicher, 2009). Internet plays a significant role in the discussed funding method (Brabham, 2008; Kleemann et al., 2008). As a phenomenon, it is linked to rapid technological development and consequential automatization of financial processes. Crowdfunding is performed through specifically designed two-sided online social media marketplace – crowdfunding platforms – where entrepreneurs link and communicate with potential funders (Estrin et al., 2018; Estrin and Khavul, 2016; Evans and Schmalensee, 2016; Dushnitsky et al., 2016; Miglo, 2021; Lambert and Schwienbacher, 2010; Schwienbacher and Larralde, 2010). Unlike traditional sources of financing, crowdfunding is open to a larger audience of entrepreneurs and contributors, allowing the latter to invest even small amounts of money (pay-what-you-want model) (Hardy, 2013; Belleflamme et al., 2012). Additionally, according to Schwienbacher and Larralde (2010) and Mollick (2014), crowdfunding platforms can be a solution for those projects' creators who find it difficult to obtain capital from traditional means of funding like loans, grants,

angel investors, venture capitalists, etc. (Gerber et al., 2012; Miglo, 2021), especially, after financial crisis (Belleflamme et al., 2012).

Crowdfunding is related to crowdsourcing. The latter concept was introduced by Howe (2008) in 2006. Crowdsourcing involves the direct participation of the crowd and its resources (time, skills, knowledge, and abilities) to find and develop different kinds of ideas or complete various tasks (Kleemann et al., 2008). An example of a global crowdsourcing project is the popular website Wikipedia[1], which is based on the principles of public access to information and freedom of its creation. Thus, the main difference between crowdsourcing and crowdfunding is that the latter concerns raising funds instead of obtaining ideas from a pool of individuals.

In the crowdfunding mechanism, the projects can range significantly from the idea of a food product to raising funds to reconstruct a public place. However, crowdfunding gained recognition through financing creative projects. What is more, crowdfunding platforms emerged and developed in the art industry. The first example of internet crowdfunding is the fundraising campaign organized by fans of the rock band Marillion to support and sponsor the group's tour in United States (US), in 1997. Subsequently, the group recorded and promoted more albums using this technique. In 1999, the Professional Contractors Group, a trade association for freelancers in the United Kingdom (UK), raised the necessary funds via the internet in 5 days to enable it to conduct its professional operations as a public organization (Howe, 2008). Brian Camelio, born in 1965, is the founder and CEO of the first crowdfunding platform called ArtistShare[2], established in 2001 to promote and finance musical artists. Following this, in 2002, websites for the film industry emerged – FilmVenture.com. Four years later, a similar crowdfunding platform for music, Sellaband, was launched in Austria, but it went bankrupt in 2010 despite retaining a third of the revenue from the sale of released albums (Agrawal et al., 2014). Nowadays, creative products are one of the most popular categories for raising funds on crowdfunding platforms. For illustration, in France, 74,614 projects in the art sphere have been successfully funded through crowdfunding platforms (Cicchiello et al., 2022). There are a great variety of online platforms for different types of crowdfunding in the art industry, such as Kickstarter[3],

[1]https://www.wikipedia.org
[2]https://www.artistshare.com
[3]https://www.kickstarter.com

Art Fund[4], Artemundi[5], etc. Most recently, a donation option became available in museums. Donation-based crowdfunding is a powerful tool for such institutions to secure financial support while fostering a deeper relationship with their audience. For example, Kunsthistorisches Museum (KHM)[6] offers their audience to donate money in pieces and projects of art collection in exchange for non-financial rewards, such as becoming a member of Art Patrons, invitations to exclusive events, and including the donor's name on the electronic roll of honour, listing donors on the Kunsthistorisches Museum (KHM) homepage. Despite the donation system, it has other characteristics of online crowdfunding platforms: it allows every person, not only professional investors, to be a contributor and donate a wide range of money, including minimal amounts of sum (Belleflamme et al., 2012); it operates through the internet.

2.2 Types of Crowdfunding

According to Buysere et al. (2012), there are four types of crowdfunding models such as donation-based, reward-based, debt-based, and equity-based crowdfunding. These forms can also be distinguished between commercial and noncommercial (Massolution, 2015). The difference between these two types is the benefit structure (private or public) and the presence of a system of rewards and bonuses. A commercial project is created first and foremost for generating profit; thus, the benefits that the contributor receives are primarily private. In comparison, noncommercial projects prioritize solving specific problems, implementing ideas, and donations as their main goals. Therefore, the provided benefits are public, and the contributor can receive non-financial rewards. Recently, a new type of crowdfunding has emerged - hybrid crowdfunding that combines a benefit structure and a system of both and includes, such that the consumer can receive both equity and product in a form of reward.

2.2.1 Noncommercial Crowdfunding

The fundamental principle of a noncommercial crowdfunding project is that its goal is a noncommercial object and public benefit. Material-financial rewards are exclusive to commercial projects, as other projects do not aim to generate

[4]https://www.artfund.org/donate/art-happens
[5]https://artemundi.com
[6]https://www.khm.at/en/give-and-join/preserving-our-cultural-heritage/

profit and, therefore, cannot offer monetary rewards. Noncommercial initiatives exist in almost all spheres of life. The purpose of innovation in some projects is to help people, solve social problems, or even optimize the production of some companies. Thus, noncommercial crowdfunding includes reward-based and donation-based crowdfunding.

In donation-based crowdfunding, the sponsor funds the project out of altruism without the intention of receiving a reward (Massolution, 2015). This crowdfunding type is often used for social, environmental, and medical projects to help treat diseases, pay university fees, donate to museums to preserve art objects, etc. In return, there may be a non-financial reward, such as mentioning the donor on the website, etc. Examples of such platforms are fandly[7], Donio[8], etc. It is worth noting that until 2012, this direction was dominant within all of crowdfunding.

In reward-based crowdfunding, the sponsor invests funds and receives a contract guaranteeing benefits in accessing the product or service after its realization or receiving some reward or bonus for investing in an ongoing campaign. This crowdfunding has the greatest number of internet platforms,making it the most widely used type (GoFundMe[9], Indiegogo[10], Hithit[11], etc.). The main characteristic of reward-based crowdfunding is that sponsors fund projects in exchange for non-financial rewards (autographs, invitations to events, recorded music albums, etc.) or early access (pre-order) to the funded product (Mollick, 2014). Thus, reward-based crowdfunding has shown to be an effective method for generating money for various projects, from complex technology items to creative endeavours. According to Harms (2007) and Hemer (2011), non-financial rewards are one of the dominant incentives for contributors to participate in crowdfunding.

2.2.2 Commercial Crowdfunding

As it was mentioned earlier, commercial crowdfunding is designed for private benefit with the purpose of profit generation. The main difference between noncommercial crowdfunding and commercial crowdfunding is that the latter involves an asymmetry problem, which includes not only the feasibility of the

[7]https://fundly.com
[8]https://donio.cz
[9]https://www.gofundme.com/en-gb
[10]https://www.indiegogo.com
[11]https://www.hithit.com

product and the principle's ability to create and deliver the good to the consumer, but also the ability of the inventor to create equity value through business development (Agrawal et al., 2014). Therefore, commercial crowdfunding includes debt-based crowdfunding and equity-based crowdfunding.

In debt-based crowdfunding, the sponsor provides funds with a certain interest rate. Lenders benefit from this type of financing because of the high interest rates and the possibility of providing loans to projects they favour across a broad spectrum of industries. At the same time, borrowers benefit because of the convenience and ease of obtaining funds and lower interest rates as well (Buysere et al., 2012). The existence of a precise repayment schedule for the funds borrowed by investors, along with the agreed-upon interest, is a crucial feature of this type of financing. Additionally, the funding source is exclusively private individuals, while the borrower can be a legal entity or an individual. Fewer platforms are functioning in the lending segment to legal entities. In this case, the loan amounts are more significant, and the crowdfunding platform serves as an intermediary between both parties. The lend-based crowdfunding platform includes Zopa[12] in United Kingdom (UK), Smava[13] in Germany, Babyloan[14] in France, etc. The social lending model is a unique case of this form of financing, which is characterized by nominal interest rates on the loan or their complete absence. The primary goal of such loans is to help the underprivileged and poor populations. The KIVA[15] is one the largest examples of lend-based crowdfunding platforms.

