**MASTER THESIS**

# “Get it done and create impact”. Exploring early-stage academic spin-off success criteria: a set-theoretic approach.


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## Abstract

Academic spin-offs (ASOs) are strategic driving forces of regional growth, innovation and competitiveness in the knowledge-based economy and fundamental technology transfer instruments. However, it has been found that the majority of the ASOs reach only limited organisational performance and, thus, fail to produce positive societal and economic value. Institutional efforts have hitherto set an emphasis on increasing the quantity of ASOs instead of procuring their quality. Furthermore, prior research has mostly focused on the identification of single contextual elements that may affect ASO formation. Hence, there is a paucity of knowledge regarding how organisational and individual elements can combine to produce ASOs early-stage success. These combinations represent causally complex relationships that need to be examined comprehensively. Thus, to address this issue, I analyse 259 project proposals filed by ASOs between 2007 and 2014 to apply for Valorisation Grant of the Dutch Research Council and apply Fuzzy-Set Qualitative Comparative Analysis (fsQCA) methodology to comprehend how (1) organisational elements (*business concept articulation, technology, IP strategy, marketing strategy, new business development strategy and financial strategy*) and (2) attributes of the entrepreneurs involved (*entrepreneurial experience and knowledge*) combine to impact the ASO early-stage success in terms of positive funding decision and survival. I find that there are several pathways towards ASO early-stage success —and failure—. I.e. ASO early-stage success is not just a function of the sum of isolated attributes, but rather a function of how these attributes coexist and combine to construct unique causal configurations. This is one of the first academic studies that apply a set-theoretic perspective and proposes a novel forward-looking approach that intends to predict the potential early-stage outcomes of ASOs. I hope that this work promotes research efforts that lead to improving our understanding of how early-stage ASOs can succeed and start creating a real positive impact.

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## Abbreviations

| | |
|---|---|
| ASO | Academic Spin-Off |
| BDA | Bayh-Dole Act |
| NWO | Dutch Research Council |
| EO | Entrepreneurial Orientation |
| fsQCA | Fuzzy Set Qualitative Comparative Analysis |
| IP | Intellectual Property |
| IPR | Intellectual Property Rights |
| MO | Market Orientation |
| NPD | New Product Development |
| PoC | Proof of Concept |
| PRI | Proportional Reduction in Inconsistency |
| QCA | Qualitative Comparative Analysis |
| TTO | Technology Transfer Office |
| TTO | Time-To-Market |
| USO | University Spin-Off |

# 1 Introduction

## 1.1 Background

In European countries, the development in recent years of policies and legislation aiming to promote publicly funded research commercialisation has converted academic spin-offs (ASOs) into important technology and knowledge transfer mechanisms (Bathelt, Kogler, & Munro, 2010; Mathisen & Rasmussen, 2019; Rasmussen, 2011). ASOs are considered strategic driving forces of regional growth, innovation and competitiveness in the knowledge-based economy (Marzocchi, Kitagawa, & Sánchez-Barrioluengo, 2019; OECD, 2019; Skute, 2019) and essential instruments for supplying the industry with new technologies (Bathelt et al., 2010; Fini, Fu, Mathisen, Rasmussen, & Wright, 2017; Mathisen & Rasmussen, 2019). Interestingly, the capital invested in European ASOs increased by 47%, from USD 3,317M in 2015 to USD 4,889M in 2019 (Atomico (UK) Partner LLP, 2019). Additionally, ASOs represent approximately 25% of the IPOs in European high-tech industries (Bonardo, Paleari, & Vismara, 2011; Mathisen & Rasmussen, 2019).

Furthermore, universities, entrepreneurs, private industry, and government —among other stakeholders— are continuously increasing their support to ASOs because they do not only recognise their essential economic role but also its potential to generate positive integral societal impacts, such as the transfer of innovative technologies to the logistics and transport industry to develop cleaner electrical solutions (Fini, Rasmussen, Siegel, & Wiklund, 2018; Mathisen & Rasmussen, 2019).

The foundation of ASOs in Europe has seen a considerable increment during the last years (Fini et al., 2017; Shane, 2004), yet there is a fundamental practical concern: most of the ASOs achieve only limited organisational performance and, consequently, fail to generate positive societal and economic value (Fini et al., 2017; Grimaldi, Kenney, Siegel, & Wright, 2011; Mowery, 2011). I.e. although ASOs have higher survival rates than typical start-ups (Fini et al., 2017; Shane, 2004; Veugelers, 2014; Zhang, 2009), the majority of the ASOs do not display attributes of high-growth ventures and, hence, tend to prevail as small firms (Borlaug, 2009; Fini et al., 2017; Grimaldi et al., 2011; Prokop, Huggins, & Bristow, 2019).

Several are the factors that can be helpful to explain why ASOs fail to grow and to produce positive societal and economic value. One explaining factor may be related to the difficulty to identify the promising ASOs at their early stage of development, i.e. ASOs whose projects show relevant potential. Interestingly, capital availability does not represent the primary financial obstacle for promising ASOs to be recognised (Lundström & Stevenson, 2005; Rasmussen & Sørheim, 2012). Building on Rasmussen and Sørheim (2012) work, it can make sense to consider the financial complication for ASOs as a two-sided problem. On the one hand, from the supply-side of funding,

investors might fail to detect attractive ASOs in their early stage with substantial projects that can generate positive economic and societal impact (Sørheim, Øystein Widding, Oust, & Madsen, 2011). On the other hand, from the demand-side of funding, ASOs in their early-stage and the involved entrepreneurs may not possess specific organisational resources and individual capabilities, respectively, for effectively acquiring the available external funds (Rasmussen & Sørheim, 2012). Fundamental to state is that, for the purposes of this study, the *involved entrepreneurs* can be either (a) exclusively academic founders from the parent university who developed the original idea or (b) academic founders from the parent university and external non-academic expert entrepreneurs with a management background.

Currently, there is a growing number of governmental instruments created to finance ASOs in their early stages, namely funding-gap instruments. These instruments intend to support ASOs generally until the point in which they can sufficiently reduce the project-inherent uncertainty and, thus, become attractive to private investors (Rasmussen & Sørheim, 2012). Frequently, attributes embedded in the ASOs and their founders that display success potential may influence the investment decision-making process of the investors positively (Meseri & Maital, 2001; Wiltbank, Read, Dew, & Sarasvathy, 2009). However, as stated before, promising ASOs may not be easily recognised. Hence, the following may be an additional explaining factor to comprehend why ASOs do not generate positive impact: funding-gap instruments may have obstacles to recognise ASOs with innovative and promising project proposals effectively. Consequently, funding may be awarded to non-promising projects and rejected to promising projects.

### 1.2 Problem formulation and objective

The lack of understanding of the ASOs' early-stage success factors and their interplay may be related to the fact that, until now, almost no scholars have intended to analyse data from the early stages of the ASOs' development to apply a forward-looking configurational approach to predict potential outcomes. The studies about ASOs have essentially focused on understanding how ASO formation is affected by diverse contextual elements, such as environmental, institutional and individual variables (Diánez-González, Camelo-Ordaz, & Fernández-Alles, 2020; Mathisen & Rasmussen, 2019; O'Shea, Chugh, & Allen, 2008). Furthermore, several relevant studies, such as those from Nerkar and Shane (2003) and Criaco, Minola, Migliorini, and Serarols-Tarrés (2014), have employed a backwards-looking approach to examine the rationale behind ASO success and failure by using historical data. Nerkar and Shane (2003) employed data from 1980 to 1996 from the MIT Technology Transfer Office to examine the impact of the patent activity on ASO success. Criaco et al. (2014) used data from 2008 to analyse the impact of the academic founders' human capital attributes on ASO success.

The scarcity of understanding of the interplay of ASOs' early-stage success factors may bring the following practical complications: first, when initially granting an ASO with capital via a public funding-gap instrument, for the public entity may be complicated to analyse and diagnose the current situation of the ASO success factors; thus, it may be virtually impossible to support the development of new success attributes or complement the existent to increase ASO investment readiness. Second, if ASOs survive and overcome the requirements of the public funding-gap instrument, but no success attributes have been developed or leveraged, then it may be probable that potential private investors do not detect any growth-potential and success attributes in the ASO; and thus, decline to invest on it.

With this study, I propose to treat the ASO organisational factors and the attributes of the involved entrepreneurs as elements that combine and create causally complex relationships. I.e. under the assumption that there is more than one "success recipe", a holistic approach is required to understand how these factors produce several combinations to produce ASO early-stage success.

In summary, to effectively initiate an understanding of how ASOs can achieve early-stage success and, thus, have a positive societal and economic impact, I utilise high-quality data from a renowned Dutch funding institute to achieve the main goal of the current study: to understand how the organisational elements of academic spin-offs and the attributes of the entrepreneurs involved combine to produce early-stage spin-off success in the context of positive funding decision and survival.

### 1.3 Research setting

I undertake this academic work using aggregated and anonymised information obtained from the Dutch Research Council (NWO). The dataset contained 259 project proposals of ASOs that applied for the phase 2 of the NWO funding instrument Valorisation Grant (VG) between 2007 and 2014. The goal of the VG was to financially support early-phase technical science projects of innovative academic entrepreneurs (Dutch Research Council, 2014a, 2020d). The NWO is a national research organisation that —among other activities— supports ASOs to promote academic entrepreneurship within the Dutch knowledge institutions (Dutch Research Council, 2020a). In 2019, from the total direct R&D expenditure carried out by the Dutch government, the funds allocated to the NWO equalled EUR 955M, namely 17,29% of the national budget. (Rathenau Instituut, 2019). The NWO's mission is to encourage and support outstanding scientific research with scientific and societal impact (Dutch Research Council, 2020c). Apart from providing the Dutch universities and public research institutes with capital for scientific research and knowledge exchange, the NWO performs a fundamental connecting role among stakeholders: (a) NWO brings multidisciplinary researchers and societal partners together and (b) invites partners from the government, societal entities, and industry

to actively participate and strengthen the planning, accomplishment and co-funding of research (Dutch Research Council, 2020c).

### 1.4 Research question and methodology

To reach the primary research objective, I define the following central research question:

*How do organisational elements of academic spin-offs and attributes of the entrepreneurs involved combine to produce early-stage spin-off success (in terms of positive funding decision and survival)?*

To answer this study's primary research question, I utilise a directed approach to content analysis to explore, categorise, and quantify a unique aggregated dataset. Moreover, I create interval-scale concept indicators and select specific macrovariables and causal conditions to construct a model to examine the complex configurations of factors that may promote early-stage ASO success. To analyse this causal complexity, I employ a set-theoretic method, namely Fuzzy-Set Qualitative Comparative Analysis (fsQCA). Hence, this is a mixed-methods academic study with an explorative-descriptive nature and a deductive approach.

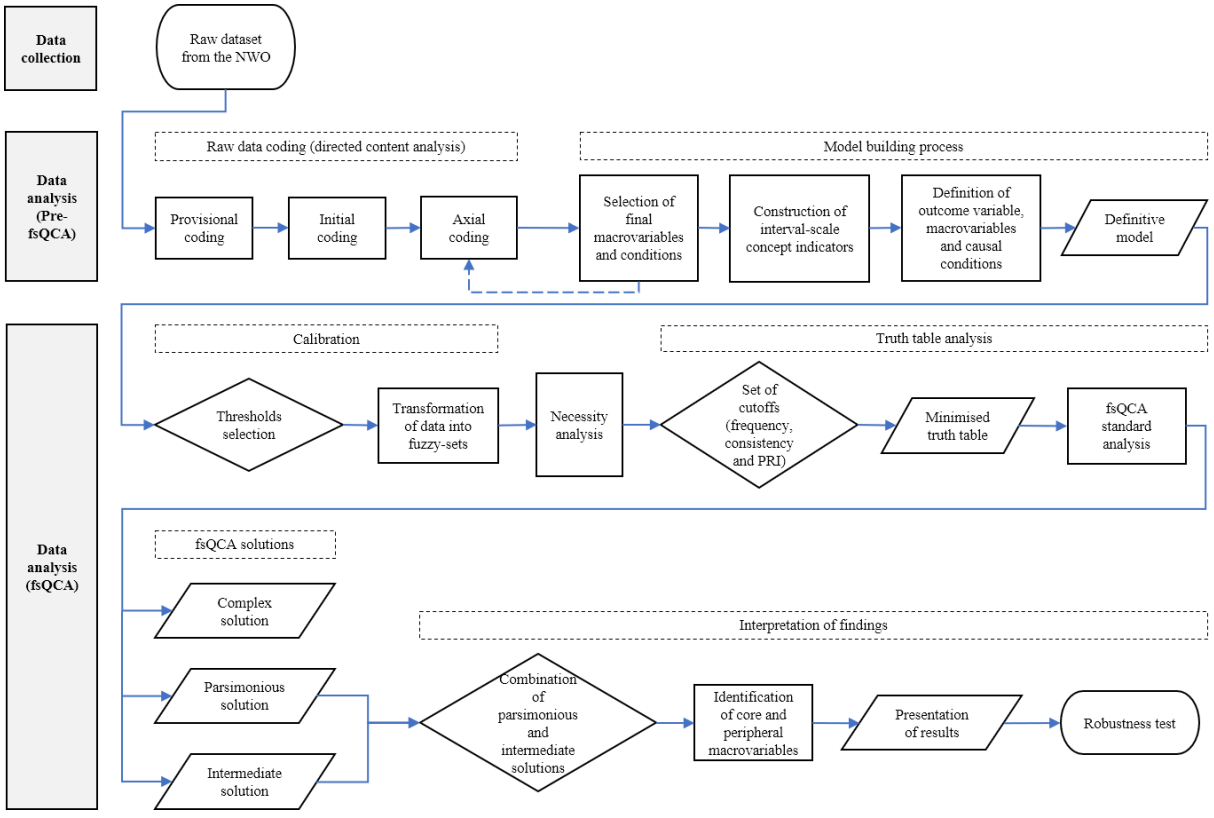


Figure 1.1 Research methodology

### 1.5 Implications

This study found that ASO early-stage success is not just a function of the sum of isolated attributes, but rather a function of how these attributes coexist and combine to construct unique causal

configurations. The fact of applying fsQCA to analyse the configurations of elements to produce ASO early-stage success represents a unique and novel approach in the academic entrepreneurship literature. In this academic work, the conditions that construct the configurational paths are supported by previous research, thus, confirming the relevance of particular attributes towards higher ASO early-stage performance and success. I.e. *entrepreneurial experience and knowledge* (Criaco et al., 2014; Hayter, 2013; Huynh, Patton, Arias-Aranda, & Molina-Fernández, 2017; Lockett, Wright, & Franklin, 2003; Lundqvist, 2014; Prokop et al., 2019; Prokop, 2021; Wennberg, Wiklund, & Wright, 2011), *business concept articulation* (Druilhe & Garnsey, 2004; Grandi & Grimaldi, 2005; Mustar et al., 2006; Ziaee Bigdeli, Li, & Shi, 2016), *technology* and innovativeness (Colombo & Piva, 2012; Criaco et al., 2014; Mathisen & Rasmussen, 2019; Ortín-Ángel & Vendrell-Herrero, 2014), *IP strategy* (Mathisen & Rasmussen, 2019; Migliori, Pittino, Consorti, & Lucianetti, 2019; Siegel, Veugelers, & Wright, 2007; Vohora, Wright, & Lockett, 2004), *marketing strategy* (Diánez-González & Camelo-Ordaz, 2019; Migliori et al., 2019; Rasmussen, Mosey, & Wright, 2014; Vohora et al., 2004; Würmseher, 2017), *new business development strategy* (Mota, Godinho Filho, Osiro, Ganga, & Mendes, 2021; Mustar et al., 2006; Wright, Vohora, & Lockett, 2004), and *financial strategy* (Diánez-González et al., 2020; Vohora et al., 2004). My intention with this academic study is to show scholars that the application of a forward-looking approach together with fsQCA represents a methodological alternative with an enormous potential to effectively commence to understand the interplay of ASO early-stage success factors.