In equity-based crowdfunding, the sponsor becomes a partial owner of the company's funds, receiving a share of the business's profits. Equity crowdfunding is the most advanced form of crowdfunding, where the investor funds the project in exchange for equity, often denoted as pitch (Cumming and Zhang, 2016; Rossi and Vismara, 2017; Estrin et al., 2018). Contributors can receive an ownership stake, the share of the income or profit from the funded project, dividends, or the right to vote at general meetings of shareholders as a reward(Massolution, 2015). For illustration, a contributor can invest in a music band and later receive the revenue from the band's profits (the case of the Sellaband crowdfunding platform). What is more, equity-based crowdfunding allows not only professional and experienced investors but also "general people" to invest in projects, which makes this type of crowdfunding a suitable option for

[12]https://www.zopa.com
[13]https://www.smava.de
[14]https://www.babyloan.org/fr/
[15]https://www.kiva.org

new funders who want to communicate with other contributors and learn about investments. (Estrin et al., 2018) states in their findings that many investors hope to find a 'golden unicorn' through equity-based platforms, however, recognizing the risks associated with crowdfunding. Examples of equity-based crowdfunding platforms are Seedrs[16], game development LookAtMyGame[17], etc.

2.2.3 Hybrid Crowdfunding

Hybrid crowdfunding it the type of crowdfudning that combines commercial and noncommercial types of crowdfunding. For example, hybrid crowdfunding models can combine reward-based and equity-based crowdfunding elements, offering funders a combination of tangible rewards and financial return on their investment, bringing both private and public benefits. This approach can be appealing to a broader range of contributors, attracting those interested in both the project itself and the possibility of financial gain. For illustration, the funder can invest money and support their favourite artist and then receive revenue from their future profits and an exclusive art object from the artist as a reward. Another example is the crowdfunding platform called "ArtistShare" [18]. During the first three years of its existence, the platform allowed contributors to receive non-financial rewards along with the revenue from the profits of successfully funded works of artists (Agrawal et al., 2014).

At this current moment, there are only a few crowdfunding platforms that provide services based on more crowdfunding models, operating on a commercial and noncommercial basis. Additionally, most of the platforms primarily focus on one type of crowdfunding (reward-based crowdfunding, equity-based crowdfunding) but allow to include "add-on" options from other types of crowdfunding, for example, financial or reward incentives. These platforms are StartEngine[19], Wefunder[20], Republic[21].

Hybrid crowdfunding is the most recent and still evolving type of crowdfunding that requires more research and development. In the next chapter, the definition of hybrid crowdfunding will be covered by reviewing the existing literature.

[16]https://europe.republic.com
[17]https://www.lookatmygame.com
[18]https://www.artistshare.com
[19]https://www.startengine.com
[20]https://wefunder.com
[21]https://republic.com

Chapter 3

Literature Review

In this chapter, the author of the thesis covers the literature concerning the hybrid crowdfunding platform that combines equity-based and reward-based crowdfunding. The main property of crowdfunding – being a marketing research tool – is covered as well.

3.1 Hybrid Crowdfunding - Literature Review

There is no literature that covers hybrid crowdfunding as a phenomenon specifically. However, some authors briefly touch upon the concept and its potential in their works.

Agrawal et al. (2014) mentions the mixed type of crowdfunding that combines equity-based crowdfunding with reward-based crowdfunding. They discus the potential benefit of hybrid crowdfunding in increasing a product's or project's popularity and reducing information asymmetry. They also refer to the case when the creator of the Pebble, after demonstrating an interest and customers' demand for the product in non-equity crowdfunding, raised the next round of funding from equity investors in conventional channels. This two-step process opens up the possibility of classifying this process as a concept of mixed crowdfunding. Therefore, hybrid crowdfunding implies a system where entrepreneurs first advertise their projects and gain recognition through the reward-based crowdfunding model. Then, they move to equity-based crowdfunding, which allows creators to get more significant sums of investments (Miglo, 2016). According to Estrin et al. (2018), some creators consider crowdfunding platforms as a "start" for their projects where they can test their ideas and gain finance and recognition before moving to the next step – larger plat-

forms. By referring to larger platforms, we can assume equity-based crowdfunding platforms as they allow the funders to invest larger amounts of money into bigger projects.

In their paper on cultural crowdfunding, Roche and Nagle (2013) mention an opportunity to develop hybrid crowdfunding platforms that would combine reward-based and equity-based crowdfunding, specifically in the art industry. They explain several benefits of such type of crowdfunding. First, as mentioned by Agrawal et al. (2014) as well, it would provide investors with both, benefits typical to the art industry and potential financial return. Secondly, Roche and Nagle (2013) also mention that hybrid crowdfunding would link reward-based crowdfunding with big-budget productions and projects (Miglo, 2016; Estrin et al., 2018). At the current moment, reward-based crowdfunding is associated with small projects. As such, it receives small donations from contributors, while, in equity-crowdfunding, funders usually invest more significant amounts of money (Estrin et al., 2018).

Additionally, in their work, Gerber et al. (2012) mention the potential impact of mixed crowdfunding not only on the economy but, foremost, on the social part of human lives by the realisation of innovative projects.

3.2 Marketing Research in Crowdfunding

In their research, (Estrin et al., 2018) conduct a study on incentives for both entrepreneurs and investors to participate in equity-based crowdfunding. The study shows that crowdfunding acts not only as a way to raise funds but also as a powerful marketing instrument (Gerber and Hui, 2013) that, moreover, does not involve additional spending on advertisements. In their studies, Miglo (2016) came to the same conclusion, emphasising the importance of feedback for the market in equity-based crowdfunding. In the recent article by Miglo (2022), this is reiterated with the further mention that some entrepreneurs explicitly choose crowdfunding to gain market feedback and learn the crowd's wisdom, even when they have other financing options available. It highlights the value of crowdfunding as a market research tool beyond its primary function as a fundraising mechanism (Burtch et al., 2013).

According to Estrin et al. (2018), entrepreneurs use crowdfunding platforms for marketing reasons to help entrepreneurs create "momentum and buzz", i.e. to gain quick recognition. However, as mentioned by (Agrawal et al., 2014), after reaching popularity, creators have a potential for transition to equity-based

crowdfunding, tapping into a broader pool of investors and seeking financial returns. This two-step process does not only boost the product awareness but also fosters transparency, as the initial phase helps validate the project's viability and mitigates potential risks for investors.

Agrawal et al. (2014) define the reduction of the cost of capital and the gain of the additional information as the main incentives for entrepreneurs to choose crowdfunding as the means of financing their projects. They go on to describe information gathering as one of the ways entrepreneurs can produce effective marketing strategies by testing the product or project and getting a certain idea of the potential demand in the market. It allows creators to learn about consumer preferences, get media attention, and prepare the public for the final launch. This information about the behaviour of entrepreneurs and investors can significantly reduce the high degree of risk caused by information asymmetry (Connelly et al., 2011; Miglo, 2022).

Agrawal et al. (2014) also discuss the distinguishing property of reward-based crowdfunding – pre-buying mechanism – which has the potential to solve the imperfect information problem by aligning contributors' incentives with their means. Moreover, Mollick (2014) mention in their paper funders' responsiveness to signals concerning the quality of projects and the preferences of the other investors. In this case, signalling often leads to the herding behaviour that, on the one hand, increases the probability of successfully raising funds for specific projects (Agrawal et al., 2010; Burtch et al., 2013; Freedman and Jin, 2011) and, on the other hand, leaves the rest without attention. Some studies find evidence of herding behaviour in equity-based crowdfunding (Vismara, 2016; Hornuf and Schwienbacher, 2015), but more research needs to be conducted in reward-based and other types of crowdfunding.

Finally, in hybrid crowdfunding, signalling and communication between both parties can have higher quality because the consumer's incentives align with their means (Agrawal et al., 2014). In this way, through the pre-buying mechanism and contributors' willingness to pay, crowdfunding can be viewed as a type of marketing research that provides informative signals to incentive-compatible post-launch demand (Estrin et al., 2018). Hybrid crowdfunding allows better cooperation that results in a raise of capital and innovative projects. Hallen and Eisenhardt (2012) refer to such networking as the formation of strategic ties between creators and contributors.

Overall, this study initiates an exploration into hybrid crowdfunding and highlights the unique potential of this form of alternative financing, an area

scarcely explored in existing literature. Crowdfunding not only raises capital but also acts as a powerful marketing and market research tool, fostering innovation and collaboration. Effective marketing strategies through crowdfunding can reduce capital costs, connect project creators with investors, generate publicity, and increase the likelihood of timely project funding. Entrepreneurs often validate their projects through reward-based crowdfunding, gaining recognition and reducing future investment risks, before transitioning to equity-based crowdfunding for larger investments. This two-step process, highlighted by Agrawal et al. (2014), combines reward-based and equity-based elements, offering more accurate signals from investors to project creators through combined incentives of pre-buying mechanism and financial returns. These clearer signals can reduce information asymmetry and improve marketing strategies.

In the next chapter, this thesis will examine the potential of hybrid crowdfunding in the art industry by employing a baseline model, supported by calculations and graphs, to demonstrate its benefits in providing clear informative signals from contributors to project creators based specifically on pre-buying mechanism in reward-based crowdfunding.

Chapter 4

Baseline Model

Hybrid crowdfunding is a new form of crowdfunding that is still gaining recognition. Therefore, only an insignificant amount of literature and research papers exists that covers the phenomena that combines reward-based and equity-based crowdfunding. Because of that reason, as a first step in this chapter, a separate analysis is done by taking into consideration one of the main advantages of the former: in reward-based crowdfunding, backers fund specific interesting projects in exchange for non-financial rewards or even early access to the products, in other words, incentives (Mollick, 2014; Agrawal et al., 2014). In general, and primarily through the pre-buying mechanism, crowdfunding is a type of marketing research that provides creators with an informative signal about incentive-compatible post-launch demand of consumers (Estrin et al., 2018). Thus, this alternative way of funding has the ability to increase the quality of the discussed signals by reducing the so-called "noise" associated with factors that can interfere with the accuracy of collected information (Lauga and Ofek, 2009). In particular, the author of this thesis refers to the random fluctuations due to factors such as measurement error, sampling error, random shocks, etc.

In this chapter, a baseline model is built based on a logic of incentive-aligned truth-telling mechanism in conjoint analysis and the Becker-DeGroot-Marschak (BDM) method motivated by Ding (2007). The mechanism defines an incomplete information game between the principal and the consumer where the former is unsure about the preferences of the latter. The idea is that the principal wants to obtain certain private information about the agent. However, the contributor is willing to report such private information – in our case, we want to know the consumer's Willingness to pay (WTP) – only when they have the proper incentives given by the principal (Ding, 2007). Therefore,

the pre-sailing or reward incentives in reward-based crowdfunding serve the discussed purpose. However, the problem is that the principal cannot be sure that the consumer's reported WTP is actual. In order to prove the opposite, we incorporate the BDM method – an incentive-compatible procedure – to measure the agent's true WTP for a good (Ding, 2007; Becker et al., 1964). Thus, through the BDM mechanism, it is illustrated that it is in the best buyers' interest to respond creator their truthful WTP, assuming that conjoint analysis is unbiased if the truth-telling strategy is assumed (Ding, 2007; Becker et al., 1964).

The BDM methodology, that is mentioned by Ding (2007), is used and involves several following steps; at first, the consumer is presented with a good, with no identification of the actual product, and asked to report the amount they would be willing to pay in order to acquire the item. Secondly, a price (x) is drawn randomly from a (in our case, continuous) distribution and independently from the participant's bid and compared with the consumer's reported WTP. Finally, the consumer's reported WTP is compared to the random price and the outcome is determined: if x is lower or equal to the consumer's stated WTP, the participant will pay only x and receive the item; however, if x is higher than the stated WTP, the participant will not be able to purchase the item. As a result, we conclude that overstating and understating consumer's WTP will lead to an inferior outcome for the participant. Therefore, according to the BDM procedure, the consumer's optimal strategy to maximize their expected payoff is to report their actual WTP (Becker et al., 1964).

In this research, the discussed BDM procedure is provided on an example of three different cases with the logic mentioned by Ding (2007) in their paper: when the consumer is offered one product that applies no "noise"; when the consumer is offered a product with uncertainty due to different factors of production (design, quality of the product, etc.) but still with no measurement error; and, finally, we consider the case when the consumer is offered one product with applied "noise" on x. As mentioned earlier, by "noise," we mean the consumer's WTP that exhibits the characteristics of variance and the expected value of continuous distribution due to the influence of random factors affecting the agent's behaviour. It is essential to mention that the described steps of the BDM procedure are implemented in all three scenarios; however, they are adjusted according to each case's different contexts and assumptions. These changes are going to be described in more detail in further sections.

4.1 One Product without Measurement Error

4.1.1 Theory

We consider the case when the funder is offered one product with no "noise" applied – no measurement error. In other words, we do not assume that the agent's behaviour fluctuates due to extraneous factors. So, the consumer's reported WTP (w) is fixed and would not deviate due to different internal and external circumstances.

The price X is drawn randomly from the closed interval from the general distribution of continuous distributions such that X is a continuous random variable and, in our case, let $X \in [x_L; x_H]$ with the Cumulative Distribution Function (CDF) $F(x)$ that is defined as

$$F(x) = P(X \leq x),$$

where $P(X \leq x)$ is the probability that the random variable X is less or equal to x.

Let X be a continuous random variable drawn from the general continuous distribution with CDF $F(x)$ such that $X \in [x_L; x_H]$. Generally, the Probability Density Function (PDF) of X is a function $f(x)$ such that for any two numbers x_L and x_H with $x_L \leq x_H$, we have:

$$F(X) = P(x_L \leq x \leq x_H) = \int_{x_L}^{x_H} f(x)dx \geq 0.$$

Properties of PDF $f(x)$ include implied non-negativity for all values of the random variable, in other words, $f(x) \geq 0$ for all x. Additionally, the total area under the curve equals 1:

$$\int_{-\infty}^{\infty} f(x)dx = 1.$$

I am comparing the reported WTP (w) and the randomly drawn x from a continuous distribution. According to Becker et al. (1964), the product is allocated if $w \geq x$ at a price x, so the agent receives the good but only pays x. On the other hand, respectively, the product is not allocated if $w < x$.

I am using the calculations of the Expected utility (EU) for the proofs. We can express EU as

$$EU = \int_{-\infty}^{\infty} u(x) \cdot f(x)dx.$$

According to Becker et al. (1964), the product will be allocated if $w \geq x$ so that the agent would benefit from the deal. Thus, the consumer's utility function would be $u(x) = W - x$, where W is the contributor's true WTP. On the contrary, when $w < x$, the consumer cannot purchase the good, and hence, the utility function would be $u(x) = 0$. The purchase price (x) is drawn randomly such that $x \in [x_L; x_H]$, and $w \in [x_L; x_H]$. However, because we consider the interval where the utility function of the consumer's WTP is non-zero, $u(w) = W - x$, we should also note that we consider the interval $x \in [x_L; w]$, where the lower bound $x_L \geq 0$, as the price x cannot be negative (see Figure 4.1).