Once the involved entrepreneurs overcome the critical juncture of entrepreneurial commitment, they are entirely devoted to converting their somewhat vague idea into a strategic business viable concept (Vohora et al., 2004). Hence, it is precisely at this point in which the findings of my study may be of extreme benefit for the involved entrepreneurs. A high innovativeness degree and a flexible and broad technological applicability potential do not guarantee, by themselves, that successful commercialisation can be achieved. Suppose academics looking to create an ASO commence to realise that their absorptive capacity should be incremented to complement their specialised technological base and scientific expertise effectively. In that case, they may be able to increase their chances to overcome the *valley of death* by maximising the investment readiness of their ASOs.

The results of this study can also be helpful for policymakers and government-based entities to start thinking in the formation of progressive, long-term policy instruments to effectively develop, monitor and measure the ASOs' investment readiness in their early stages. National and European policymakers should work closely with universities, industry actors, and private investors to create institutionalised industry-specific frameworks based on scientific research that translate into best-practice manuals.

### 1.6 Thesis structure

I organise the remaining part of the current study as follows. Chapter two contains the theoretical framework of the study. Chapter three depicts in detail the applied methodology. Chapter four displays the study findings to answer the central research question. In chapter five, I present the discussion, limitations, and contributions. Finally, chapter six contains the study conclusions.

## 2 Theory

### 2.1 Academic entrepreneurship and the ASO phenomenon

Academic spin-offs (ASOs), also known as university spin-offs (USOs), are one of the methods that support universities with their *third mission*, i.e. with the application of science via the transfer of knowledge and technology to the industry and society (Miranda, Chamorro, & Rubio, 2018).

The successful western model of academic entrepreneurship that emerged with the Bayh-Dole Act in the US in 1980 has been the role model for European countries in their effort to commercialise university research via ASO creation effectively (Grimaldi et al., 2011; Miranda et al., 2018; Rasmussen & Sørheim, 2012). According to Mustar, Wright, and Clarysse (2008) and Rasmussen and Sørheim (2012), together with the fact that universities have more control regarding intellectual property rights due to the execution of Bayh-Dole-motivated policies, two are the main elements that have encouraged the creation of ASOs in the last years. (1) Larger and more accessible public financial instruments to increase the ASOs' investment readiness, i.e. to bridge their financing gap; and (2) stakeholders' exertion of higher pressure to universities to actively commit themselves to research commercialisation activities.

Furthermore, the stakeholders' pressure has not only driven the universities to spin out more knowledge-based enterprises, but it has also induced the universities to apply a more business-wise and entrepreneurial way of carrying out their operations (Kirby, 2006; Miranda et al., 2018). These universities display a greater degree of participation in social and economic development, a higher amount of patent and licensing activities, positive attitude modifications among entrepreneurs toward collaborative university-industry projects, more institutionalised spin-off processes, and, thus, a significantly intensified research results' commercialisation (Miranda et al., 2018; van Looy et al., 2011).

Aligned with the increase in the number of ASOs and their practical relevance, over the last twenty years, scholars in the field of academic entrepreneurship have progressively attempted to understand better how the process of university research commercialisation through the foundation of ASOs can be enhanced (Marzocchi et al., 2019; Miranda et al., 2018; Prokop et al., 2019). A fundamental debate

among academic entrepreneurship scholars relates to recognising the elements that potentially lead towards ASO early-stage success (Fisher, Kotha, & Lahiri, 2016; Skute, 2019).

To analyse the interplay of the characteristics of ASOs and their involved entrepreneurs, I utilise a dynamic capabilities perspective to assess the structural characteristics of ASOs and their involved entrepreneurs. I.e. the bundle of resources —organisational and individual— and the technical knowledge and expertise of an ASO interacting with each other and the external environment to construct a long-term competitive advantage (Eisenhardt & Martin, 2000; Mota et al., 2021; Sunder M., L.S., & Marathe, 2019).

Furthermore, as noted in the problem formulation, I expect that the combination of ASO organisational elements with the attributes of the involved entrepreneurs produces causally complex relationships. Causally complex relationships are linkages that display conjunction, asymmetry, and equifinality (Misangyi et al., 2017). Conjunction means that the outcome emerges from the interlinkage of several causal conditions (Misangyi et al., 2017). Asymmetry is when specific attributes of one causal configuration can be either inversely related or unrelated to the outcome when situated in a distinct configuration (Misangyi et al., 2017; Ragin, 2008). Equifinality —the key element of the fsQCA analysis— occurs when different configurations of conditions can produce the same outcome (Misangyi et al., 2017; Ragin, 2008).

### 2.2 The ASOs' phases of development

As noted by Skute (2019), the comprehension of the ASOs' entire lifecycle is a prerequisite to recognising their success factors. Hence, it can be purposeful to draw on the seminal work of Vohora et al. (2004), which outlines the five development phases of an ASO: (a) the research phase, (b) the opportunity framing phase, (c) the pre-organisation phase, (d) the re-orientation phase, and (e) the sustainable returns phase. Each of the five stages encompasses a well-defined set of activities and strategic focus that the ASO must successfully execute before it can advance to the next phase of development (Vohora et al., 2004).

The *research phase* refers to the scientific research carried out by the academic founders within the parent university before recognising any related commercial opportunity (Vohora et al., 2004). During this phase, the academic founders' primary motivation is to be recognised and awarded through high-quality publications (Vohora et al., 2004). The *opportunity framing phase* refers to how the academic founders identify and evaluate the technological validity of an opportunity to transform it into a commercially viable concept (Vohora et al., 2004). Afterwards, when the academic founders have framed the opportunity and committed to exploiting it commercially, the ASO can now carry out the *pre-organisation phase*, i.e. the development and initial implementation of the ASOs' strategic plans (Vohora et al., 2004). The *pre-organisation phase* represents for the academic

founders the abruptest learning curve because it is here when they need to reflect on the knowledge and resources that they currently possess and start developing the strategic plan to complement them in order to reach the ASO's goals (Qian & Acs, 2013; Vohora et al., 2004). In the *re-orientation phase*, the ASOs are endowed with enough credibility to access and gain the necessary resources to launch the business activities and enter the markets. Thus, they intend to start delivering value to the stakeholders and end customers (Vohora et al., 2004). In this phase, the involved entrepreneurs leverage their absorptive capacity and dynamic capabilities. I.e. in a continuous, dynamic and non-linear process, ASOs identify, acquire, and incorporate knowledge and resources and subsequently reconfigure them to produce returns and growth (Eisenhardt & Martin, 2000; Qian & Acs, 2013; Vohora et al., 2004). In the last ASO development stage, the *sustainable returns phase*, the ASOs now own sufficient dynamic capabilities to effectively and continuously re-configure their resources and knowledge. Hence, the ASOs can secure sustainable returns (Vohora et al., 2004). In other words, by reaching this phase, the ASO is now a functioning business-oriented high-tech enterprise that commences increasing its traction in the competitive landscape, and for which science, technology, and research are not anymore the only-existing priorities, but elements of an integral organisational business strategy (Vohora et al., 2004).

The transitions between each ASO development phase are the critical junctures, namely critical problems that arise along the ASOs' growth path and that impede them to move forward to the next development phase (Vohora et al., 2004). The following are the four critical junctures (see Figure 2.1): (1) *opportunity recognitio*n, (2) *entrepreneurial commitment*, (3) *threshold of credibility*, and (4) *threshold of sustainability* (Vohora et al., 2004).

Based on the specifics of the Valorisation Grant Phase 1 and 2, it can make sense to infer the following. For the ASOs, receiving the VG phase 1 suggests that they passed the critical juncture entrepreneurial commitment. Afterwards, they started working on (a) the improvement points and (b) the initial implementation plans (pre-organisation phase) required to file the proposal of the VG phase 2. Finally, by being granted the VG phase 2, the ASOs have overcome the threshold of credibility. Hence, this study addresses its analysis on the ASOs situated on the pre-organisation phase looking to overcome the threshold of credibility (see Figure 2.1).

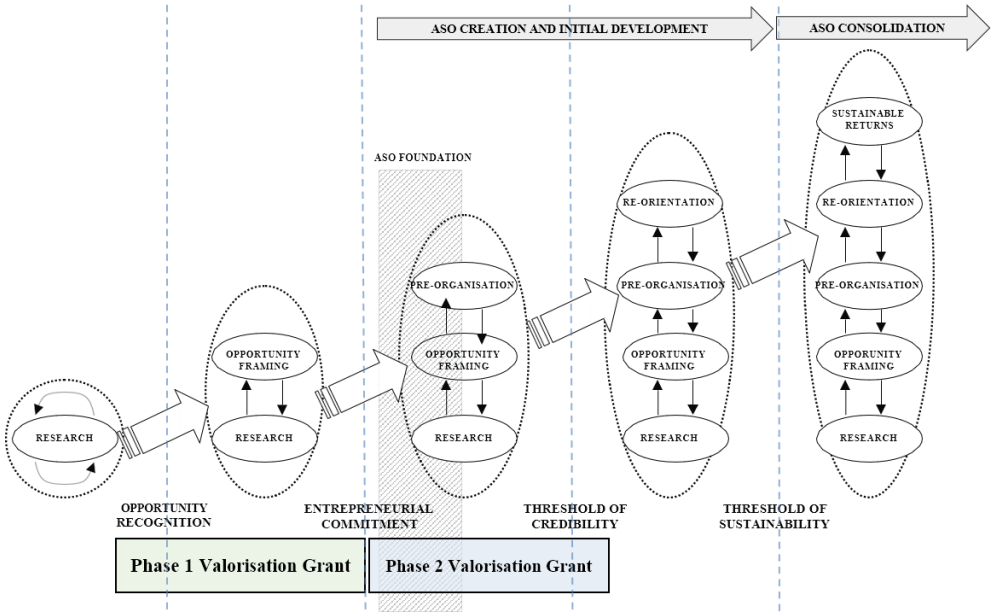


Figure 2.1 Critical junctures in the development of ASOs and the VG program scope of operation (Fernández-Alles, Camelo-Ordaz, & Franco-Leal, 2015; Sousa-Ginel, Franco-Leal, & Camelo-Ordaz, 2021; Vohora et al., 2004)

### 2.3 Dimensions and definition of ASOs

In their thorough critical review, Mathisen and Rasmussen (2019) identify four key dimensions used in the literature to define ASOs: *entrepreneurs, institutional origin, form of knowledge,* and *sponsorship*. The first dimension, *entrepreneurs*, refers to the attributes of individuals structuring the initial entrepreneurial team (Mathisen & Rasmussen, 2019). One criticism of much of the literature is that in most cases, the ASO founders are defined as entrepreneurial teams derived exclusively from the scientific community, e.g. faculty members and researchers (Ensley & Hmieleski, 2005; Knockaert, Spithoven, & Clarysse, 2010; Mathisen & Rasmussen, 2019; Nicolaou & Birley, 2003). However, experienced surrogate entrepreneurs can also be part of the initial ASO founding team, providing the founding team with the managerial and commercial expertise that the academic founders regularly do not possess (Mathisen & Rasmussen, 2019; O'Gorman, Byrne, & Pandya, 2008). As stated before, for this study, the involved entrepreneurs can be either (a) exclusively academic founders from the parent institution or (b) academic founders from the parent institution and external expert entrepreneurs.

The second dimension, *institutional origin*, relates to the parent institution in which the ASOs carry their business and technical activities to develop the scientific research results (Mathisen & Rasmussen, 2019). Traditionally, it has been argued that universities are typically the ASOs' parent institutions; nevertheless, academics can also execute research in other institutes, such as

public research institutes (PRIs) and governmental laboratories (Mathisen & Rasmussen, 2019; Moray & Clarysse, 2005).

*Form of knowledge*, the third dimension, outlines the nature of the ASOs' technological knowledge and how it is structured (Mathisen & Rasmussen, 2019). ASOs are often structured upon tacit knowledge and general scientific expertise; nonetheless, scholars frequently infer that ASOs commercialise innovative inventions based on explicit knowledge and well-structured intellectual property (IP) (Djokovic & Souitaris, 2008; Hindle & Yencken, 2004; Karnani, 2013; Mathisen & Rasmussen, 2019).

The fourth dimension identified by Mathisen and Rasmussen (2019), *sponsorship*, relates to whether the ASOs receive any support or not from the parent institution (e.g. licensing and equity as sponsoring modes). Interestingly, a significant fraction of ASOs are not founded inside their parent institution's formal channels, either because an ASO does not want to collaborate with the parent institution's technology transfer office (TTO) (Fini, Lacetera, & Shane, 2010; Mathisen & Rasmussen, 2019; Thursby & Thursby, 2002) or because the TTO does not have interest in seeking benefits of its legal rights of the ASOs' inventions (Aldridge & Audretsch, 2010), i.e., in either case, the ASO is unsponsored from its parent institution (Mathisen & Rasmussen, 2019). Nevertheless, a common misconception is that, given that TTOs have arisen as popular mechanisms created by universities to administer the ASO-creation process, all the ASOs are formally founded by the TTOs (Mathisen & Rasmussen, 2019).

This study defines ASOs as new firms founded by academics within a university context with the primary purpose of converting a new technology, innovation or knowledge —consequence of academic research— into a viable business opportunity, with the inclusion —or not— of external expert entrepreneurs (Huynh et al., 2017; Rasmussen, 2011).

### 2.4 Gap-funding instruments

Contrary to corporate spin-offs, ASOs do not arise from a commercial environment; thus, the academic founders may lack the required resources and abilities to effectively carry out the process of research commercialisation (Bathelt et al., 2010; Huynh et al., 2017; Rasmussen, 2011). Additionally, ASOs in the early stages, driven by (a) the acknowledgement of their lack of commercial competencies and (b) the necessity to complement them, are more prone to get involved with diverse stakeholders, e.g. private investors, private industry, public funding institutes, new management teams, and university technology transfer offices (Bathelt et al., 2010; Belitski, Aginskaja, & Marozau, 2019; Huynh et al., 2017; Rizzo, 2015). Therefore, a potential risk in which the involved stakeholders' interests are not aligned can arise, hindering the ASOs early-stage success (Bathelt et al., 2010; Huynh et al., 2017; Rasmussen, 2011).

ASOs often require large amounts of capital before their innovations can be introduced to the market because they usually develop tacit, disruptive technologies (Huynh et al., 2017; Rasmussen & Sørheim, 2012; Shane, 2004). Furthermore, investors often show reluctance to fund ASO early-stage projects due to the extreme levels of uncertainty, extended payback time, diverse informational gaps, and lower exit rates (Huynh, 2016; Munari, Rasmussen, Toschi, & Villani, 2016; Rasmussen & Sørheim, 2012).

The financing gap — often known as the *valley of death* — is a market-failure phenomenon that represents the disparity between the following two elements: (a) the ASOs' amount of required external capital to further develop their project and convert their knowledge innovation or technology into a commercially feasible concept, and (b) the extent to which such required financial resources are available for the ASOs (Ayoub, Gottschalk, & Müller, 2017; Munari et al., 2016; Rasmussen & Sørheim, 2012).

Rasmussen and Sørheim (2012) recognise three gap-funding government programs: Proof of concept (PoC), Pre-seed, and Seed. (1) Proof-of-concept (PoC) programs fund ASOs —usually with a 100% grant— so they can demonstrate the technological feasibility of the research-based innovative technological product or service (Mustar et al., 2008; Rasmussen & Sørheim, 2012). (2) Pre-seed funding programs strive to enhance the organisational attributes of the ASOs' projects (Munari et al., 2016; Mustar et al., 2008; Rasmussen & Sørheim, 2012). By targeting the demand-side of the financial market (Queen, 2002), PoC and Pre-seed programs intend to increase the level of certainty —technological and organisational, respectively— of the ASOs' projects, and consequently, augment the ASOs' investment readiness (Rasmussen & Sørheim, 2012). (3) Seed funding programs endow ASOs with financial resources to effectively transform the research-based innovation into a commercially viable product or process (Munari et al., 2016; Rasmussen & Sørheim, 2012). Different to PoC and Pre-seed funding programs, by locating its scope of action on the financial market's supply-side (Queen, 2002), Seed funding instruments' goal is to decrease the ASOs' project-associated investment risks (Rasmussen & Sørheim, 2012).

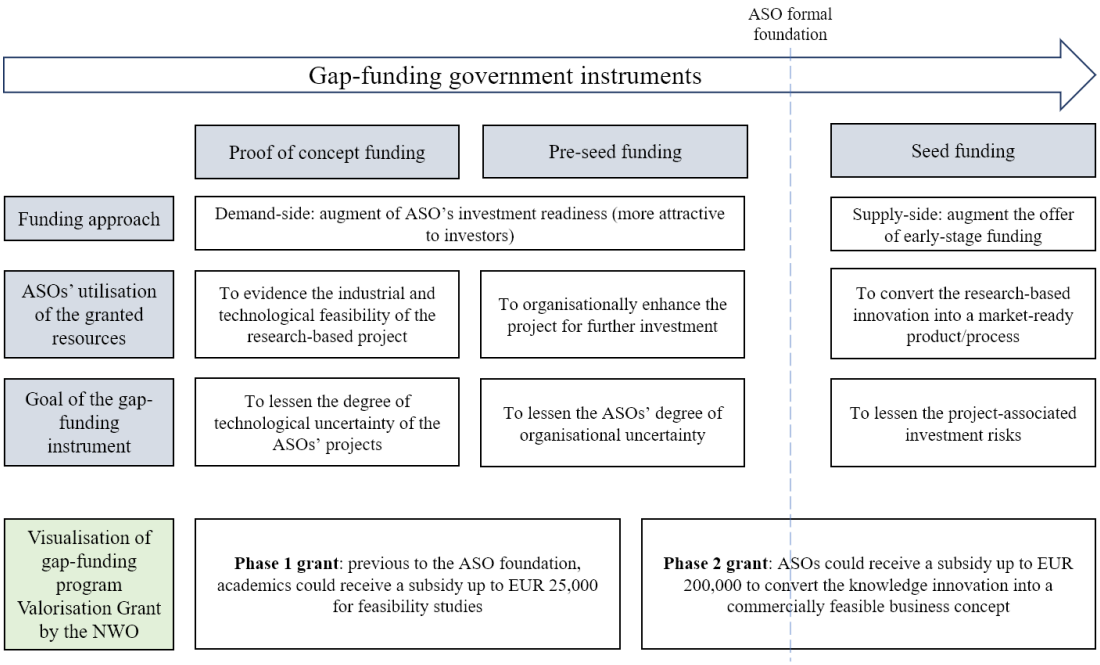


Figure 2.2 Gap-funding instruments and Valorisation Grant program (Dutch Research Council, 2014, 2020b; Rasmussen & Sørheim, 2012)

### 2.5 Business concept articulation

According to Grandi and Grimaldi (2005), the effective articulation of the business concept and ideas carried out by an ASO in its early stage is a fundamental predictor of success. In other words, an early-stage ASO will be more prone to achieve success if it is capable to effectively communicate, written and orally, its core business concepts and model, goals, and mission (Grandi & Grimaldi, 2005).

ASOs' early-stage activities are often carried out without a clear conception and understanding of how value will be created and delivered (Druilhe & Garnsey, 2004; Mustar et al., 2006). Analysed from the perspective of the ASOs' development phases' framework, the latter problem arises when the academic founders fail to "frame" the detected opportunity into a commercial concept (opportunity framing phase) (Vohora et al., 2004). I.e. the academic founders frequently cannot express clearly how the technology applications will perform commercially in different markets (*marketing strategy*), the plans to access those intended markets (*new business development strategy*), and the financial approach required to fulfil the ASO's goals (*financial strategy*) (Vohora et al., 2004). Consequently, a comprehensive business plan that not only displays a well-developed technology but contains an overall solid business strategy to achieve the ASO's goals (Hormozi, Sutton, McMinn, & Lucio, 2002) will be more prone to access external funding sources.

An ASO's business model, if effectively structured, should outline in a clear and compact visual representation the interactions between the ASO's core business components to deliver value and

create returns (Druilhe & Garnsey, 2004; Mustar et al., 2006; Ziaee Bigdeli et al., 2016). In other words, the business model represents the "heart" of the ASO's overall strategic business plan. Experts in entrepreneurship frequently assume that constructing and concretely communicating a business model is a rather complicated undertaking. Interestingly, Vohora et al. (2004) state that ASOs will be more likely to create a precise business model once they overcome the threshold of sustainability and start operating in the *sustainable returns phase*. I.e. until the ASOs reach that point, they must have significantly improved their dynamic capabilities to address the initial uncertainties inherent to the business model (Vohora et al., 2004), and hence, the involved entrepreneurs should —by that moment— have increased their *entrepreneurial experience and knowledge*. The later argument is supported by Druilhe and Garnsey (2004), who utilise a dynamic perspective to suggest that the business models are modified, improved, and further detailed as the involved entrepreneurs gain more knowledge about their resources and business opportunities. I.e. the linkage between the *business concept articulation* and the increase of the involved entrepreneurs' *entrepreneurial experience and knowledge* can be seen as a causally complex relationship.

Interestingly, in the specific context of the VG phase 2, the proposals were filed using a standard format. Hence, no practical distinction could be inferred about the quality of the business plans. Therefore, it can make sense to assume that the extent to which the ASOs communicated a more advanced and comprehensive business model during the oral presentations, may have confirmed —or not— the initial opinion that the judges had regarding the quality of the business plan.

### 2.6 Entrepreneurial experience and knowledge

There is a consensus among academic entrepreneurship scholars that assumes that *entrepreneurial experience and knowledge* are essential attributes for academics to successfully found and manage an ASO (Criaco et al., 2014; Hayter, 2013; Huynh et al., 2017; Lockett et al., 2003; Lundqvist, 2014; Prokop et al., 2019; Prokop, 2021; Wennberg et al., 2011).

Grandi and Grimaldi (2005) and Criaco et al. (2014) analyse the effect of the academic founders' specific human capital attributes on ASO survival and performance. Criaco et al. divide the specific human capital into three categories: (1) entrepreneurship human capital (EHC) is the gained knowledge related to entrepreneurship through personal experience and formal education; (2) industry human capital (IHC) is the acquired knowledge through past experiences within the same industry in which the ASO current operates; and (3) university human capital represents the gained knowledge through past teaching and research experiences in universities (Colombo & Grilli, 2005; Criaco et al., 2014). An interesting result of the study of Criaco et al. (2014) is that the academic founders' entrepreneurial education exerts a positive effect on ASO survival and performance.

If endowed with a certain degree of entrepreneurial experience, the academic founders may be more capable of acquiring new technological knowledge, comprehend its value, and effectively convert their entrepreneurial intentions into entrepreneurial activities (Bird & Schjoedt, 2009; Guerrero & Urbano, 2014; Qian & Acs, 2013), such as the foundation of an ASO. I.e. experienced academic entrepreneurs are the main actors of a technological transfer process, namely the commercialisation of a technological product through an ASO (Guerrero & Urbano, 2014). However, an essential issue has been identified in significant articles in the academic entrepreneurship literature: the academic founders may own deep expertise in their research fields but may lack entrepreneurial and business administration capabilities, and networks required to found and successfully manage an ASO (Bathelt et al., 2010; Criaco et al., 2014; Fini et al., 2010; Huynh et al., 2017; Prokop et al., 2019; Rasmussen, Mosey, & Wright, 2011; Sciarelli, Landi, Turriziani, & Tani, 2020). To alleviate the latter issue, the academic founders, realising (a) their entrepreneurial and commercial inexperience and (b) their focus almost solely to the technical aspects of the innovation, often bring surrogate entrepreneurs, namely non-academic expert entrepreneurs, to integrate their capabilities, managerial resources and networks and to jointly manage the ASO (Colombo & Piva, 2012; Lockett et al., 2003; Mustar et al., 2006; Sciarelli et al., 2020; Visintin & Pittino, 2014; Vohora et al., 2004). Moreover, the inclusion of experienced external entrepreneurs increases the ASO chances to overcome the threshold of credibility and to gain access to external funding, thus, augmenting the overall ASO probabilities of success during its early-stage (Diánez-González et al., 2020; Hayter, 2013; Lundqvist, 2014; Prokop et al., 2019; Vohora et al., 2004).

The entrepreneurs involved in an ASO are classified into two segments: (a) the research group of origin, namely the first team of academics who develop the new technology, and who may possess or not entrepreneurial experience; and (b) the external experts, mainly accountable for the management activities for commercialising the technology via the ASO (Grandi & Grimaldi, 2005). For the purposes of this academic work, the *involved entrepreneurs* can be either (a) exclusively academic founders from the parent university or (b) academic founders from the parent university and external non-academic expert entrepreneurs with a management background.

Building upon (1) the entrepreneurship human capital framework of Criaco et al. (2014) —concepts of EHC and IHC—, and (2) the work of Knoben and Oerlemans (2006), I define *entrepreneurial experience and knowledge* as follows: the degree to which the involved entrepreneurs display (a) entrepreneurial attributes and (b) specialised technical knowledge required to adapt the core technology to the industry needs. Hence, it can make sense to assume that the level of the specialised technical knowledge of the involved entrepreneurs may relate to the effective development of the *marketing strategy* and the *new business development strategy* (causal complexity).

The early-stage successful ASO development is positively affected by the ASO entrepreneurial orientation (EO), a central concept in the field of entrepreneurship, that describes the degree to which an ASO reflects an organisational entrepreneurial mindset embedded in the strategic processes that emphasise innovativeness, risk-taking and proactiveness towards entering new or established markets to commercialise a technological product or service (Diánez-González & Camelo-Ordaz, 2016, 2019; Migliori et al., 2019; Rauch, Wiklund, Lumpkin, & Frese, 2009; Walter, Auer, & Ritter, 2006). Thus, for this study, it would be purposeful to consider that the extent to which an ASO is entrepreneurially oriented may explain the absence or presence of success-related factors for ASOs in their early stage.

### 2.7 Technology

In the academic entrepreneurship literature, a vast majority of scholars consider that ASOs are subsets of new technology-based firms (NTBFs); thus, ASOs are expected to be strongly technology-oriented (Colombo & Piva, 2012; Criaco et al., 2014; Mathisen & Rasmussen, 2019; Ortín-Ángel & Vendrell-Herrero, 2014). The literature states that ASOs are endowed with a significantly higher degree of innovativeness than other new technology-oriented enterprises (Miranda et al., 2018; Sousa-Ginel et al., 2021). Moreover, ASOs tend to focus on introducing radical innovations (Clausen & Rasmussen, 2013; Sousa-Ginel et al., 2021). Hence, it seems that a high innovativeness degree can be an inherent characteristic of ASOs. However, there is little known about (a) the capabilities that ASOs require to enhance the organisational innovation performance and (b) how the ASOs can further develop these capabilities towards a commercialisation path (Lejpras, 2014; Sousa-Ginel et al., 2021).

As a prerequisite to developing an innovative *technology*, the academic founders need to have the capabilities to produce, absorb, transform, and apply —technological— knowledge (Qian & Acs, 2013; Sousa-Ginel et al., 2021). I.e. the academic founders' absorptive capacity and knowledge conversion capability (KCC) will potentially determine (1) the innovativeness degree of the developed *technology* and (2) the extent to which the technology can be effectively transformed into a commercially attractive product or service with a broad range of technical applications (Sousa-Ginel et al., 2021; Zahra, van de Velde, & Larraneta, 2007; Zhou & Wu, 2009).

According to Zahra et al. (2007) and Sousa-Ginel et al. (2021), ASO knowledge conversion capability is structured by three fundamental capacities. First, the *embodiment and integration capacity* is the ASO's capability to absorb and integrate external knowledge to transform the core *technology* into tangible marketable products or services (Sousa-Ginel et al., 2021; Ulrich, 2003). The academic founders' initial technical knowledge, primarily produced during the research development phase, will be later applied during the development phases two and three to plan and

define the commercialisation path. Hence, the *embodiment and integration capacity* is particularly relevant during the first three ASO's stages of development (see Figure 2.1) (Sousa-Ginel et al., 2021; Vohora et al., 2004). Second, *conceptualisation and visioning capacity* is the ASO's capability to realise and formulate feasible applications for the innovative *technology*, analysing and defining who will be the users of the technology and how they will utilise its technical applications (Sousa-Ginel et al., 2021). Third, with the *configuration and design capacity*, ASOs can convert their technological knowledge —by constructing working prototypes— into a new product or service that can be manageably manufactured, marketed, and delivered (Sousa-Ginel et al., 2021; Ulrich, 2003).

### 2.8 IP strategy

Among academic entrepreneurship scholars, IP-related issues are commonly assumed to be one of the most complicated hurdles that need to be carefully analysed before the commercialisation of a university-based technological innovation through an ASO can be achieved (Siegel et al., 2007). E.g. (a) the academic founders' motivations to disclose —or not— their technological inventions, (b) the way to persuade the academic founders to remain actively involved throughout the whole process to develop the IP further and introduce the product or technology to the market, and (c) the assessment of the viability of overcoming asymmetric-information problems regarding the business potential and value of the ASOs' technological invention (Siegel et al., 2007).

Under the most widely applied Intellectual Property (IP) regime in Europe, namely Bayh-Dole Act-based models, the academic founders are required to grant disclosure of their inventions to the parent university through the Technology Transfer Office (TTO) (Åstebro, Braguinsky, Braunerhjelm, & Broström, 2019; Siegel et al., 2007). I.e. the parent university holds ownership of the IP but usually endows the academic founders a specific share, either in royalties or equity (Åstebro et al., 2019; Siegel et al., 2007). If the academic founders have been successfully motivated by the TTO —usually the owner of the parent university IP— to disclose their inventions, then, just before overcoming the critical juncture of *opportunity recognition*, the TTO will analyse the commercial potential of the technological invention (Åstebro et al., 2019; Siegel et al., 2007; Vohora et al., 2004). If the technological invention displays sufficient commercial viability, the TTO will start with creating a suitable *IP strategy* for the ASO. However, formal technology transfer processes in which there is a strong institutional link between the parent university and the ASO can bring a relevant complication. The emphasis of the TTO may be set primarily (1) on increasing the quantity of ASOs instead of procuring their quality and (2) on licensing and patenting activities and not in fostering academic entrepreneurship in which the academic founders should play a fundamental role (Åstebro et al., 2019; Siegel et al., 2007). Overall, when the commercialisation of a technological invention is based on a formalised *IP strategy*, such as patenting and licensing, a lack of convenient and attractive IP arrangements in which the academic founders have an active role in co-developing the *IP strategy* is

found to be a critical element that can impede the ASO on overcoming the first critical juncture *opportunity recognition* (Åstebro et al., 2019; Siegel et al., 2007). Interestingly, as outlined by Fini et al. (2010; 2018) and Diánez-González and Camelo-Ordaz (2019), for many ASOs the figure of a TTO may represent more a threat than a supportive partner and, hence, ASOs often prefer to use informal channels to pursue their commercialisation activities.

It is relevant to remark that formal IP protection through patenting and licensing activities, either through an institutionalised or informal technology transfer process, does not represent the only alternative an ASO has to develop its *IP strategy*. A significant amount of ASOs is built upon more general tacit knowledge and scientific expertise (Djokovic & Souitaris, 2008; Hindle & Yencken, 2004; Karnani, 2013; Mathisen & Rasmussen, 2019; Migliori et al., 2019). Hence, ASOs frequently adopt informal —but still practical and competitive— IP protection strategies, such as secrecy (Mathisen & Rasmussen, 2019). The latter is a common strategy for ASOs whose main activity is software development (Mathisen & Rasmussen, 2019). Moreover, it can be purposeful to assume that the existence of a strong IP strategy may signalise the presence of a sound technological knowledge base and an overall strong technological expertise (causal complexity).