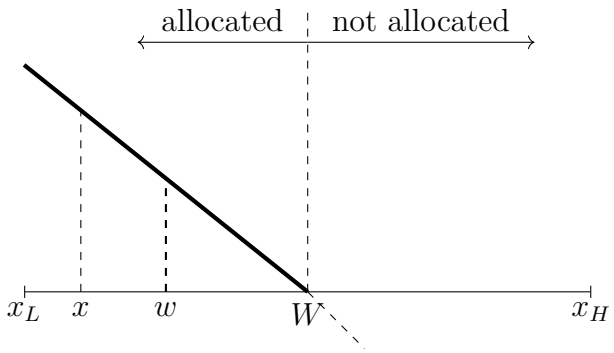

Figure 4.1: BDM procedure. Relation of contributor's true WTP to randomly drawn price x.

The expected utility function of the consumer's WTP w would be the following:

$$EU(w) = \int_{x_L}^{w} (W - x) \cdot f(x) dx,$$

with PDF function $f(x)$ that differs depending on a type of distribution – general or uniform.

4.1.2 Uniform Distribution

To begin with, we suppose the purchase price (x) is randomly drawn from the uniform distribution. According to the properties of the uniform distribution, x_L and x_H are, respectively, the lower and upper bounds of the interval. Furthermore, all values within the interval $[x_L, x_H]$ have an equal probability of occurring. Therefore, $F(x_L) = 0$ while $F(x_H) = 1$; the density function $f(x) = \frac{1}{x_H - x_L} > 0$ for any $x \in (x_L; x_H)$ and $f(x) = 0$ elsewhere. Thus, the EU

of the consumer's reported WTP (w) would be:

$$EU(w) = \int_{x_L}^{w} (W - x) \cdot \frac{1}{x_H - x_L} \cdot dx$$

When we solve the integral we will get that EU(w) is:

$$EU(w) = \frac{2W \cdot w - w^2 - 2W \cdot x_L + x_L^2}{2(x_H - x_L)},$$

where W is the true WTP of the consumer.

In order to prove that the consumer's reported WTP (w) is their true WTP (W), we calculate the slope of EU(w). Doing that will give us a better understanding of the shape of the continuous function of EU(w) with the maximum critical point (w^*) – maximizer of the consumer's EU.

$$\frac{dEU(w)}{dw} = \frac{W - w}{x_H - x_L} = 0.$$

$$W - w = 0.$$

$$W = w^*.$$

Therefore, we can clearly see that the function of EU(w) is increasing if $w < W$ and, on the contrary, decreasing when $w > W$. Thus, it is obvious that the function has the maximum optimum at the point w^*, which equals the consumer's true WTP (W) (see Figure 4.2).

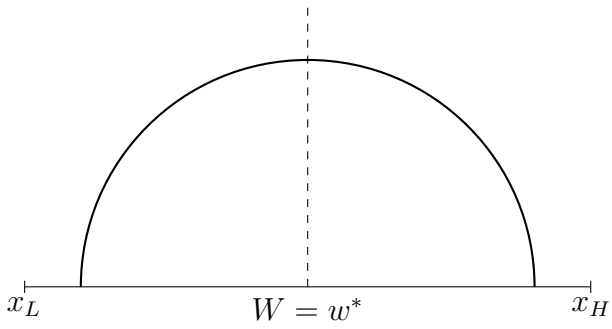

Figure 4.2: Contributor's true WTP as their optimum choice.

The same result can also be observed from the calculations of the second derivative of EU(w) with respect to w:

$$\frac{d^2EU(w)}{dw} = W^* - w = -1.$$

Because the second derivative is negative, it means the found critical point ($W = w^*$) is indeed maximum.

Therefore, the consumer achieves the highest expected value for their WTP by truthfully reporting their WTP (W^*). Thus, it is in the agent's best interest to report their WTP to the creator.

4.1.3 General Continuous Distribution

Now, we suppose that the purchase price (x) is randomly drawn from a continuous general distribution with the positive PDF function $f(x) > 0$. The Expected utility (EU) of the consumer's WTP (w) would be the following:

$$EU(w) = \int_{x_L}^{w} (W - x) \cdot f(x) dx.$$

In order to prove that the consumer's reported WTP (w) is their true WTP (W), we calculate the average maximum expected utility EU(w) by equaling it to zero. In other words, we want to calculate the slope of EU(w) in order to find the maximizer of the EU(w), which is w^*. Since the CDF $F(x)$ of the general continuous distribution has full support on the discussed interval, such that $f(x) > 0$, the Leibniz Rule for a finite region is used that gives us the following result:

$$\frac{dEU(w)}{dw} = (W - w) \cdot f(w) = 0.$$

We assume that $f(w) > 0$, hence,

$$W - w = 0.$$

$$W = w^*,$$

where W is the true WTP of the consumer.

From the done calculations, we can clearly see the slope of $\frac{dEU(w)}{dw}$. The continuous function is decreasing when $w > W$ and increasing whenever $w < W$. The result of the shape gives us the critical point, — unique optimum ($W = w^*$), – where any further increase or decrease in w would not lead to higher EU(w) (see Figure 4.2). The fact that the critical point ($w^* = W$) is maximum can also be observed from the second derivative of EU(w) with respect to w:

$$\frac{d^2 EU(w)}{dw} = W - w = -1.$$

Since $\frac{d^2EU(w)}{dw} < 0$ at the critical point, the found critical point $W = w^*$ is indeed maximum. Thus, we can clearly see that the maximizer of the consumer's EU (w^*) equals the consumer's true WTP (W). Therefore, by stating their true WTP (W), the agent will maximize their expected WTP, so it is the optimal strategy for them to report their true WTP to the principal.

4.2 Product Uncertainty, No Measurement Error

4.2.1 Theory

In the second section of the this chapter, we consider an example when the consumer is offered the product with uncertainty due to, for example, different factors of production (quality of the produced products, design, and so on.) that were not stated to the agent before the gathering of information. We assume that the product can be of two types ($i = 1, 2$), where the first type ($i = 1$) occurs with probability $p_1 \in [0, 1]$ and $p_2 = 1 - p_1$. Since the consumer is uncertain about the product type, the estimate of their true WTP (W) is contaminated by product uncertainty at the report stage. As mentioned in the previous section, we do not assume that the agent's behaviour fluctuates due to extraneous factors. So, the consumer's reported WTP (w) is fixed and would not be deviated due to different internal and external circumstances. Thus, there is no measurement error in the consumer's report, so the report is always correctly observed and interpreted. The steps of the BDM procedure remain the same, as described earlier in the current chapter. However, all the calculations and graphs are alternated by taking into consideration all the assumptions of the case in the current section 4.2 (see Figure 4.3).

The consumer reports their WTP (w) to the agent, such that $w \in [x_L, x_H]$. It is also obvious that the consumer's WTP is positive since the price cannot be negative, so for the product of any type i, the consumer's WTP would be $w_i > 0$. Again, according to Becker et al. (1964), in their BDM procedure, the product is allocated if and only if $w \geq x$. Therefore, we are considering the consumer's utility function for their WTP (w_i) for product type i as $u(w_i) = w_i - x$ if $x < w$ and $u(w_i) = 0$ for any other x.

The price x is randomly drawn from the closed interval $x \in (x_L; x_H)$, where $x_L < x_H$, with the CDF $F(x)$ and PDF $f(x) > 0$; their properties are described earlier in section 4.1. Because the price x cannot be negative ($x > 0$), we consider the interval $x \in [x_L; w]$, where the lower bound $x_L > 0$.

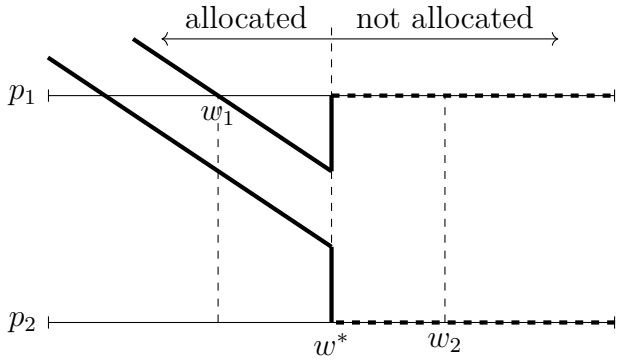

Figure 4.3: Product uncertainty.