Interestingly, as part of a causally complex linkage, the level of expertise of the academics that found an ASO may have a substantial effect on how effective an ASO's *IP strategy* is planned and implemented (Vohora et al., 2004). In its seminal work, Vohora et al., (2004) found that the *IP strategy* of an ASO can be better developed and implemented by the academic founders who are experts in their fields. An overall strong strategy to protect the ASO IP rights may eliminate the academic founders' belief that external actors, such as the parent university, private investors, or not yet reliable non-academic collaborators, may take over the original idea and project, and thus motivates the founder academics to actively look for external partnerships and funds (Hellmann & Puri, 1999; Wright, Clarysse, Mustar, & Lockett, 2007).

### 2.9 Marketing strategy

An effective ASO *marketing strategy*, result of the ASO market orientation and essential part of the overall entrepreneurial organisational strategy, is acknowledged as an essential element to foster ASO performance and success during the early stage phases of development (Diánez-González & Camelo-Ordaz, 2019; Migliori et al., 2019; Rasmussen et al., 2014; Vohora et al., 2004; Würmseher, 2017). I.e. the ASOs should define a long-term oriented strategic action plan, based on market and industry analysis, to effectively develop, advertise and deliver the intended technological product or service (Varadarajan, 2010).

As a consequence of their specific nature, ASOs often face uncertain, hostile, competitive and technologically sophisticated environments (Diánez-González & Camelo-Ordaz, 2019; Migliori et

al., 2019; Rauch et al., 2009). Thus, the involved entrepreneurs should be endowed with sufficient marketing capabilities (Diánez-González & Camelo-Ordaz, 2019; Pérez & Sánchez, 2003) to (a) analyse and comprehend the market in which they intend to operate (Duening, Hisrich, & Lechter, 2021), (b) objectively assess the commercial potential of the technological product or service (Conceição, Fontes, & Calapez, 2012; Wright et al., 2004), and (c) to construct a feasible forward-looking plan that includes the timing and volume of the required sales to support the ASO's objectives (Aras, Deveci Kocakoç, & Polat, 2017; Curtis, Lundholm, & Mcvay, 2014). Nevertheless, due to their highly specialised expertise, the academic founders often lack the capabilities required to comprehend the market in which they aspire to commercialise their technological product or service and, thus, they rely on external entrepreneurs to enhance the overall market orientation of the ASO (Druilhe & Garnsey, 2004; Lundqvist, 2014; Migliori et al., 2019; Vohora et al., 2004). Drawing on Migliori et al. (2019), an ASO endowed with market intelligence capabilities, namely market orientation, will be more prone to achieve higher performance during the critical early development stages.

### 2.10 New business development strategy

Although it also emerges from the ASO market orientation, the *new business development strategy* of an ASO is distinct from the ASO *marketing strategy*. First, while the main emphasis of the *marketing strategy* is addressed to understand the market to assess the commercial viability of the technological product or service (Conceição et al., 2012; Varadarajan, 2010; Wright et al., 2004), the *new business development strategy* focuses on —based on the marketing understanding— to avoid the identified market-entry barriers to launch the technological product or service (Burgers, van den Bosch, & Volberda, 2008; Kuester, Konya-Baumbach, & Schuhmacher, 2018). Second, the *new business development strategy* adopts a short-term perspective that primarily encompasses the new product development (NPD) process and whose main goal is to successfully launch the technological product within a specific timeframe and potentially supported by launching customers (Enkel, Perez-Freije, & Gassmann, 2005; Gassmann, Kausch, & Enkel, 2010). Whereas the *marketing strategy* is long-term oriented, i.e. it aims to sustainably deliver value to customers (Curtis et al., 2014; Varadarajan, 2010).

ASOs, in their efforts of commercially exploit the technological knowledge result of scientific research, can face several severe market-entry barriers (Conceição et al., 2012; Mustar et al., 2006). Go-to-market strategies are strategic plans based on a sound market, and industry understanding carried out by ASOs to successfully launch a technological product or service in a specific market by effectively understanding and avoiding the potential market-entry barriers (Kuester et al., 2018).

For new technology-oriented ventures that intend to introduce a highly innovative product or service in the market, such as ASOs, the speed and accuracy of the NPD process are critical to achieving success in the commercialisation of a technological product or service (Mota et al., 2021). The fundamental performance indicator of the NPD process is time-to-market (TTM), i.e. the ASO's capability to effectively and rapidly launch its product or service (Cankurtaran, Langerak, & Griffin, 2013; Mota et al., 2021). To accelerate the TTM, ASOs can collaborate with strategic partners, namely launching customers, who can support them with the introduction of the product or service into the market (Enkel et al., 2005; Gassmann et al., 2010).

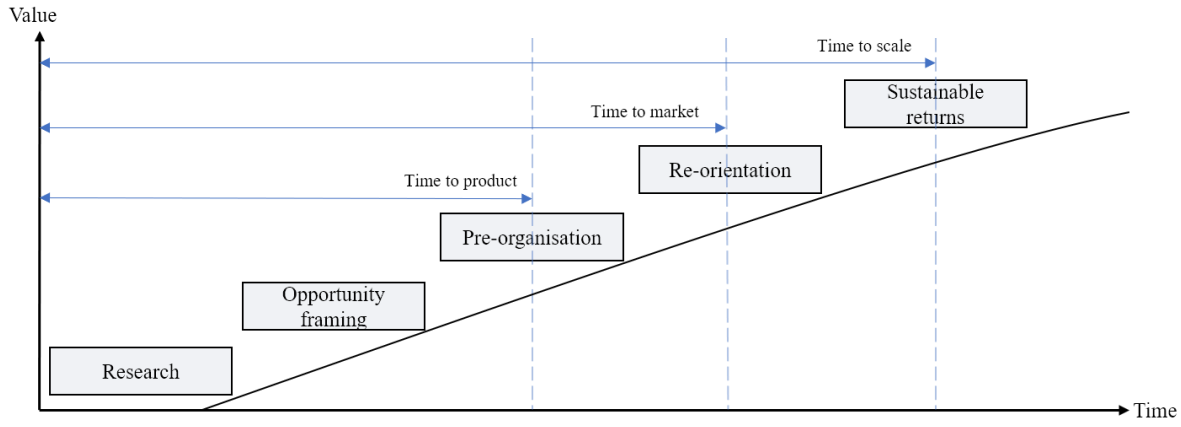


Figure 2.3 NPD and ASOs' development phases (Mota et al., 2021; Vohora et al., 2004)

### 2.11 Financial strategy

The academic founders' entrepreneurial capabilities, either developed by the own industrial and managerial experience or leveraged by the inclusion of external entrepreneurs, play an essential role in the establishment of an effective ASO *financial strategy* (Diánez-González et al., 2020; Diánez-González & Camelo-Ordaz, 2019).

The extent to which the involved entrepreneurs are capable of deciding which financial resources need to be required now and in the future, as well as when and where these resources are going to be deployed to reach the ASO's organisational goals, represents a critical point that can extensively affect the overall success of the ASO (Vohora et al., 2004). The latter critical set of decisions must be taken by the involved entrepreneurs early, usually during the *pre-organisation phase*.

ASOs' commercialisation efforts and business activities are often grounded in "fundamental" research, and the time-to-market may be sometimes extended, generating, thus, higher risks —for the ASO and investors— and costs (Mota et al., 2021). According to Neves and Franco (2018), the lack of a financial plan that clearly outlines the detailed resources for the technology transfer process and the innovation-associated costs will probably impede the ASOs reach and overcome the critical juncture of credibility. According to Wright et al. (2007), venture capitalists will be more prone to

invest in ASOs that were able to construct a robust *financial strategy* with the involvement of external non-academic entrepreneurs. Thus, the extent to which an ASO is capable of developing a viable, clear, future-oriented set of numbers that transparently includes the associated risks and projects the future financial performance of the organisation, namely a budget, may positively influence how the ASO's credibility is seen by potential investors (critical juncture of credibility), increasing thus, the ASO's chances to access funding and, ultimately, survive (King, Clarkson, & Wallace, 2010; Vohora et al., 2004).

# 3 Methodology

## 3.1 Research strategy

This work is an explorative-descriptive mixed-methods study with a deductive approach and applies content analysis and documentary research strategies. This study has an explorative and descriptive nature because (1) it delves into a set of unstructured data whose quality offers reliability since it comes from the NWO experts, and (2) it describes the identified success and failure characteristics critical for academic spin-offs. This study aims to complement the existing theory by providing new interesting insights; hence, this work adopted a theory-leading deductive approach.

## 3.2 Data collection

For this academic study, I analysed an aggregated and anonymised dataset containing 259 projects from 2007 to 2014 of the Dutch Research Council (NWO) funding instrument Valorisation Grant, whose goal was to financially support early-phase technical science projects of innovative academic entrepreneurs (Dutch Research Council, 2014a, 2020d). The Valorisation Grant program was structured in two phases: in phase 1, the academic founders could obtain a grant up to EUR 25,000 for feasibility studies; in phase 2, the newly founded academic spin-offs could receive a grant up to EUR 200,000 to transform the knowledge innovation into a commercially viable business concept (Dutch Research Council, 2014b). The data consists of written personalised feedback made by the evaluation committee of the NWO given to the newly founded academic spin-offs (mostly high-tech) that applied to the phase 2 grant. The feedback expressed positive and negative points of the academic spin-offs (organisational attributes) and the academic founders (individual attributes). Important to remark is that the written assessment was communicated to all the ASO applicants, regardless if they received the phase 2 grant or not.

## 3.3 Data analysis

Academic spin-offs of Dutch institutions represent the research setting. The units of analysis are the ASOs that applied for the phase 2 grant of the NWO Valorisation Grant program. The subunits of analysis are the entrepreneurs involved in the ASOs when the application for the phase 2 grant was filed. The rationale for selecting the units and subunits of analysis is the following: the feedback

given by the NWO was directed to the ASOs as companies with own legal personality; hence, I will draw the main conclusions about the ASOs.

This work applies a mixed-methods approach. The raw data was pre-existent and qualitative, i.e. the dataset with the written feedback from the NWO was not initially created for the research purposes of this study. Thus, following the recommendations made by Saunders, Lewis, and Thornhill (2016) and Hsieh and Shannon (2005), with the goal of quantifying the raw textual data, I applied Directed Content Analysis as an analytical technique to examine the qualitative data, code it and break it down into smaller parts until having a relatively small amount of categories and subcategories ready to be analysed quantitatively. I utilised Provisional Coding and Initial Coding as First Cycle coding methods. Given that some general concepts can be found within the existent theory, Provisional Coding allowed deriving *a priori* codes based on the theoretical framework before the qualitative data is analysed. Initial Coding is compatible with this study's overall research design because it is a flexible tool that (a) represents a starting point to rationally guide the researcher towards further exploration (Saldaña, 2016), and (b) reduces the qualitative data into smaller and better analysable elements to start their categorisation (Saldaña, 2016; Saunders et al., 2016). Moreover, I employed Axial Coding as Second Cycle coding method. Axial Coding helped me to (a) reconstruct the fractured data during Initial Coding, (b) revise initial codes and provide new codes to the initially non-categorised data, and (c) to outline relationships between categories and subcategories by defining their attributes and dimensions (Charmaz, 2006; Saldaña, 2016; Saunders et al., 2016). Furthermore, Axial Coding was fundamental to reach the point in which no more useful information emerges from the data coding process, i.e. to achieve *saturation* (Saldaña, 2016; Strauss & Corbin, 1998).

### 3.3.1 Fuzzy-set qualitative comparative analysis (fsQCA)

Scholars have hitherto identified a great diversity of —theoretically and empirically relevant— factors that can potentially lead young companies —including ASOs—to success. Nevertheless, there is not yet a clear and generalised understanding of the configurational paths towards ASO success. Hence, it can make sense to assume that the young ASOs' success does not depend on one individual factor nor the sum of several individual factors but on highly complex interactions of relevant elements entangled together, namely causally complex relationships (Muñoz & Dimov, 2015). Consequently, this study intends to find the "recipes" that may drive ASOs towards success in their early-stage.

To reach this study's goal, I applied a configurational approach built on causal complexity, namely fuzzy-set qualitative comparative analysis. fsQCA is specially designed to analyse and comprehend the outcome variable as a configuration of causes (Muñoz & Dimov, 2015; Ragin, 1987).

The social scientist Charles Ragin developed the fsQCA methodology with the goal of renewing and extending the scope of the qualitative comparative analysis (QCA) (Ragin, 2000). When the researcher needs to study complex phenomena, fsQCA arises as a diversity-focused methodological approach that helps understand the construct of an outcome through the presentation and analysis of different alternative paths or "recipes" (Henik, 2015; Kent, 2005; Kraus, Ribeiro-Soriano, & Schüssler, 2018). Specifically, with the utilisation of Boolean algebra logic, fsQCA goes beyond calculating counted net effects of the independent variables and evaluates all the relationships result of the interaction between all the binary configurations of the independent variables and the outcome (Kraus et al., 2018). An exciting functionality of fsQCA is that it displays the conditions that are sufficient but not necessary to produce the outcome (Kraus et al., 2018; Woodside, 2010).

After the coding was executed, the rise of three situations, built on the work of Vis (2012), confirmed the presence of multiple conjunctural causation. First, a specific combination of the attributes of ASOs and the involved entrepreneurs may promote ASO success. Second, a particular attribute of an ASO or an academic may promote ASO success when present and absent. Third, there may be several different combinations of attributes of ASOs and the involved entrepreneurs that may be associated with ASO success, namely equifinality —an essential concept of fsQCA (Ganter & Hecker, 2014; Grofman & Schneider, 2009; Mas-Verdú, Ribeiro-Soriano, & Roig-Tierno, 2015; Vis, 2012). I.e. ASO success can have more than one cause —multiple causality— and these causes (ASOs and involved entrepreneurs' attributes) interact to promote ASO success (Grofman & Schneider, 2009; Kraus et al., 2018). Hence, aligned with Kraus et al. (2018) and Vis (2012), I considered fsQCA as the most appropriate methodology for this academic study.

I excluded regression analysis as a method because even though it can also undertake multiple conjunctural causation, the statistical approach required to analyse and interpret the interaction of more than two conditions in a large-n study with hundreds of cases, such as this work, may be problematic (Braumoeller, 2004; Vis, 2012).

### 3.3.2 Operationalisation

For studies with many cases, like this one with 259, the optimal number of variables for fsQCA is between 5 and 8. Hence, I followed Ragin's (2009b) advice and created seven "macrovariables" to group several causal conditions that fit the same category.

Due to the uniqueness of the aggregated data, I created a set of interval-scale concept indicators, ranging from -4 to 4, to measure the impact that each macrovariable had on each case (see Table 3.1). For example, if project N had three positive comments regarding its *IP strategy*, I assigned project N a 3 in *IP strategy*. I.e. the interval-scale concept indicators are equal to the sum of the comments fitting a specific macrovariable. The minimum and maximum interval-scale concept

indicators are set given the dataset's characteristics, i.e. there is no single project with more than four comments, negative or positive, affecting the same macrovariable.

Table 3.1 Interval-scale indicators for independent macrovariables

| -4 | -3 | -2 | -1 | 0 | 1 | 2 | 3 | 4 |
|---|---|---|---|---|---|---|---|---|
| Extremely negative | Very negative | Moderately negative | Slightly negative | Neutral | Slightly positive | Moderately positive | Very positive | Extremely positive |

Regarding the outcome variable *final evaluation*, the scale utilised corresponds to the assigned final grade that was given by the NWO committee to the ASOs. On the scale for *final evaluation*, 5 is the best grade possible, and 3.5 represents the minimum grade for the project to be considered satisfactory.

Table 3.2 Definition of constructs

| Construct | Construct type | Definition and measurement | References |
|---|---|---|---|
| **Final evaluation (ENDTOT)** | **Outcome variable** | The final score (1 to 5) given by the NWO committee to the ASO after evaluating the written proposal and the oral presentation.<br>*Original interval-scale concept indicators to grade each case (i.e. the ASOs' project proposals): 1 (lowest) to 5 (highest) See section 3.3.2*<br>*Thresholds for calibration in fsQCA: threshold of full membership = 4, crossover point = 3.5, and threshold of full nonmembership = 0.5. See section 3.3.3* | Aggregated dataset from NWO |
| **Business concept articulation (BUSCON)** | **Independent macrovariable** | The degree to which the ASO effectively communicates, written and orally, its business concept, goals, and mission through the business plan, business model and business pitch.<br>*Original interval-scale concept indicators to measure the impact of the macrovariable on each case (applicable to all independent macrovariables): -4, extremely negative; -3, very negative; -2, moderately negative; 0, neutral; 1, slightly positive; 2, moderately positive; 3, very positive; and 4, extremely positive. See section 3.3.2*<br>*Thresholds for calibration in fsQCA (applicable to all independent macrovariables): threshold of full membership = 2.7, crossover point = 0, and threshold of full nonmembership = -2.7. See section 3.3.3* | Grandi and Grimaldi (2005); Vaznyte and Andries (2019) |
| Business plan | Causal condition | The extent to which the ASO effectively communicates a written report that contains the business strategies to achieve the organisational goals. | Hormozi et al. (2002) |
| Business model | Causal condition | The extent to which the ASO effectively communicates a clear and compact visual outline of the interactions between its core business components to deliver value and create returns. | Druilhe and Garnsey (2004); Ziaee Bigdeli et al. (2016) |
| Business pitch | Causal condition | The degree to which the involved entrepreneurs deliver a short and concise speech summarising the business idea and its business potential. | Denning and Dew (2012) |

Table 3.2 Definition of constructs (continued)

| Construct | Construct type | Definition and measurement | References |
|---|---|---|---|
| **Entrepreneurial experience and knowledge (ENTEXP)** | **Independent macrovariable** | The degree to which the involved entrepreneurs display entrepreneurial attributes and specialised technical knowledge. | Criaco et al. (2014); Hayter (2013); Huynh et al. (2017); Knoben and Oerlemans (2006) |
| Entrepreneurial experience | Causal condition | The extent to which the involved entrepreneurs display entrepreneurial attributes results from education and experience in founding and managing new ventures. | Criaco et al. (2014); Hayter (2013); Huynh et al. (2017) |
| Specialised technological knowledge base | Causal condition | The extent to which the involved entrepreneurs own specialised technical knowledge required to adapt the ASO core technology to the industry needs. | Knoben and Oerlemans (2006) |
| **Technology (TECHNO)** | **Independent macrovariable** | The extent to which the ASO core technology is innovative and capable of supporting an extensive range of potential technical applications. | Garcia and Cantalone (2002); Zhou and Wu (2009) |
| Innovativeness | Causal condition | The degree to which the ASO core technology can create a paradigm shift in the market structure. | Garcia and Cantalone (2002) |
| Technology application | Causal condition | The extent to which the design of the core ASO technology is robust and displays enough flexibility to support a broad range of potential technical applications. | Zhou and Wu (2009) |
| **IP strategy (IPSTR)** | **Independent macrovariable** | The extent to which the ASO has a strategic plan to monitor and protect its technological know-how and intellectual property. | Grimaldi, Greco, and Cricelli (2021) |

Table 3.2 Definition of constructs (continued)

| Construct | Construct type | Definition and measurement | References |
|---|---|---|---|
| **Marketing strategy (MARKET)** | **Independent macrovariable** | The extent to which the ASO owns a defined long-term-oriented strategic action plan, based on market analysis, to effectively develop, advertise and deliver a technological product. | Varadarajan (2010) |
| Market potential | Causal condition | The degree to which the ASO technological product has commercial potential | Wright et al. (2004); Conceição et al. (2012) |
| Sales strategy | Causal condition | The extent to which the ASO owns a clear and feasible forward-looking plan that specifies the timing and amount of expected sales required to support the organisational objectives. | Curtis et al. (2014); Aras et al. (2017) |
| Market analysis | Causal condition | The degree to which the ASO effectively carried out the assessment of the target market and its main competitors. | Duening et al. (2021) |
| **New business development strategy (NEWBUS)** | **Independent macrovariable** | The degree to which the ASO owns a short-term oriented strategic action plan to introduce a technically complete product into a specific market within a specific timeframe. | Burgers et al. (2008); Thornhill and Amit (2001) |
| Go-to-market strategy | Causal condition | The extent to which the ASO has a strategic plan to avoid potential market-entry barriers and successfully launch the technological product in a specific market. | Kuester et al. (2018) |
| Launching customers | Causal condition | The extent to which the ASO has strategic customers who will actively support introducing the technical product into the market. | Gassmann et al. (2010); Enkel et al. (2005) |
| Time to market | Causal condition | The extent to which the ASO's technological product can be shortly introduced in the market | Mota et al. (2021) |

Table 3.2 Definition of constructs (continued)

| Construct | Construct type | Definition and measurement | References |
|---|---|---|---|
| **Financial strategy (FINANC)** | **Independent macrovariable** | The degree to which the ASO has a well-defined, forward-looking strategic plan to acquire the required funds and manage them to achieve the organisational goals. | Bender and Ward (2011) |
| Budget | Causal condition | The extent to which the ASO has a feasible, clear, and future-oriented set of numbers to project the future financial performance of the organisation | King et al. (2010) |

### 3.3.3 Calibration

In fsQCA, calibration refers to the process in which the original variables' values (e.g. Likert scales) are operationalised as —fuzzy— membership scores that describe the extent to which cases pertain to a specific set (Kraus et al., 2018; Ragin, 2009a). I.e. the data must be "fuzzified" (Kent, 2005; Kraus et al., 2018). The fuzzy-set membership scores range from 0.0 (full nonmembership) to 1.0 (full membership) (Muñoz & Cohen, 2017; Ragin, 2009a).

For the process of calibration, three thresholds must be defined: the threshold of full membership (≥0.95), the crossover point (0.5), and the threshold of full nonmembership (≤0.05) (Ragin, 2009a). Hence, for the current study, for the outcome variable *final evaluation,* I defined 4.5 as the threshold of full membership, 3.5 as crossover point, and 0.5 as the threshold of full nonmembership. For the independent macrovariables, I assigned 2.7 as the threshold of full membership, 0 as crossover point, and -2.7 as the threshold of full nonmembership (see Appendix A). Once defined, I gave the thresholds as an input in fsQCA. The program automatically generated a new —not yet minimised— truth table with fuzzy-set membership scores instead of the original interval-scale concept indicators. Based on the selected cutoffs, this truth table is the base to construct the minimised truth tables for the final analysis (see tables 4.2 and 4.4).

It is important to remark that given that this academic study utilises a unique dataset, I could not apply external agreed-upon standards to define the variables thresholds of the calibration process —as recommended by Ragin (2009a). Furthermore, there is no benchmark (e.g. a peer-reviewed article) from which calibration values from comparable variables could be taken. Therefore, I relied entirely on the structure of the coded and categorised dataset.

My selection of thresholds for the outcome variable is built upon the following assumptions: first, the correlation between the *final evaluation* and a positive funding decision is positive and significant at the 0.01 level (0.733) and from the 104 cases with a positive funding decision, 91% displayed a final evaluation score ≥3.50; thus, the crossover point can be considered a reliable indicator. Second, I assumed that the variance above 4.5 (only 2 cases score ≥4.50) and below 0.5 are irrelevant; hence, I applied a commonly accepted statistically approach for the full membership and full nonmembership scores, i.e. 95% and 5%, respectively.

Regarding the independent macrovariables, I specified their thresholds based exclusively on the results of the first phase of the data analysis, namely the final coded and categorised dataset. Whenever the feedback given to a specific project did not include either positive or negative comments regarding a specific macrovariable, the given interval-scale indicator is 0. Hence, the neutral interval-scale indicator also works as the crossover point, which indicates that everything above begins to be more in than out the set, and everything below starts to be more out than in the set. The situation in which

a macrovariable affects a project with an interval-scale indicator >2 only occurs six times. Furthermore, the situation in which a macrovariable affects a project with an interval-scale indicator <-2 only occurs nine times. Hence, I consider the variance above 2.7 and below -2.7 to be irrelevant.

# 4 Results

## 4.1 Findings 1: necessary condition analysis

The necessary condition analysis tests if the conditions and their absence are necessary for (1) the outcome and (2) the absence of the outcome (Vis, 2012). A necessary condition must be present in every solution term to reach the outcome; nevertheless, its sole presence does not assure that the outcome will occur (Greckhamer, Furnari, Fiss, & Aguilera, 2018; Jie & Harms, 2019). Consistency examines the extent to which instances of the outcome display the condition considered to be necessary, whereas coverage examines the empirical relevance of the condition (Ragin, 2006). A condition can be considered necessary when its consistency and coverage values reach the generally accepted conservative benchmark of 0.90 (Greckhamer et al., 2018; Jie & Harms, 2019; Vis, 2012). Table 4.1 shows that there is no single necessary condition for either satisfactory or unsatisfactory *final evaluation*. Furthermore, I confirm the necessary analysis findings by controlling that in the intermediate solution for both satisfactory and unsatisfactory *final evaluation*, no single condition appears consistently in all the solution terms (see Tables 4.3 and 4.5).

Table 4.1 Necessary condition analysis results

| Conditions | Outcome | | | |
|---|---|---|---|---|
| | **Satisfactory** final evaluation (ENDTOT) | | **Unsatisfactory** final evaluation (~ENDTOT) | |
| | Consistency | Coverage | Consistency | Coverage |
| BUSCON | 0.72 | 0.88 | 0.68 | 0.67 |
| ~BUSCON | 0.73 | 0.74 | 0.88 | 0.71 |
| ENTEXP | 0.75 | 0.84 | 0.75 | 0.68 |
| ~ENTEXP | 0.71 | 0.78 | 0.83 | 0.73 |
| TECHNO | 0.83 | 0.75 | 0.85 | 0.62 |
| ~TECHNO | 0.58 | 0.83 | 0.66 | 0.76 |
| IPSTR | 0.70 | 0.85 | 0.75 | 0.74 |
| ~IPSTR | 0.78 | 0.80 | 0.84 | 0.69 |
| MARKET | 0.72 | 0.82 | 0.73 | 0.67 |
| ~MARKET | 0.71 | 0.76 | 0.81 | 0.70 |
| NEWBUS | 0.70 | 0.86 | 0.76 | 0.75 |
| ~NEWBUS | 0.79 | 0.80 | 0.86 | 0.70 |
| FINANC | 0.69 | 0.88 | 0.76 | 0.78 |
| ~FINANC | 0.83 | 0.81 | 0.88 | 0.69 |

Notes: BUSCON = Business concept articulation; ENTEXP = Entrepreneurial experience and knowledge; TECHNO = Technology; IPSTR = IP strategy; MARKET = Marketing strategy; NEWBUS = New business development strategy; FINANC = Financial strategy. The symbol (~) indicates that the condition is negated.

### 4.2 Findings 2: configurations for *satisfactory final evaluation*

To generate the minimised truth table, I applied a consistency threshold of 0.90 —a significantly higher cutoff value than the advised by Ragin (2009b). Considering that this is a large-n study with 259 cases, I followed the recommendation of Ragin (2000; 2009b) and utilised a frequency cutoff of 2 cases to keep only the relevant causal configurations for the analysis. Furthermore, built on the work by Greckhamer et al. (2018), I applied a proportional reduction in inconsistency (PRI) threshold of 0.50 to evade that *satisfactory final evaluation* includes simultaneous subset relations.

Table 4.2 Minimised truth table for satisfactory final evaluation (ENDTOT)

| BUSCON | IPSTR | NEWBUS | ENTEXP | TECHNO | MARKET | FINANC | Number of cases | ENDTOT | Raw consist. | PRI consist. |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | 1 | 0 | 1 | 1 | 1 | 0 | 5 | 1 | 0.93 | 0.72 |
| 1 | 1 | 1 | 1 | 1 | 1 | 0 | 5 | 1 | 0.93 | 0.70 |
| 1 | 1 | 0 | 1 | 1 | 1 | 1 | 8 | 1 | 0.93 | 0.68 |
| 1 | 0 | 1 | 1 | 1 | 1 | 0 | 5 | 1 | 0.93 | 0.71 |
| 1 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | 0.93 | 0.69 |
| 1 | 1 | 1 | 1 | 1 | 1 | 1 | 37 | 1 | 0.92 | 0.68 |
| 1 | 0 | 1 | 1 | 1 | 1 | 1 | 17 | 1 | 0.92 | 0.68 |
| 1 | 1 | 0 | 0 | 1 | 1 | 1 | 2 | 1 | 0.92 | 0.65 |
| 1 | 0 | 1 | 1 | 0 | 1 | 1 | 4 | 1 | 0.92 | 0.64 |
| 1 | 1 | 1 | 1 | 1 | 0 | 0 | 3 | 1 | 0.92 | 0.66 |
| 1 | 1 | 1 | 1 | 0 | 1 | 0 | 4 | 1 | 0.92 | 0.65 |
| 1 | 1 | 1 | 0 | 1 | 1 | 1 | 8 | 1 | 0.92 | 0.64 |
| 1 | 0 | 1 | 1 | 1 | 0 | 0 | 3 | 1 | 0.92 | 0.67 |
| 1 | 1 | 1 | 1 | 1 | 0 | 1 | 13 | 1 | 0.92 | 0.63 |
| 1 | 1 | 0 | 1 | 1 | 0 | 0 | 2 | 1 | 0.92 | 0.65 |
| 1 | 1 | 1 | 1 | 0 | 0 | 1 | 3 | 1 | 0.92 | 0.60 |
| 1 | 1 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 0.92 | 0.62 |
| 1 | 1 | 0 | 1 | 1 | 0 | 1 | 6 | 1 | 0.92 | 0.63 |
| 1 | 0 | 1 | 1 | 1 | 0 | 1 | 3 | 1 | 0.92 | 0.63 |
| 0 | 1 | 0 | 1 | 1 | 1 | 1 | 8 | 1 | 0.92 | 0.62 |
| 0 | 1 | 1 | 1 | 0 | 1 | 1 | 3 | 1 | 0.92 | 0.58 |
| 1 | 0 | 1 | 0 | 1 | 1 | 0 | 2 | 1 | 0.92 | 0.65 |
| 0 | 1 | 1 | 1 | 1 | 1 | 1 | 9 | 1 | 0.91 | 0.60 |
| 1 | 0 | 1 | 0 | 1 | 1 | 1 | 3 | 1 | 0.91 | 0.61 |
| 0 | 1 | 1 | 1 | 1 | 1 | 0 | 6 | 1 | 0.91 | 0.63 |
| 1 | 0 | 1 | 0 | 1 | 0 | 1 | 2 | 1 | 0.91 | 0.61 |
| 0 | 0 | 0 | 1 | 1 | 1 | 1 | 2 | 1 | 0.91 | 0.61 |
| 0 | 0 | 1 | 1 | 1 | 1 | 1 | 10 | 1 | 0.91 | 0.59 |
| 1 | 0 | 0 | 0 | 1 | 0 | 1 | 3 | 1 | 0.91 | 0.60 |
| 0 | 0 | 1 | 1 | 1 | 1 | 0 | 4 | 1 | 0.91 | 0.62 |
| 0 | 1 | 1 | 1 | 1 | 0 | 1 | 5 | 1 | 0.91 | 0.52 |
| 0 | 1 | 0 | 1 | 1 | 0 | 1 | 3 | 1 | 0.90 | 0.53 |
| 0 | 1 | 1 | 1 | 1 | 0 | 0 | 3 | 1 | 0.90 | 0.55 |
| 0 | 1 | 1 | 0 | 1 | 1 | 0 | 2 | 0 | 0.90 | 0.56 |
| 0 | 1 | 1 | 0 | 1 | 1 | 1 | 8 | 0 | 0.90 | 0.52 |
| 0 | 0 | 1 | 1 | 1 | 0 | 1 | 3 | 0 | 0.90 | 0.53 |
| 0 | 0 | 1 | 0 | 1 | 1 | 1 | 3 | 0 | 0.90 | 0.52 |
| 0 | 0 | 1 | 1 | 0 | 0 | 1 | 3 | 0 | 0.90 | 0.50 |
| 0 | 1 | 1 | 0 | 1 | 0 | 0 | 2 | 0 | 0.89 | 0.52 |

Notes: BUSCON = Business concept articulation; ENTEXP = Entrepreneurial experience and knowledge; TECHNO = Technology; IPSTR = IP strategy; MARKET = Marketing strategy; NEWBUS = New business development strategy; FINANC = Financial strategy; ENDTOT = satisfactory final evaluation; Consistency cutoff: 0.9; frequency cutoff: 2 cases; PRI consistency cutoff: 0.50.