It is obvious that the consumer's true WTP (W) lies between w_1 and w_2 ($W \in [w_1; w_2]$) and it is an optimal choice when W is equaled to our randomly drawn price x ($W = x$). We can prove it by calculating the EU of WTP that the consumer ultimately chooses:

$$EU = p_1 \cdot (w_1 - x) + p_2 \cdot (w_2 - x) = 0.$$

$$p_1 \cdot w_1 + p_2 \cdot w_2 - x \cdot (p_1 + p_2) = 0$$

$$p_1 \cdot w_1 + p_2 \cdot w_2 - x = 0$$

Now we assume that $W = p_1 \cdot w_1 + p_2 \cdot w_2$. Therefore,

$$W - x = 0.$$

$$W = x.$$

After that we will compare the reported consumer's WTP (w) and the randomly drawn price x.

4.2.2 Uniform Distribution

In order to prove that, despite the consumer's uncertainty about the product type i, the consumer's reported WTP (w) is their true WTP (W), let us to consider an example when the price x is drawn from the continuous uniform distribution. According to the properties of the uniform distribution, $F(x_L) = 0$ while $F(x_H) = 1$; the density function $f(x) = \frac{1}{x_H - x_L} > 0$ for any $x \in [x_L; x_H]$ and $f(x) = 0$ elsewhere. We need to find the total expected utility EU(w) by summing up the expected utilities of products of both types $i = 1, 2$, – ($EU(w_1)$

and $EU(w_2)$). Thus, the EU functions $EU(w_1)$ and $EU(w_2)$ are the following:

$$EU(w_1) = \int_{x_L}^{w} (w_1 - x) \cdot \frac{1}{x_H - x_L} \cdot dx.$$

$$EU(w_1) = \frac{2w_1 \cdot w - w^2 - 2w_1 \cdot x_L + x_L^2}{2(x_H - x_L)}.$$

$$EU(w_2) = \int_{x_L}^{w} (w_2 - x) \cdot \frac{1}{x_H - x_L} \cdot dx.$$

$$EU(w_2) = \frac{2w_2 \cdot w - w^2 + 2w_2 \cdot x_L - x_L^2}{2(x_H - x_L)}.$$

Therefore, the consumer's total EU(w) of choosing both products is:

$$EU(w) = p_1 \cdot EU(w_1) + p_2 \cdot EU(w_2).$$

$$EU(w) = p_1 \cdot \frac{2w_1 \cdot w - w^2 - 2w_1 \cdot x_L + x_L^2}{2(x_H - x_L)} + p_2 \cdot \frac{2w_2 \cdot w - w^2 - 2w_2 \cdot x_L + x_L^2}{2(x_H - x_L)}.$$

As the next steps, the author is finding the maximum critical point, – maximizer of the EU(w) (w^*), – by calculating the slope of the EU(w):

$$\frac{dEU(w)}{dw} = -\frac{w_1 p_1 - p_1 w + p_2 w_2 - p_2 w}{x_H - x_L} = 0.$$

$$w_1 p_1 + w_2 p_2 - w(p_1 + p_2) = 0.$$

$$w_1 p_1 + w_2 p_2 = w.$$

$$W = w^*.$$

We can clearly see that when $w < W$, the function of EU(w) is increasing. When $w < W$ the function of EU(w) is decreasing (see Figure 4.2). Hence, the point w^* is indeed the maximum critical point, which equals to the consumer's true WTP (W). The same result can also be observed from the calculations of the second derivative ($\frac{d^2 EU(w)}{dw}$):

$$\frac{d^2 EU(w)}{dw} = W^* - w = -1.$$

Because $\frac{d^2 EU(w)}{dw} < 0$, the found critical point ($W = w^*$) is indeed maximum.

Thus, we can see from the proof that there is no difference in using (considering) and not using (not considering) product uncertainty: the BDM procedure elicits the agent's true WTP, which is also the consumer's optimum ($W = w^*$)

in any case. Therefore, when there are two or several unknown product types on the market, it is still not in the consumer's best interest to falsify their report on their WTP (w) for the product and their true average (expected) WTP. In other words, it is the funder's optimal strategy to state their true WTP in order to maximize their overall utility.

4.2.3 General Continuous Distribution

In order to prove that the consumer's reported WTP (w) is their true WTP (W), despite the product uncertainty, we need to find the total expected utility EU(w) by summing up the expected utilities of products of both types one and two ($i = 1, 2$), – ($EU(w_1)$ and $EU(w_2)$):

$$EU(w_1) = \int_{x_L}^{w} (w_1 - x) \cdot f(x)dx.$$

$$EU(w_2) = \int_{x_L}^{w} (w_2 - x) \cdot f(x)dx.$$

Therefore, the consumer's total EU(w) is:

$$EU(w) = p_1 \cdot EU(w_1) + p_2 \cdot EU(w_2).$$

$$EU(w) = p_1 \cdot \int_{x_L}^{w} (w_1 - x) \cdot f(x)dx + p_2 \cdot \int_{x_L}^{w} (w_2 - x) \cdot f(x)dx.$$

In order to prove that the consumer's reported WTP (w) is their true WTP (W), we find the slope of the function EU(w), as in section 4.1, by calculating the first-order condition of the consumer's WTP by equaling it to zero. Since $f(x) > 0$, the Leibniz Rule is ised for a finite region:

$$\frac{dEU(w)}{dw} = p_1 \cdot (w_1 - w) \cdot f(w) + p_2 \cdot (w_2 - w) \cdot f(w) = 0.$$

We assume that $f(w) > 0$, hence

$$p_1 \cdot (w_1 - w) + p_2 \cdot (w_2 - w) = 0.$$

$$p_1 \cdot w_1 + p_2 \cdot w_2 - w \cdot (p_1 + p_2) = 0.$$

According to our assumption, $W = p_1 \cdot w_1 + p_1 \cdot w_2$ and $p_1 + p_2 = 1$, thus:

$$W - w = 0.$$

$$W = w^*,$$

where W is the true WTP of the consumer and w^* is the maximizer of the EU(w). As in the subsection 4.2.2. (see Figure 4.2), we can clearly observe the shape of the function of EU(w) and its maximum critical point at w^*, which equals to the consumer's true WTP (W). The same result can be seen from the calculations of the second derivative of EU(w):

$$\frac{d^2EU(w)}{dw} = W^* - w = -1.$$

Since $\frac{d^2EU(w)}{dw}$ is negative, w^* is indeed the maximizer of the consumer's EU(w).

Therefore, the BDM procedure elicits the agent's true WTP, which is also the consumer's optimum ($W = w^*$), despite the consumer's uncertainty regarding the product type i. Thus, it is in the consumer's best interest and optimal strategy to report their true WTP (W) to the principal in order to maximize their payoff.

4.3 One Product with Measurement Error

In section 4.3, an example when the consumer is offered one product is considered, as in section 4.1; however, this time, the observed report would contain the measurement error. We need to know the agent's WTP (w) value that the consumer wants to report to the principal. Therefore, we assume that the agent's behaviour fluctuates due to extraneous factors and that the consumer's reported WTP w is not fixed. So, we expect w to deviate due to different internal and external circumstances. The BDM procedure remains unchanged, as was described earlier in this chapter. However, all the calculations are adjusted according to the current assumptions.

The consumer reports their WTP (w). However, in this case, the experimenter observes $y = w + \varepsilon$, where ε introduces the "noise" or some randomness, such that $\varepsilon \in (-\infty; \infty)$. Thus, ε is independent on w with mean zero, $E(\epsilon|w) = 0$, and positive variance which is also independent on w, such that $Var(\varepsilon|w) = Var(w) > 0$. Following these assumptions, we can deduce some properties concerning the mean and variance of y conditional on w, which are $E(y|w)$ and $Var(y|w)$, respectively. Because $y = w + \varepsilon$, where w and ϵ are

independent, their covariance is zero, – $Cov(w, \varepsilon) = 0$. Then,

$$E(y|w) = E(w + \varepsilon|w) = w + E(\varepsilon|w) = w.$$

And the variance of y conditional on w would be:

$$Var(y|w) = Var(w + \varepsilon|w) = Var(\varepsilon|w) = Var(\varepsilon),$$

since ϵ is independent of w, the conditional variance is equal to the unconditional variance.

We suppose the purchase price (x) is randomly drawn from the uniform distribution, such that $x \in [x_L; x_H]$. According to the properties of the uniform distribution, CDF $F(x_L) = 0$, while CDF $F(x_H) = 1$; the density function PDF $f(x) = \frac{1}{x_H - x_L} > 0$, for any $x \in [x_L; x_H]$, and $f(x) = 0$, elsewhere.

In order to calculate the EU(w), first, we have to find the EU(y). According to the Becker procedure (Becker et al., 1964), the product will be allocated if the consumer's WTP (w) is smaller than x, $w \leq x$. On the contrary, the consumer cannot purchase the good if $w > x$. Thus, the consumer's utility function would be $u(y, x) = W - x$, – where W is the consumer's true WTP, – if $x \leq y$, and $u(y, x) = 0$ if $x > y$. What is more, since we are considering the interval where the utility function of the consumer's WTP is non-zero – the interval $x \in [x_L; y]$, where the lower bound $x_L \geq 0$, as the price x cannot be negative. Thus, the $EU(y)$ is :

$$EU(y) = \int_{x_L}^{y} (W - x) \cdot \frac{1}{x_H - x_L} \cdot dx$$

$$EU(y) = \int_{x_L}^{y} \frac{2W \cdot y - y^2 - 2W \cdot x_L + x_L^2}{2(x_H - x_L)}.$$

Now we can calculate the expected utility of the consumer's reported WTP (EU(w)):

$$EU(w) = \int_{-\infty}^{\infty} \frac{2W \cdot (w + \varepsilon) - (w + \varepsilon)^2 - 2W \cdot x_L + x_L^2}{2(x_H - x_L)} \cdot g(\varepsilon) d\varepsilon.$$

Since $Var(\epsilon) = \int_{-\infty}^{\infty} (\varepsilon - 0)^2 \cdot g(\varepsilon) d\varepsilon$, then:

$$EU(w) = \frac{2W \cdot w - w^2 - 2W \cdot x_L + x_L^2}{2(x_L - x_H)} - Var(\varepsilon)$$

In order to find the maximizer (w^*) of the consumer's expected utility of their reported WTP, the author is finding the slope of the EU(w), as in previous sections 4.1 and 4.2 (see Fidure 4.2):

$$\frac{dEU(w)}{dw} = \frac{2W - 2w}{2(x_L - x_H)} = 0.$$

$$W - w = 0.$$

$$W = w^*.$$

It is obvious that the function of EU(w) is increasing if $w < W$ and decreasing when $w > W$. Therefore, w^*, which equals the consumer's true WTP (W), is indeed the function's maximum critical optimum. We can come to the same result by finding the second-order condition of EU(w) with respect to w:

$$\frac{d^2EU(w)}{dw} = W^* - w = -1.$$

Because the second derivative is negative, it means the found critical point ($W = w^*$) is indeed maximum.

Therefore, the BDM procedure elicits the consumer's true WTP even when we consider that the report contains measurement error. Despite the consumer's fluctuating behaviour, it is in the agent's best interest and optimal strategy to report their true WTP to the seller in order to maximize their utility.

Overall, this study highlights the efficacy of the pre-buying mechanism in reward-based crowdfunding, demonstrating its ability to provide accurate private information about contributors' preferences. The baseline model, the BDM method as in Ding and Eckel (2006), was applied across three different scenarios. These scenarios included offering consumers a single product with and without measurement error, and offering a product with uncertainty (such as variations in quality or design) without measurement error. Despite the variations in assumptions and cases, the outcome remained consistent: consumers' reported willingness to pay (WTP) matched their true WTP, indicating that it is optimal for contributors to report their actual WTP to entrepreneurs. Consequently, through this pre-buying mechanism, project creators receive precise and informative signals about contributors' preferences, enhancing the decision-making process.

Chapter 5

Application of BDM procedure in Hybrid Crowdfunding

5.1 Mechanism

In this chapter, a way how to link hybrid crowdfunding with the BDM procedure is discussed. This section is based on an idea recommended by the supervisor. The author proposes a straightforward and simple extension of the BDM mechanism that has not been discussed before in the limited literature on hybrid crowdfunding. For illustration, Hardy (2013) build a model that analyzes crowdfunding by focusing on how contributors' incomes and the perceived value of rewards influence their BDM. It suggests that contributors increase their pledges as long as they perceive the benefits to outweigh the costs, and that the perceived value of a project increases with the price offered, not just the quantity demanded. Thus, existing literature provides more complicated frameworks.

In this thesis, a mechanism that elicits the funder's BDM and secures their funding is constructed. We disregard any additional uncertainty over the project's success. So, if the mechanism elicits correct WTP from a sample of investors, meaning there is no additional uncertainty. Therefore, if the company finds the obtained WTP sufficient, it produces the good. On the contrary, if the elicited WTP is regarded as insufficient, the good is not produced and investors get the loans back.

The mentioned mechanism involves three steps. First, we need to elicit the investor's WTP. We assume the future market price is uncertain (random), while uncertainty is exogenous. It is similar to the BDM procedure discussed in

the previous chapter, where the price (x) is randomly drawn from a continuous distribution. This setting is crucial because it implies that the funder thinks about their best interest and chooses the optimal decision in every possible scenario. Thus, as in Becker's procedure, we get a true WTP of the contributor as their optimum. Therefore, the good is allocated if the investor's WTP is above or equal to the future market price. And the good is not allocated if the contributor's WTP is less than the future market price.

Second, it is important to take into account the main property of crowdfunding – contributors fund into projects and ideas before getting the rewards and even realization of the product. So, the investors' payments are executed as loans that can be repaid financially and by the good itself – a mix of financial and consumption benefits. In other words, we assume that hybrid crowdfunding is the combination of advanced selling and loans.

Finally, the allocation rule for the good, or the structure of the loan repayment, is designed such that the investor's choice of the loan size gives the information about their WTP and the investor is willing to join the mechanism. In order to solve an incentive-compatibility condition, we use the idea of the BDM procedure: we assume that the consumer's level of capital is the evaluation of the good that is later can be used for the loan repayment, however, where the unpaid part of the loan must be returned as well. In other words, if the good is not allocated, the investor receives only the paid amount of the loan (financial benefit). And, if the good is allocated, the funder gets the loan amount minus the good's market price (financial and consumption benefits).

In the discussed mechanism, the contributor is indifferent regarding participation in hybrid crowdfunding. We can see this in the earlier discussed BDM procedure, which gives us the difference between the consumer's WTP and the randomly drawn price, which is, respectively, the difference between the consumer's valuation of the good and the future market price. Following the computations and obtained results of the BDM procedure in the Chapter 4, the contributor is indifferent about entering the BDM procedure. Thus, the same property holds in our mechanism as well.

In the following sections, we analyze the returns from the consumption (product) and financial sides (benefits) of hybrid crowdfunding to see the similarities between our mechanism and the BDM procedure in more detail. Furthermore, we would be able to conclude that the investor's provided loan is basically the contributor's WTP, and they are indeed indifferent about joining the mechanism in hybrid crowdfunding.

5.2 Theory Part

Let us suppose that an investor has a capital (K) that consists of a loan to the principal (k) and their untouchable savings ($K - k$). We are observing the relation of the consumer's WTP for the product and their capital (K) to the unknown future price (p) on the market. We use the logic and properties of the BDM procedure discussed in the Chapter 4. Thus, we assume that the level of capital (K), – the choice variable – is used to evaluate the good. In other words, the contributor's choice for the loan (k) shows the principal of the investor's WTP.