Following the work of Fiss (2011) and Pappas and Woodside (2021), I combined the parsimonious and intermediate solutions (see Appendix B) and created four high-level solutions to provide a comprehensive and detailed yet intuitive outlook of the results. The intermediate solution encloses easy counterfactuals only, i.e. simplifying assumptions aligned with the theoretical expectations (Ragin, 2008). In comparison, the parsimonious solution includes all the simplifying assumptions, regardless if they contain difficult or easy counterfactuals (Mas-Verdú et al., 2015; Ragin, 2008).

Table 4.3 summarises the fourteen solution terms distributed over the four general solutions. For each solution term, I inform the consistency, raw coverage and unique coverage values and the number of cases in which the specific solution term can be found. In the context of solution terms, i.e. a combination of individual conditions that lead to the outcome, consistency informs how closely the perfect subset relation is approximated (Ragin, 2006), whereas coverage defines the extent of the empirical importance of the combination. Unique coverage indicates the fraction of cases covered exclusively by a specific solution term (Greckhamer et al., 2018).

To synthesise and interpret the solution terms, I utilise simplified Boolean equations in which the core conditions are expressed with bold characters. Due to the extended amount of solution terms, I intended to provide greater parsimony and a better understanding. Hence, following the work of Ragin (2008), I created "supersets" by combining the solution terms in which the core conditions identically overlap. Supersets are structured as follows: superset AX, solution terms A1 and A3; superset BX, solution terms B1, B2, B3, B4 and B5; superset CX, solution terms C1 and C2; and superset DX, solution terms D1 and D2. Solution terms A2, A4 and A5, are interpreted individually.

The results display a high degree of consistency: the overall solution consistency is 0.89, and the solution terms consistency is at least 0.90. The overall solution coverage (0.72) indicates that the solution terms together explain a high fraction of the outcome. As expected and congruent with Ragin (2006), the solution terms' raw coverage was slightly lower than the consistency values, being the lowest value 0.42. Interestingly, each solution term has significantly low unique coverage, suggesting that each configuration has a high degree of uniqueness. The overall model that contains solutions A, B, C and D, is informative because its consistency and coverage are above 0.74 and 0.25, respectively (Ragin, 2008; Woodside, 2013).

Table 4.3 Configurations for s*atisfactory final evaluation* (ENDTOT)

| **Conditions** | **Solution A** | | | | | **Solution B** | | | | | **Solution C** | | **Solution D** | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | A1 | A2 | A3 | A4 | A5 | B1 | B2 | B3 | B4 | B5 | C1 | C2 | D1 | D2 |
| Business concept articulation | ● | ● | ● | ● | ⊗ | ● | ● | ● | ● | ● | | | | |
| Entrepreneurial experience and knowledge | ● | ● | ● | ● | ● | • | | | | ⊗ | ● | ● | ● | ● |
| Technology | • | | | | | • | • | • | • | • | • | • | • | • |
| IP strategy | ● | ● | ● | ⊗ | ● | | | ⊗ | • | ⊗ | ● | ● | | |
| Marketing strategy | | ● | ⊗ | ● | ● | | | • | • | ⊗ | | | ● | ● |
| New business development strategy | | • | • | • | • | • | • | • | | | • | | • | |
| Financial strategy | | ⊗ | • | • | • | | • | | • | • | | • | | • |
| Consistency | 0.92 | 0.92 | 0.92 | 0.92 | 0.91 | 0.92 | 0.91 | 0.92 | 0.93 | 0.91 | 0.90 | 0.91 | 0.91 | 0.92 |
| Raw coverage | 0.51 | 0.44 | 0.42 | 0.43 | 0.42 | 0.52 | 0.51 | 0.47 | 0.46 | 0.45 | 0.51 | 0.52 | 0.52 | 0.52 |
| Unique coverage | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.01 | 0.01 | 0.00 | 0.00 | 0.01 | 0.00 | 0.00 | 0.00 | 0.01 |
| Number of cases | 20 | 9 | 16 | 20 | 12 | 20 | 20 | 20 | 20 | 5 | 20 | 20 | 20 | 20 |
| Overall solution consistency | 0.89 | | | | | | | | | | | | | |
| Overall solution coverage | 0.72 | | | | | | | | | | | | | |

Notes: ● = core condition present
⊗ = core condition absent
• = peripheral condition present
⊗ = peripheral condition absent
= "do not care" conditions
Consistency cutoff: 0.90; frequency cutoff: 2

Solution A displays the solution terms of the intermediate solution in which more than one core condition converge. Hence, I consider solution A to be the one with the most robust explanatory strength. The minimised Boolean equation of superset AX (solution terms A1 and A3) reads: ENDTOT = **BUSCON** * **IPSTR** * **ENTEXP** * (NEWBUS * **~MARKET** * FINANC + TECHNO). I.e. *satisfactory final evaluation* results from a combination of *business concept articulation, IP strategy, entrepreneurial strategy and knowledge, new business development strategy,* and the *absence of marketing strategy*, with either *financial strategy* or *technology*. Interestingly, in superset AX, the absence of core condition *marketing strategy* plays a relevant role to reach *satisfactory final*

*evaluation.* Moreover, peripheral condition *new business development strategy* strengthens the core conditions.

Boolean simplified equation of solution term A2 reads: ENDTOT = **BUSCON** * **IPSTR** * NEWBUS * **ENTEXP** * **MARKET** * ~FINANC. Namely, *satisfactory final evaluation* results from a combination of *business concept articulation, IP strategy, new business development strategy, entrepreneurial experience and knowledge, marketing strategy* and the absence of *financial strategy. Technology* does not play any role in solution term A2. Here, the presence of the peripheral condition *new business development strategy* and the absence of the peripheral condition *financial strategy* strengthen the core conditions.

Similar to solution term A3, in solution terms A4 and A5, the absence of a core condition (*IP strategy* and *business concept articulation,* respectively*)* strengthens the causal configuration. For solution term A4, *satisfactory final evaluation* emerges from a combination of *business concept articulation, new business development strategy, entrepreneurial experience and knowledge, marketing strategy, financial strategy* and the absence of *IP strategy.* I.e. ENDTOT = **BUSCON** * **~IPSTR** * NEWBUS * **ENTEXP** * **MARKET** * FINANC. For solution term A5, *satisfactory final evaluation* arises from a configuration of *IP strategy, new business development strategy, entrepreneurial experience and knowledge, marketing strategy, financial strategy* and the absence of *business concept articulation.* I.e. ENDTOT = **~BUSCON** * **IPSTR** * NEWBUS * **ENTEXP** * **MARKET** * FINANC. As in solution A2, peripheral condition *technology* is irrelevant in solution terms A3, A4 and A5.

Solution B presents the solution terms of the intermediate solution that contain the core condition **BUSCON**. The minimised Boolean equation of superset BX (solution terms B1, B2, B3, B4 and B5) reads: ENDTOT = **BUSCON** * TECHNO * (NEWBUS * (**~IPSTR** * **MARKET** + **ENTEXP**) + FINANC * (**~ENTEXP** * **~IPSTR** * **~MARKET** + **IPSTR** * **MARKET** + NEWBUS)). I.e. *satisfactory final evaluation* emerges from a combination of *business concept articulation, technology;* and (1) *new business development strategy,* and the absence of *IP strategy* with either *marketing strategy* or *entrepreneurial experience and knowledge,* or (2) *financial strategy,* the absence of *entrepreneurial experience and knowledge,* the absence of *IP strategy* with either the absence of *marketing strategy* or *IP strategy,* and either *marketing strategy or new business development strategy.*

I found that peripheral condition *technology* (the condition with the highest consistency value in the necessity analysis) appears in all the solution terms, together with core condition *business concept articulation.* In other words, *technology* reinforces the core condition towards producing a *satisfactory final evaluation.* Important to remark is, that for the specific context of solution B, neither *IP strategy, entrepreneurial experience and knowledge* nor *marketing strategy* is considered core condition

because their appearance does not match any of the solution terms of the parsimonious solution (ENDTOT = **ENTEXP** * (**MARKET** + **IPSTR**); see Appendix B).

In solution B, findings show a configurational path (B5) in which the absence of three conditions play a relevant role: absence of *IP strategy, entrepreneurial experience and knowledge, and marketing strategy.* Solution term B5 represents the only configurational path with three negated conditions. Moreover, *IP strategy, entrepreneurial experience and knowledge, and marketing strategy* appear as core conditions in solutions A, C and D. In the majority of the solution terms, their presence plays a relevant role towards producing the output (e.g. A1, A2, A5, C1, C2, D1 and D2).

Solution C outlines the solution terms of the intermediate solution that contain the core conditions **IPSTR** * **ENTEXP**. In superset CX (solution terms C1 and C2), *satisfactory final evaluation* is the effect of combining *IP strategy, entrepreneurial experience and knowledge*, and *technology*, with either *new business development strategy* or *financial strategy.* I.e. ENDTOT = **IPSTR** * **ENTEXP** * TECHNO * (NEWBUS + FINANC). In solution C, neither *business concept articulation* nor *marketing strategy* is relevant for the configurational path. Furthermore, peripheral condition *technology*, just as in solution term A1 and complete solution B, reinforces the core conditions.

Solution D displays the solution terms of the intermediate solution that include the core conditions **ENTEXP** * **MARKET**. In superset DX (solution terms D1 and D2), *satisfactory final evaluation* emerges from a combination of *entrepreneurial experience and knowledge, technology*, and *marketing strategy,* with either *new business development strategy* or *financial strategy.* I.e. ENDTOT = **ENTEXP** * TECHNO * **MARKET** * (NEWBUS + FINANC). In solution D, neither *business concept articulation* nor *IP strategy* is essential for producing the outcome. Furthermore, peripheral condition *technology* remains present and strengthens the core conditions, such as in solution term A1, complete solution B and solution C.

### 4.3 Findings 3: configurations for *unsatisfactory final evaluation*

To generate the minimised truth table for *unsatisfactory final evaluation*, I used the same cutoff values of *satisfactory final evaluation*. I.e. consistency threshold of 0.90, frequency cutoff of 2 cases, and PRI of 0.50.

Table 4.4 Minimised truth table for unsatisfactory final evaluation (~ENDTOT)

| BUSCON | ENTEXP | TECHNO | IPSTR | MARKET | NEWBUS | FINANC | Number of cases | ~ENDTOT | Raw consist. | PRI consist. |
|---|---|---|---|---|---|---|---|---|---|---|
| 0 | 0 | 1 | 1 | 0 | 1 | 1 | 5 | 0 | 0.90 | 0.51 |
| 0 | 0 | 1 | 0 | 0 | 1 | 1 | 3 | 0 | 0.89 | 0.53 |
| 0 | 0 | 1 | 0 | 0 | 0 | 0 | 2 | 0 | 0.88 | 0.52 |

Notes: BUSCON = Business concept articulation; ENTEXP = Entrepreneurial experience and knowledge; TECHNO = Technology; IPSTR = IP strategy; MARKET = Marketing strategy; NEWBUS = New business development strategy; FINANC = Financial strategy; ~ENDTOT = unsatisfactory final evaluation; Consistency cutoff: 0.9; frequency cutoff: 2 cases; PRI consistency cutoff: 0.50.

In table 4.5, I present solution N with eight solution terms. Important to remark is that these eight configurations correspond exclusively to the parsimonious solution of fsQCA (see Appendix C). The results of the standard analysis in fsQCA did not generate any intermediate solution due to the inexistence of causal configurations with outcome 1. I.e. fsQCA did not find causal configurations — based on the selected cutoffs— that would lead to *unsatisfactory final evaluation.*

The results for *unsatisfactory final evaluation* do not display a sufficient degree of consistency: the overall solution consistency is 0.60, way below the accepted benchmark of 0.80, and therefore suggesting that the solution terms are not consistent with the outcome. Furthermore, only one solution term reaches a consistency of 0.80. Even though the overall solution coverage (0.90) implies that the solution terms together could explain a relatively high proportion of the outcome, solution N cannot be considered informative. I.e. there are not clearly defined and sufficiently consistent causal configurations leading to *unsatisfactory final evaluation.*

Table 4.5 Configurations for *unsatisfactory final evaluation* (~ENDTOT)

| **Conditions** | **Solution N** | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | N1 | N2 | N3 | N4 | N5 | N6 | N7 | N8 |
| Business concept articulation | | ● | | | | | | |
| Entrepreneurial experience and knowledge | | | ● | | | | | |
| Technology | ⊗ | | | | | | | |
| IP strategy | | | | | ● | ● | | |
| Marketing strategy | | | | ● | | | | |
| New business development strategy | | | | | | ⊗ | ● | ⊗ |
| Financial strategy | | | | | ⊗ | | ⊗ | ● |
| Consistency | 0.76 | 0.67 | 0.68 | 0.67 | 0.78 | 0.79 | 0.77 | 0.80 |
| Raw coverage | 0.66 | 0.68 | 0.75 | 0.73 | 0.74 | 0.72 | 0.75 | 0.74 |
| Unique coverage | 0.01 | 0.00 | 0.00 | 0.02 | 0.00 | 0.00 | 0.00 | 0.00 |
| Number of cases | 20 | 20 | 20 | 20 | 20 | 20 | 20 | 20 |
| Overall solution consistency | 0.60 | | | | | | | |
| Overall solution coverage | 0.90 | | | | | | | |

Notes: ● = core condition present
⊗ = core condition absent
• = peripheral condition present
⊗ = peripheral condition absent
= "do not care" conditions
Consistency cutoff: 0.9; frequency cutoff: 2

For a more intuitive understanding of solution N, the minimised Boolean equation reads: ~ENDTOT = **~NEWBUS** * (**FINANC** + **IPSTR**) + **~FINANC** * **NEWBUS** + **MARKET** + **ENTEXP** + **BUSCON** + **~TECHNO**. I.e. u*nsatisfactory final evaluation* emerges as a result of a configuration of

*the absence of new business development strategy* and either *financial strategy* or *IP strategy*, with either (1) *the absence of financial strategy* and *new business development strategy*, or (2) *marketing strategy*, or (3) *entrepreneurial experience and knowledge*, or (4) *business concept articulation*, or (5) *the absence of technology*.

### 4.4 Robustness check

To test robustness, I controlled the results under different circumstances. In test 1, I increased the PRI cutoff by 20% (from .5 to .6) and let the consistency cutoff without change because .9 is already a significantly high value. In test 2, I decreased the PRI cutoff by 20% (from .5 to .4) and decreased the consistency cutoff to 8, just at the lowest level accepted.

The overall results did not show impactful changes in the consistency and coverage values (see table 4.6)., nor in the behaviour of the core conditions concerning the outcome (see Appendix D and E for the complete intermediate solutions of tests 1 and 2).