5.2.1 Financial Benefit

in this thesis, the author supposes that the future unknown market price of the good is p, while the true consumer's WTP (W) is lower than their capital (K). The investor has some untouchable savings ($K - k$), so they can use only the debt value (k). Thus, if the market price is below or equal to the investor's debt value, the investor would receive the good and is returned $k - p$, so the consumer's utility function would be:

$$u(K) = k - p + (K - k) = K - p.$$

However, if $p > k$, the investor is returned only what they paid – debt value (k), so the function is:

$$u(K) = k + (K - k) = K.$$

Following the results, we get the graphical representation of the financial side of the mechanism in hybrid crowdfunding (see Figure 5.1).

It leads us to the point that the contributor is indeed indifferent over participating in hybrid crowdfunding or waiting for the realization of the market price of the good and then buying it if their $k > p$. As in the BDM procedure, our calculation gives us the difference between the consumer's valuation of the good and the market price – contributor's surplus. Moreover, this is the same as if the consumer purchases the good on the general market – $k = p$.

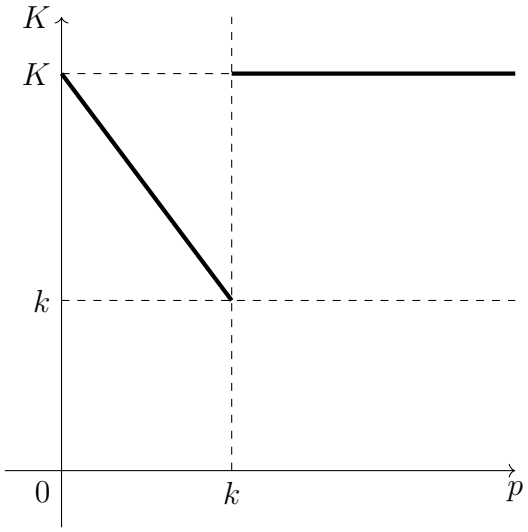

Figure 5.1: Financial benefit of the contributor.

5.2.2 Consumption Benefit

As stated earlier, the part of the loan can be returned by the good itself. This amount depends on the future market price of the good. It is the same logic behind the good allocation rule as described in the BDM procedure. Thus, the good will be allocated if the randomly drawn price p is less or equal to the consumer's true WTP W:

$$u(K) = K + W.$$

On the contrary, If the price (p) is higher than the consumer's WTP (W), the investor cannot purchase the good, so:

$$u(K) = K + 0.$$

We also get the graphical representation of the consumption benefit of the contributor (see Figure 5.2).

5.2.3 Total

Now we can clearly see the investor's utility function that is combining the financial side and consumption side:

$$u(K) = \begin{cases} K - p + W, & p \leq k \\ K, & p > k \end{cases}$$

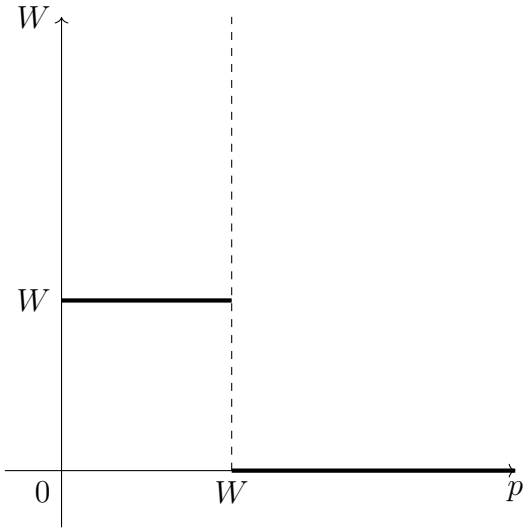

Figure 5.2: Consumption benefit of the contributor.

In other words:

$$u(K) = K + \begin{cases} W - p, & p \leq k \\ 0, & p > k \end{cases}$$

So we can observe that only when $p \leq k$, the investor gets an extra value, $W - p$, on top of their capital (K). Again, a similar logic was observed in the BDM procedure in the previous 5. We assume that $p \in [p_L, p_H]$. Then,

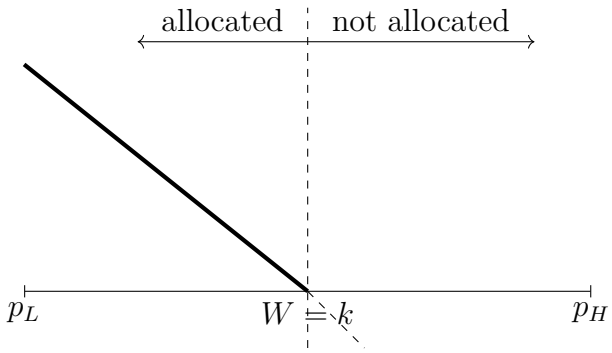

Figure 5.3: BDM procedure. Relation of contributor's WTP to to market price p.

Obviously, to maximize the expected payoff, the investor wants to capture the extra value $W - p$ whenever $p \leq W$. It requires k to be equal to W. Overall, the consumer's utility, resulting from the combination of the financial side and consumption side, is:

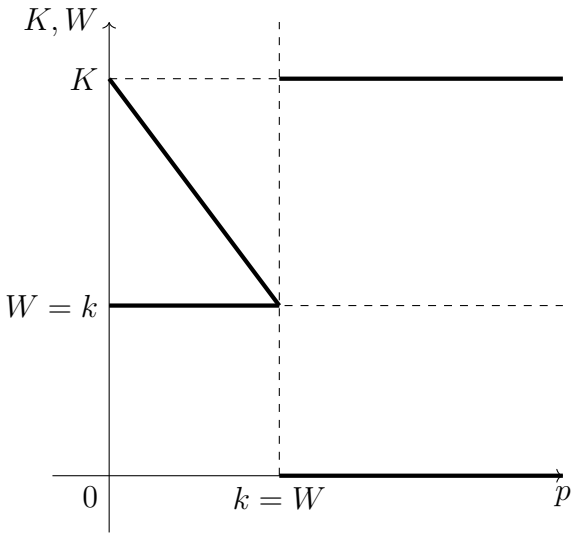

Figure 5.4: Total benefit of the contributor.

So, we conclude that the contributor's loan amount (k) is their actual WTP(W), and the investor strictly prefers to pay for the good $k = W$ to maximize their payoff.

Chapter 6

Results

6.1 Results

Therefore, the author of this thesis provided a simple and straightforward extension of the BDM model in hybrid crowdfunding and analyzed the ability of both incentive structures pre-buying and potential financial returns to provide informative signals based on the consumer's WTP. The procedure was similar to the BDM procedure but included several assumptions: the consumer always chose the optimal choice, and contributor's WTP is their optimum; and the investors' payments were executed in the form of loans (based on the crowdfunding definition) that could be repaid financially and by the good itself – a mix of financial and consumption benefit. Therefore, in this mechanism, the author of the thesis designed the allocation rule for the good or the structure of the loan repayment, such that the investor's choice of the loan size was giving the information about their WTP, and the investor was indifferent about joining the hybrid crowdfunding mechanism. The result of the calculations shows that the contributor's capital amount that they are ready to give as a loan (k) to the project is their true WTP (W) for the good (reward) and also the optimal choice. Thus, the hybrid crowdfunding model offers accurate informative signals to investors due to the combined incentive structure – pre-buying and potential financial returns. Additionally, the mechanism ensures that investors are indeed indifferent to joining the hybrid crowdfunding, assuming that there are many incentives that can change indifference to a (strong) willingness to join the mixed crowdfunding model.

6.2 Discussion

The funding results align with the current positive perspective on hybrid crowdfunding and its potential mentioned by Agrawal et al. (2014) and Roche and Nagle (2013). However, it is challenging to place this study within existing literature due to its absence. Currently, there is no hybrid crowdfunding platform, and the authors such as Agrawal et al. (2014); Estrin et al. (2018); Roche and Nagle (2013); Gerber et al. (2012) only briefly touch upon the concept of mixed crowdfunding. Therefore, while this thesis proves the possibility of this method of financing and its benefit, it is challenging to place this study within existing literature due to its absence.

As mentioned earlier, the author proposes a simple and straightforward extension of the BDM mechanism in basic settings. Therefore, the discussed mechanism includes several crucial assumptions that make the extended BDM static and allow us to see the application of hybrid crowdfunding in a short-term period only. The study does not discuss the potential of mixed crowdfunding in a long-term perspective. Thus, due to the simplicity of the assumptions, it is difficult to ensure whether the theoretical mechanism can be applied in reality.

The discussed model assumes that there is no interest rate and future returns. The author suggests that the proposed mechanism can be expanded and alternated in future research to better understand the possibilities and opportunities of hybrid crowdfunding. For illustration, by taking into account the interest rate ($r > 0$), the discussed model can be expanded by assuming that the investor's capital with future returns is $K(1 + r)$ that consists of loan ($k(1 + r)$) and some untouchable savings ($K(1 + r) - k(1 + r)$).

Additionally, future research can focus on uncertainty regarding price fluctuations of the product received as a reward. This study ensures that the contributor is unwilling to go to the secondary market to resell the received product(reward), whether the good is allocated or not. Since the market balances out in the end, a contributor who plans to receive and then sell the good knows they will buy it at the market price (p) and sell it at the same price p, resulting in no profit. It means that, unlike situations where resale is not an option, stating a higher willingness to pay (WTP) than their true WTP does not reduce the consumer's payoff. However, it does not increase their payoff either, so the contributor's true WTP remains a non-unique optimal choice. If a small resale cost will be added, then it becomes strictly optimal for the consumer to state their true WTP. Therefore, the author suggests that future research

can analyze the hybrid crowdfunding mechanism regarding the price fluctuations associated with the price discrimination strategy of entrepreneurs and possible further reselling options of the product. Price discrimination strategy in crowdfunding involves setting different prices for different backers based on their WTP to maximize funding and participation(Bender et al., 2019). Therefore, in this case, the stated price of the product will differ from the market price (p), which can change the results of the proposed model.

Overall, the proposed extension of the BDM procedure can be expanded and alternated based on the different assumptions and additional settings. By analyzing them, a better understanding of the possibilities and opportunities of hybrid crowdfunding mechanism could be achieved. It is a newly emerged concept with much potential and room for further research.

Chapter 7

Conclusion

Crowdfunding is a way to fund startups, projects, or ideas by collecting small investments from a large pool of people. This way of funding is performed via the internet, specifically designed online platforms, which makes it affordable and apprehensible for many low-income entrepreneurs and contributors. Crowdfunding emerged alongside creative projects and evolved significantly with rapid technological development. The art industry remains one of the most popular and profitable categories for the crowdfunding market today by contributing to the art, proposing innovations, connecting people all over the world, and showing the potential for expansion in the future. There are two categories of crowdfunding that differ in structure and type of benefit: commercial crowdfunding (equity-based and loan-based) and noncommercial crowdfunding (reward-based and donation-based). Commercial projects provide private financial benefits in the form of money (equity). In contrast, noncommercial projects provide public benefits with an opportunity for non-financial rewards. Hybrid crowdfunding is the most recent but very promising model that blends features of both and allows to provide a mix of benefits in the form of mixed returns. Beyond just raising capital, the primary and most interesting advantage of crowdfunding for entrepreneurs is its ability to be a powerful marketing and market research tool, fostering innovation and collaboration.

In this thesis, it has been shown that hybrid crowdfunding that combines elements of reward-based and equity-based crowdfunding can provide clear informative signals from contributors to project creators due to the combined incentive structure – pre-buying and potential financial returns (Agrawal et al., 2014; Estrin et al., 2018). Both the baseline model and the mechanism linked to it, accompanied by necessary calculations and graphs, served this purpose

and proved the discussed benefit of hybrid crowdfunding.

First, the baseline model was built based on an incentive-aligned truth-telling mechanism in conjoint analysis and the BDM method (Becker et al., 1964) as in studies by Ding (2007). It was applied in the reward-based crowdfunding model. It analyzed the ability of the pre-buying incentive structure to provide informative signals based on the contributor's Willingness to pay (WTP) for the good, assuming that conjoint analysis is unbiased if the truth-telling strategy is adopted. The BDM procedure was applied to three different cases to take into account the possible fluctuations of contributors' behaviour and influence of externalities: when the consumer is offered one product with and without measurement error; when the contributor is offered a product with uncertainty (e.g., variations in quality or design) and without measurement error. In all three cases, the result was the same – consumer's reported WTP (w) is their true WTP (W), meaning it is the contributor's optimal decision to respond to their truthful WTP (W) for good in reward-based crowdfunding. Thus, through the pre-buying mechanism, the project's creator gets accurate private information about the agent's preferences.

Second, the author of this thesis provided a simple and straightforward extension of the BDM model in hybrid crowdfunding and analyzed the ability of both incentive structures pre-buying and potential financial returns to provide informative signals based on the consumer's WTP. The procedure was similar to the BDM procedure but included several assumptions: the consumer always chose the optimal choice, and contributor's WTP is their optimum; and the investors' payments were executed in the form of loans (based on the crowdfunding definition) that could be repaid financially and by the good itself – a mix of financial and consumption benefit. Therefore, in this mechanism, the author of the thesis designed the allocation rule for the good or the structure of the loan repayment, such that the investor's choice of the loan size was giving the information about their WTP, and the investor was indifferent about joining the hybrid crowdfunding mechanism. The result of the calculations shows that the contributor's capital amount that they are ready to give as a loan (k) to the project is their true WTP (W) for the good (reward) and also the optimal choice. Thus, the hybrid crowdfunding model offers accurate informative signals to investors due to the combined incentive structure – pre-buying and potential financial returns. These clearer signals can reduce information asymmetry and improve marketing strategies(Connelly et al., 2011; Miglo, 2022). Additionally, the mechanism ensures that investors are indifferent to joining

hybrid crowdfunding, assuming that there are many incentives that can change indifference to the strong willingness to join the mixed crowdfunding model.

Additionally, in this thesis, the proposed mechanism does not address the long-term potential of mixed crowdfunding, and the simplicity of the assumptions raises questions about the real-world applicability of the theoretical mechanism. In other words, the model assumes no interest rates or future returns. The author suggests that future research could expand the model by incorporating interest rates and analyzing the investor's future returns.

Future research could also explore the uncertainty regarding price fluctuations of rewards. This study assumes contributors will not resell the received product on the secondary market, as they would buy and sell at the same market price (p), resulting in no profit. Therefore, future studies could analyze hybrid crowdfunding concerning price fluctuations associated with price discrimination strategies and possible reselling options. In crowdfunding, price discrimination involves setting different prices by entrepreneurs for backers, based on their WTP, to maximize funding and participation (Bender et al., 2019).

Overall, the proposed extension of the BDM procedure can be further developed and adapted with different assumptions and settings. Analyzing these variations could enhance understanding the potential of hybrid crowdfunding.

Therefore, the purpose of this thesis was to show the possibility of emerging hybrid crowdfunding into a recognized means of financing projects in the art industry and, possibly, in other spheres of life and industries as well. The results support the positive outlook on hybrid crowdfunding (Agrawal et al., 2014; Estrin et al., 2018; Gerber and Hui, 2013), including its potential in the art industry noted by Gerber and Hui (2013). However, placing this study within existing literature is challenging due to the significant lack of literature discussing hybrid crowdfunding as a phenomenon and online platforms. Mixed crowdfunding is a recent but promising concept requiring further research and development. This thesis undertakes an exploration of hybrid crowdfunding, addressing a gap in the literature and paving the way for future research to investigate the concept of hybrid crowdfunding.

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