Table 4.6 Consistency and coverage values comparative

| | Original values | Test 1 | | Test 2 | |
|---|---|---|---|---|---|
| | | Values | Difference vs original | Values | Difference vs original |
| Intermediate solution coverage | 0.72 | 0.69 | -4.17% | 0.76 | 5.56% |
| Intermediate solution consistency | 0.89 | 0.90 | 1.12% | 0.86 | -3.37% |

Despite the minor variations, the models remain highly consistent and relevant (consistency and coverage ≥0.80 and ≥0.65, respectively). Moreover, from the ten intermediate solution terms of test 1, eight solution terms match the original model (A1, A2, A4, B1, B2, B3, B4 and B5). The minimised Boolean equation of the new grouped two solution terms of test 1 reads: ENDTOT = ENTEXP * TECHNO * MARKET * (NEWBUS * ~FINANC + ~NEWBUS * FINANC).

From the sixteen intermediate solution terms of test 2, twelve solution terms match the original model (A1, A2, A3, A4, A5, B1, B3, B4, B5, C2, D1 AND D2). Remarkably, the five solution terms with the strongest explanatory capability of the original model remain identical in test 2. The minimised Boolean equation of the new grouped four solution terms of test 2 reads: ENDTOT = NEWBUS * FINANC * **~BUSCON** * **~IPSTR** * **ENTEXP** * **~MARKET** + TECHNO * (IPSTR (~NEWBUS * ~FINANC * BUSCON * ~ENTEXP * ~MARKET + NEWBUS * ~BUSCON) + NEWBUS * FINANC).

# 5 Discussion and limitations

## 5.1 Discussion

From a broader perspective, the study findings obtained in solutions A, C and D are consistent with those of Hayter (2013), Criaco et al. (2014), Prokop et al. (2019), Lundqvist (2014), Lockett et al. (2003), Wennberg et al. (2011), and Huynh et al. (2017); they suggest that early-stage ASOs with experienced entrepreneurs are more likely to achieve success. Solution B, however, represents an unexpected outcome that differs from the aforementioned major articles. I.e. in solution B, *entrepreneurial experience and knowledge* is practically irrelevant to achieve a satisfactory final evaluation. Interestingly, Nerkar and Shane (2003) also found that prior new venture experience of the founder entrepreneurs is negatively associated with ASOs' success. It can be purposeful to consider the following potential explanations: considering that it is frequently assumed that academics, namely the scientific ASO founders, lack business management and entrepreneurial experience (Bathelt et al., 2010; Criaco et al., 2014; Fini et al., 2010; Huynh et al., 2017; Prokop, 2021; Rasmussen et al., 2011), the fact that in solutions A, C and D the core condition *entrepreneurial experience and knowledge* plays such a relevant role may be due to the inclusion of experienced external entrepreneurs. I.e. it can make sense to assume that the academic founders related to projects of solutions A, C, and D may have carried out collaborations with external non-academic expert entrepreneurs with the goal of embedding their capabilities, managerial resources and networks into the ASO project. (Colombo & Piva, 2012; Lockett et al., 2003; Mustar et al., 2006; Sciarelli et al., 2020; Visintin & Pittino, 2014; Vohora et al., 2004). As stated by diverse academic entrepreneurship scholars, the engagement of experienced external entrepreneurs is fundamental to acquire external funding and credibility and, hence, positively augment the success chances of an ASO during its formation and early-stage growth (Diánez-González et al., 2020; Hayter, 2013; Lundqvist, 2014; Prokop et al., 2019). Furthermore, solutions A, C, and D may represent ASOs that already overcame the credibility threshold and commenced, aware of their lack of *entrepreneurial experience and knowledge*, the reintegration of external resources and knowledge from external entrepreneurs. Nevertheless, an interrogation remains: how could ASOs represented by solution B effectively conceptualise and communicate their business concepts while lacking *entrepreneurial experience and knowledge*? A viable explanation could be that the academic founders did not bring external experts to formally join the projects, but only had access to external specific consultancy for constructing the business concept. The reason for doing the latter could be because (a) these ASOs intend to develop a particular technical solution for a specific technological problem and (b) they have support from a launching customer (particularly those ASOs in solution terms B2 and B3), hence, they may not be interested in gaining or further developing their entrepreneurial attributes. Furthermore, if related to the imprinting theory, the *technology* attributes would represent the ASOs' "imprinting mechanisms" that are thought to persist (Niu, Zhou, & Pei, 2020). I.e. it would be purposeful to consider that the

ASOs in solution B may follow this "technology-focused" behaviour and do not give special attention to commercial aspects. In contrast, for those ASOs of solutions A and D that have a strong *marketing strategy*, the goals may be to develop technologies with a broader range of applications, and consequently, their "imprinting *entrepreneurial* mechanisms" may remain and continue to be developed.

An exciting pattern result of the analysis of solution C arises. Three conditions must be present to cause positive final evaluation: core conditions *IP strategy* and *entrepreneurial experience and knowledge*, and peripheral condition *technology*. Peripheral conditions *new business development strategy*, and *financial strategy* can be utilised interchangeably. Furthermore, *business concept articulation* and *marketing strategy* are irrelevant to producing the outcome. Therefore, solution C contrasts with solutions A and B in which *business concept articulation* and *marketing strategy* play a more relevant role towards success. I consider the following as a potential explanation: the configurations of solution C could be the ones identified in ASOs whose primary concern is the commercialisation of technology platforms at a high-growth speed (Branscomb, Auerswald, & Cheobrough, 2001; Druilhe & Garnsey, 2004; Heirman & Clarysse, 2004; Mustar et al., 2006). Usually, this kind of ASOs allocate their financial and organisational resources and capabilities primarily for technology development, platform building and *IP strategy* creation, and leave unattended the business development, marketing, and sales strategies (Heirman & Clarysse, 2004; Mustar et al., 2006). Furthermore, the ASOs in solution C, during the *opportunity framing phase*, could have been endowed with higher (1) *conceptualisation and vision* and (2) *configuration and design capacities* to visualise and start the configuration of a highly innovative and potentially broadly applicable base technology but may have failed to transform it into a market-ready tangible technological product or service due to an underdeveloped *embodiment and integration capacity* (Sousa-Ginel et al., 2021; Ulrich, 2003; Vohora et al., 2004). Consequently, they may have primarily focused on creating a business plan that may have left unattended the *marketing strategy* and addressed mostly the aspects of the *technology* innovativeness, potential, and development, and the *IP strategy* (Vohora et al., 2004). Hence, this trade-off could explain why these ASOs underperformed in *business concept articulation* and *marketing strategy* but still achieved success.

If in solutions A and C, in which the ASOs were able to develop a robust *IP strategy* and the involved entrepreneurs scored high in *entrepreneurial experience and knowledge*, the initial commercialisation activities were carried out through informal channels and not through the parent university, that would partially support scholars that state that the intermediation activities of a TTO are unlikely to positively impact academic entrepreneurship (Diánez-González & Camelo-Ordaz, 2019; Fini et al., 2010; Fini et al., 2018; Prokop et al., 2019; Vohora et al., 2004). Interestingly, the level of expertise of the academics that found an ASO may have a strong effect on how effective an ASO's *IP strategy* is

planned and implemented (Vohora et al., 2004). In its seminal work, Vohora et al., (2004) found that the *IP strategy* of an ASO can be better developed and implemented by the academic founders who are experts in their fields.

Another interesting finding of this study relates to the behaviour of the peripheral condition *technology*. In solutions B, C and D, *technology* is always present, and hence, although it is not a core condition, it seems to perform a fundamental role in reinforcing the core conditions. The rationale behind the particular relevance of *technology* could be related to the fact that the Valorisation Grant was addressed solely to projects of technical sciences; thus, it can make sense to infer that the applicant ASOs had, to some extent, a technological background. Furthermore, scholars often consider ASOs as subsets of new technology-based firms (NTBFs), i.e. ASOs, as new firms that emerge from a university context, are frequently presumed to have a strong technology orientation (Colombo & Piva, 2012; Criaco et al., 2014; Mathisen & Rasmussen, 2019; Ortín-Ángel & Vendrell-Herrero, 2014) and a higher degree of innovativeness (Miranda et al., 2018; Sousa-Ginel et al., 2021). Moreover, considering the viability that the academic founders owned a sound technology orientation, one of the strongest motivations for the academics to found the ASO could have been the desire to (1) developing a highly innovative technological product with a pre-recognised broad technological application capability or (2) exploiting an innovative technology (Colombo & Grilli, 2005; Sousa-Ginel et al., 2021). Therefore, observations of solutions B, C and D suggest that *technology* may be a baseline ingredient of the recipe towards *satisfactory final evaluation*, namely success. In the case of the analysis of the required causal paths towards unsatisfactory evaluation, *technology* is either irrelevant (seven out of eight cases) or absent (one out of eight cases). In simple words: the presence of *technology* is not likely to lead to unsatisfactory final evaluation, namely failure. Consequently, the configurations for *unsatisfactory final evaluation* reported in Table 4.5 appear to support the assumption of *technology* as a base success ingredient.

In superset AX (solution terms A1 and A3), the findings seem to partially contradict the work of Migliori et al. (2019) that states that ASO's entrepreneurial orientation is a precondition to improve and further develop the ASO's market orientation. At the same time, the ASO's entrepreneurial orientation can only take place when the ASO is endowed with —some degree— of market orientation. However, in superset AX, whereas the ASOs are endowed with a *strong entrepreneurial experience and knowledge* —potentially result of their EO—, the absence of a strong *marketing strategy* —potentially result of the ASOs' MO— is a relevant element towards success, namely a satisfactory final evaluation. The latter situation is aligned with the work of Renko, Carsrud, and Brännback (2009), in which the market orientation and entrepreneurial orientation of an ASO are opposed. I.e. an equal emphasis on both entrepreneurial orientation and market orientation could impede the ASOs to effectively overcome the critical juncture of credibility and start with the

commercialisation of their technological product. Furthermore, in superset AX the ASOs reflect a high capability to articulate their business concepts; hence, I assume that these ASOs did not fail to express their marketing strategy, but purposely failed to articulate one, achieving, nevertheless, success.

### 5.2 Contributions

Relevant studies in the field of academic entrepreneurship and ASOs, such as those from Nerkar and Shane (2003) and Criaco et al. (2014), have identified key factors that promote early-stage ASO success by means of analysing historical data; i.e. scholars have hitherto applied a backwards-looking static approach to understand how and why ASOs succeeded. Moreover, the categories that emerged from the analysis of the raw data, namely the macrovariables, are aligned with major studies in the field of academic entrepreneurship and thus, confirm the relevance of particular elements towards higher ASO early-stage performance and success. I.e. *entrepreneurial experience and knowledge* (Criaco et al., 2014; Hayter, 2013; Huynh et al., 2017; Lockett et al., 2003; Lundqvist, 2014; Prokop et al., 2019; Prokop, 2021; Wennberg et al., 2011), *business concept articulation* (Druilhe & Garnsey, 2004; Grandi & Grimaldi, 2005; Mustar et al., 2006; Ziaee Bigdeli et al., 2016), *technology* and innovativeness (Colombo & Piva, 2012; Criaco et al., 2014; Mathisen & Rasmussen, 2019; Ortín-Ángel & Vendrell-Herrero, 2014), *IP strategy* (Mathisen & Rasmussen, 2019; Migliori et al., 2019; Siegel et al., 2007; Vohora et al., 2004), *marketing strategy* (Diánez-González & Camelo-Ordaz, 2019; Migliori et al., 2019; Rasmussen et al., 2014; Vohora et al., 2004; Würmseher, 2017), *new business development strategy* (Mota et al., 2021; Mustar et al., 2006; Wright et al., 2004), and *financial strategy* (Diánez-González et al., 2020; Vohora et al., 2004).

The key contribution of this study is the adoption of a perspective that holistically analyses the causally complex relationships among the ASO organisational elements and the attributes of the involved entrepreneurs that produce ASO early-stage success, which is a perspective that has not been utilised so far for this purpose. My intention with this academic study is to advance this prior research to generate new knowledge and motivate scholars to adopt a new progressive set-theoretic view to analyse ASOs' early-stage success, i.e. a forward-looking approach that intends to predict the potential outcomes of ASOs in their early stages in terms of funding and survival. I hope that this study, as one of the firsts academic works that apply a set-theoretic perspective, can show scholars the great potential that fsQCA has to analyse the causal paths towards ASO early-stage success. It is only by means of presenting results through scientific articles that it will be possible to compare these "success recipes" and replicate them under myriad contexts, and consequently, develop a robust scientific-based framework useful to increase the ASOs' early-stage success chances to receive funding.

For academic entrepreneurs, the results of this academic work provide a straightforward message: early-stage ASO success may be virtually impossible to achieve by focusing solely on the exploitation of a single element. A high innovativeness degree and a flexible and broad technological applicability

potential do not guarantee, by themselves, that successful commercialisation can be achieved. I hope that this study can represent an innovative starting point towards the adoption of an entrepreneurial mindset and a high-growth mentality among academics that may help them to develop a better understanding regarding the essential organisational and personal attributes that they require to obtain the funding to transform their knowledge innovations into commercially feasible business concepts. If academics looking to create an ASO commence realising that their absorptive capacity should be incremented to effectively complement their specialised technological base and scientific expertise, they may be able to increase their chances to overcome the *valley of death* by maximising the investment readiness of their ASOs. Important to remark is that the results may also be valuable for other entrepreneurs —outside the academic context— looking to achieve favourable outcomes with their early-stage start-up funding search.

The results of this study can also be helpful for policymakers and government-based entities to start thinking in the formation of progressive, long-term policy instruments to effectively develop, monitor and measure the ASOs' investment readiness in their early stages. It would be purposeful that university policy-making efforts address the following issues. (1) A long-term vision to endow future academics with more robust entrepreneurial and business management capabilities. E.g. through entrepreneurial-oriented seminars. And (2) a short- and middle-term view to analyse the current set of capabilities of the academics that already carry out entrepreneurial activities through ASOs, and facilitate access to the missing resources or capabilities needed to increase their success opportunities in terms of funding acquisition. E.g. through the restructuring of Technology Transfer Offices that should include high-profile business management professionals with significant technology transfer competencies and industry expertise —as advised by Diánez-González et al. (2020)—. Moreover, national and European policymakers should work closely with universities, industry actors, and private investors towards the creation of institutionalised industry-specific frameworks based on scientific research that translate into best-practice manuals, first, for ASOs to increase their investment readiness along with their early-stage development phases, and second, for private investors to possess a robust set of criteria for funding decisions of high-quality research-based projects.

### 5.3 Limitations and further research

It is relevant to outline the limitations of this work which can provide future research avenues. First, although I coded and categorised the raw data following methodological guidelines and based on theory, the final list of macrovariables and their embedded causal conditions had to be significantly reduced and adapted to be compatible with the technical boundaries of the fsQCA software. I created a final list of macrovariables in which enough variance among the cases could be observed. In other words, the final list of macrovariables should allow variability to let the software observe relevant

differences in the ASOs' configurational paths to a satisfactory final evaluation. I.e. causal conditions which could have otherwise contributed to explaining why a satisfactory final evaluation was reached or not may have been left out of the analysis. Second, considering that an *IP strategy* is adopted by an ASO to regulate its inside-out flows of knowledge and technologies and protect its IP (Grimaldi et al., 2021), it could be argued that the macrovariable *IP strategy* could have been better structured as a causal condition dependant on the macrovariable *technology*. However, when I tested that alternative, *technology* became a significantly large macrovariable affecting the great majority of the cases, reducing —as mentioned in limitation 1— the variability of the data analysed with fsQCA. The fact of having *technology* and *IP strategy* as two different macrovariables could probably affect the interpretation of my findings, specifically those of solution A, in which *technology* unexpectedly loses its relevance, while *IP strategy* remains as a core condition. Third, due to the uniqueness of the raw dataset used for this work, I was not able to follow the advice of Ragin (2009a) and utilise external agreed-upon standards to construct and calibrate the fuzzy-sets. That means, for this study, it was not possible to apply such universally accepted indicators, e.g. national income per capita to define the degree of development of a country. Hence, although I informed the calibration criteria explicitly and applied them transparently and systematically, the original interval-scale indicators of the categories —result of the data analysis— were the foundation for the construction and calibration of the fuzzy-sets using the "direct method". Fourth, the measurement of success has been made using a specific indicator applicable exclusively for phase 2 of the Valorisation Grant program; in this respect, the findings should be interpreted cautiously. Fifth, my study relies on the perceptions of the NWO expert judges who assessed and graded each ASO project proposal. Sixth, I did not have access to additional information about the ASOs that applied for the VG phase 2. Thus, the degree of similarity or distinction among the applicant ASOs could not be inferred. Thus, the findings cannot be easily generalised, for example, to a specific industry, a particular technological specialisation, or a project size in terms of long-term required funding specifications. Seventh, the data used for this study did not allow me to identify the cases in which external expert entrepreneurs influenced the success or failure of the ASO proposal.

Scholars could also apply a set-theoretic perspective, namely fsQCA, to carry out longitudinal analyses of ASOs during a variety of their early-stage development phases. A longitudinal analysis could be helpful to capture and track —from a more dynamic lens— the multi-level evolution process of an ASO and its involved entrepreneurs through the overcoming —or failure— of different challenges to acquire funding along with its early-stage development phases; providing, thus, a more complete and complex understanding of how the causal combination of initial success factors also evolve during the whole process.

Moreover, future studies could apply the fsQCA methodology to a greater number of cases to examine the causal configurations towards ASOs' early-stage success (a) with multiple comparable outcome-indicators to measure success and (b) under different contextual circumstances. E.g. (1) funding-gap instruments that concern ASOs' projects of a specific technology-intense industry, (2) funding-gap instruments for ASOs' projects of a particular technological field, (3) funding-gap instruments for ASOs' technological projects grouped in terms of the financial resources required for the full implementation, and (4) hybrid or private seed-funding instruments for ASOs in more advanced early-stage development phases. Furthermore, it would be interesting to focus —under a set-theoretic lens— exclusively in the failure factors during the ASOs' development phases. Lastly, future research avenues could convert the presented macrovariables into outcomes and explore the specific causal combinations to reach, for example, a successful *marketing strategy*.

## 6 Conclusion

A fundamental research issue that produces constant debate in the academic entrepreneurship literature is related to the comprehension of why ASOs fail or succeed (Diánez-González et al., 2020; Mathisen & Rasmussen, 2019). Academic entrepreneurship scholars have hitherto primarily focused on two aspects. (1) The examination of how each of diverse contextual variables, such as environmental, institutional, and individual, affect ASO formation (Diánez-González et al., 2020; Mathisen & Rasmussen, 2019; O'Shea et al., 2008). (2) The efforts to comprehend the rationale behind ASO success and failure —regardless of the ASO particular development stage— have been made through applying a backwards-looking approach, i.e. with the utilisation of historical data (Criaco et al., 2014; Nerkar & Shane, 2003).

In this academic study, I examined 259 project proposals filed by ASOs between 2007 and 2014 to apply for phase 2 of the Valorisation Grant program of the Dutch Research Council (NWO). The goal was to identify —from a set-theoretic perspective— the organisational attributes of academic spin-offs and the individual attributes of the involved entrepreneurs fundamental to early-stage spin-off success in the context of positive funding decision and survival.

This academic work offers one of the first set-theoretical studies in academic entrepreneurship that focuses on the analysis of the interplay of early-stage ASOs' elements. The most relevant finding of this study demonstrates that the early-stage success of an ASO in terms of positive funding decision, specifically before overcoming the critical juncture of credibility, is not just a function of the sum of the isolated abovementioned —organisational and individual— attributes, but rather a function of how these attributes coexist and combine to construct unique complex causal configurations. No single macrovariable was found to be "necessary" to reach success, i.e. a *satisfactory final evaluation*; all the macrovariables were found to be expendable. The same result arose when analysing the causal

configurations towards failure, i.e. there was no single clearly defined configurational path that unequivocally leads to an *unsatisfactory final evaluation*.

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**Appendix A. Calibration**

**Table A. 1 Values used in the translation into set membership scores**

| Variable affected | Threshold of full membership | Cross-over point | Threshold of full nonmembership |
|---|---|---|---|
| **Independent variables (macrovariables)** | 2.7000 | 0.0001 | -2.7000 |
| **Outcome variable** | 4.5000 | 3.5000 | 0.5000 |

**Table A.2 Original interval-scale concept indicators vs fuzzy membership scores (resumed table for independent variables)**

| Interval-scale concept indicators | Degree of fuzzy membership (fsQCA calibrated) |
|---|---|
| 4 | 0.990 |
| 3 | 0.970 |
| 2 | 0.900 |
| 1 | 0.750 |
| 0 | 0.501 |
| -1 | 0.250 |
| -2 | 0.100 |
| -3 | 0.030 |
| -4 | 0.010 |

**Appendix B. Truth table analysis for satisfactory final evaluation ENDTOT (fsQCA generated)**

```
**********************
*TRUTH TABLE ANALYSIS*
**********************


Model: ENDTOT = f(BUSCON, IPSTR, NEWBUS, ENTEXP, TECHNO, MARKET, FINANC)
Algorithm: Quine-McCluskey

--- COMPLEX SOLUTION ---
frequency cutoff: 2
consistency cutoff: 0.901662
                                                  raw       unique
                                                coverage    coverage   consistency
                                               ----------  ----------  ----------
BUSCON*IPSTR*ENTEXP*TECHNO                     0.514294    0.0139109   0.924179
BUSCON*NEWBUS*ENTEXP*TECHNO                    0.519024    0.0052532   0.923899
IPSTR*NEWBUS*ENTEXP*TECHNO                     0.514525    0.00376719  0.9045
NEWBUS*ENTEXP*TECHNO*MARKET                    0.519401    0.00412303  0.908593
BUSCON*NEWBUS*TECHNO*FINANC                    0.513764    1.39475e-05 0.91499
IPSTR*ENTEXP*TECHNO*FINANC                     0.521264    0.00461143  0.905805
ENTEXP*TECHNO*MARKET*FINANC                    0.516764    0.00650901  0.915816
BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET             0.474647    0.00300676  0.921385
BUSCON*IPSTR*TECHNO*MARKET*FINANC              0.458657    0.00175107  0.92669
BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC    0.451269    0.00628567  0.909123
BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC      0.438761    0.0039835   0.923212
BUSCON*IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC      0.423085    0.00482064  0.921783
BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC      0.434338    0.00531596  0.922559
~BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*FINANC      0.422331    0.00385094  0.913863
solution coverage: 0.715592
solution consistency: 0.887794


Cases with greater than 0.5 membership in term BUSCON*IPSTR*ENTEXP*TECHNO: P138 (0.75,0.83),
  P222 (0.75,0.87), P4 (0.501,0.78), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P29 (0.501,0.03), P30 (0.501,0.03),
  P33 (0.501,0.87)
Cases with greater than 0.5 membership in term BUSCON*NEWBUS*ENTEXP*TECHNO: P222 (0.75,0.87),
  P3 (0.501,0.75), P8 (0.501,0.61), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P17 (0.501,0.85), P18 (0.501,0.6),
  P19 (0.501,0.03), P21 (0.501,0.33), P22 (0.501,0.03),
  P23 (0.501,0.03), P24 (0.501,0.03), P25 (0.501,0.03),
  P26 (0.501,0.55), P27 (0.501,0.03), P28 (0.501,0.49),
  P29 (0.501,0.03)
Cases with greater than 0.5 membership in term IPSTR*NEWBUS*ENTEXP*TECHNO: P14 (0.75,0.58),
  P222 (0.75,0.87), P3 (0.501,0.75), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P16 (0.501,0.62),
  P18 (0.501,0.6), P19 (0.501,0.03), P21 (0.501,0.33),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P29 (0.501,0.03), P30 (0.501,0.03), P37 (0.501,0.84),
  P41 (0.501,0.34)
Cases with greater than 0.5 membership in term NEWBUS*ENTEXP*TECHNO*MARKET: P163 (0.75,0.39),
  P222 (0.75,0.87), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P28 (0.501,0.49), P29 (0.501,0.03), P30 (0.501,0.03),
  P37 (0.501,0.84), P40 (0.501,0.28), P46 (0.501,0.5),
  P49 (0.501,0.44), P50 (0.501,0.72), P52 (0.501,0.25),
  P53 (0.501,0.85)
Cases with greater than 0.5 membership in term BUSCON*NEWBUS*TECHNO*FINANC: P1 (0.501,0.49),
  P2 (0.501,0.68), P3 (0.501,0.75), P9 (0.501,0.9),
  P12 (0.501,0.63), P13 (0.501,0.44), P14 (0.501,0.58),
  P18 (0.501,0.6), P19 (0.501,0.03), P20 (0.501,0.33),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P28 (0.501,0.49), P29 (0.501,0.03),
  P30 (0.501,0.03)
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Cases with greater than 0.5 membership in term IPSTR*ENTEXP*TECHNO*FINANC: P13 (0.75,0.44),
  P2 (0.501,0.68), P3 (0.501,0.75), P9 (0.501,0.9),
  P14 (0.501,0.58), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P29 (0.501,0.03), P30 (0.501,0.03),
  P33 (0.501,0.87), P36 (0.501,0.68), P41 (0.501,0.34),
  P44 (0.501,0.44)
Cases with greater than 0.5 membership in term ENTEXP*TECHNO*MARKET*FINANC: P53 (0.75,0.85),
  P9 (0.501,0.9), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P28 (0.501,0.49), P29 (0.501,0.03), P30 (0.501,0.03),
  P42 (0.501,0.78), P46 (0.501,0.5), P49 (0.501,0.44),
  P50 (0.501,0.72), P54 (0.501,0.41), P57 (0.501,0.82),
  P59 (0.501,0.77)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET: P5
(0.501,0.43),
  P17 (0.501,0.85), P20 (0.501,0.33), P28 (0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P65 (0.501,0.39),
  P67 (0.501,0.49), P71 (0.501,0.47), P80 (0.501,0.47),
  P86 (0.501,0.65), P91 (0.501,0.67), P92 (0.501,0.79),
  P109 (0.501,0.83), P117 (0.501,0.87), P127 (0.501,0.51),
  P129 (0.501,0.68), P145 (0.501,0.66), P172 (0.501,0.34),
  P179 (0.501,0.28)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*TECHNO*MARKET*FINANC: P1 (0.501,0.49),
  P9 (0.501,0.9), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P29 (0.501,0.03), P30 (0.501,0.03), P45 (0.501,0.76),
  P47 (0.501,0.61), P51 (0.501,0.89), P59 (0.501,0.77),
  P76 (0.501,0.28), P77 (0.501,0.89), P78 (0.501,0.42),
  P79 (0.501,0.65)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC: P12
(0.501,0.63),
  P68 (0.501,0.31), P160 (0.501,0.48), P243 (0.501,0.82),
  P249 (0.501,0.21)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC: P37
(0.501,0.84),
  P43 (0.501,0.37), P61 (0.501,0.82), P82 (0.501,0.48),
  P155 (0.501,0.37), P164 (0.501,0.92), P201 (0.501,0.95),
  P244 (0.501,0.93), P245 (0.501,0.33)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC: P2
(0.501,0.68),
  P3 (0.501,0.75), P13 (0.501,0.44), P14 (0.501,0.58),
  P21 (0.501,0.33), P31 (0.501,0.44), P32 (0.501,0.5),
  P41 (0.501,0.34), P48 (0.501,0.83), P97 (0.501,0.55),
  P111 (0.501,0.82), P137 (0.501,0.33), P153 (0.501,0.74),
  P158 (0.501,0.8), P161 (0.501,0.43), P239 (0.501,0.7)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC: P28
(0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P63 (0.501,0.72),
  P65 (0.501,0.39), P67 (0.501,0.49), P72 (0.501,0.53),
  P75 (0.501,0.3), P86 (0.501,0.65), P91 (0.501,0.67),
  P117 (0.501,0.87), P127 (0.501,0.51), P129 (0.501,0.68),
  P172 (0.501,0.34), P202 (0.501,0.46), P225 (0.501,0.88),
  P236 (0.501,0.8), P242 (0.501,0.6), P247 (0.501,0.84),
  P248 (0.501,0.96)
Cases with greater than 0.5 membership in term ~BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*FINANC: P34
(0.501,0.76),
  P46 (0.501,0.5), P49 (0.501,0.44), P69 (0.501,0.43),
  P110 (0.501,0.36), P116 (0.501,0.33), P130 (0.501,0.41),
  P133 (0.501,0.3), P157 (0.501,0.44), P203 (0.501,0.84),
  P214 (0.501,0.87), P230 (0.501,0.37)
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*TRUTH TABLE ANALYSIS*
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Model: ENDTOT = f(BUSCON, IPSTR, NEWBUS, ENTEXP, TECHNO, MARKET, FINANC)
Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---
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frequency cutoff: 2
consistency cutoff: 0.901662
                     raw       unique
                   coverage    coverage   consistency
                  ----------  ----------  ----------
BUSCON            0.71511     0.128045    0.877685
IPSTR*ENTEXP      0.607764    0.0200502   0.892995
ENTEXP*MARKET     0.619024    0.038754    0.893691
solution coverage: 0.827773
solution consistency: 0.853612



Cases with greater than 0.5 membership in term BUSCON: P31 (0.9,0.44),
  P100 (0.9,0.65), P113 (0.9,0.86), P4 (0.9,0.78),
  P17 (0.9,0.85), P80 (0.9,0.47), P144 (0.9,0.45),
  P153 (0.9,0.74), P212 (0.9,0.9), P248 (0.9,0.96),
  P63 (0.75,0.72), P35 (0.75,0.87), P86 (0.75,0.65),
  P67 (0.75,0.49), P118 (0.75,0.81), P71 (0.75,0.47),
  P18 (0.75,0.6), P72 (0.75,0.53), P91 (0.75,0.67),
  P120 (0.75,0.9)
Cases with greater than 0.5 membership in term IPSTR*ENTEXP: P13 (0.75,0.44),
  P14 (0.75,0.58), P15 (0.75,0.53), P136 (0.75,0.48),
  P138 (0.75,0.83), P214 (0.75,0.87), P222 (0.75,0.87),
  P4 (0.501,0.78), P9 (0.501,0.9), P10 (0.501,0.4),
  P16 (0.501,0.62), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03)
Cases with greater than 0.5 membership in term ENTEXP*MARKET: P66 (0.75,0.83),
  P57 (0.75,0.82), P15 (0.75,0.53), P17 (0.75,0.85),
  P80 (0.75,0.47), P59 (0.75,0.77), P96 (0.75,0.85),
  P92 (0.75,0.79), P53 (0.75,0.85), P85 (0.75,0.39),
  P145 (0.75,0.66), P163 (0.75,0.39), P166 (0.75,0.34),
  P169 (0.75,0.6), P191 (0.75,0.75), P193 (0.75,0.62),
  P196 (0.75,0.83), P199 (0.75,0.87), P214 (0.75,0.87),
  P222 (0.75,0.87)
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*TRUTH TABLE ANALYSIS*
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Model: ENDTOT = f(BUSCON, IPSTR, NEWBUS, ENTEXP, TECHNO, MARKET, FINANC)
Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 2
consistency cutoff: 0.901662
Assumptions:
                                                    raw       unique
                                                  coverage    coverage   consistency
                                                 ----------  ----------  ----------
BUSCON*IPSTR*ENTEXP*TECHNO                       0.514294    0.0139109   0.924179
BUSCON*NEWBUS*ENTEXP*TECHNO                      0.519024    0.0052532   0.923899
IPSTR*NEWBUS*ENTEXP*TECHNO                       0.514525    0.00376719  0.9045
NEWBUS*ENTEXP*TECHNO*MARKET                      0.519401    0.00412303  0.908593
BUSCON*NEWBUS*TECHNO*FINANC                      0.513764    1.39475e-05 0.91499
IPSTR*ENTEXP*TECHNO*FINANC                       0.521264    0.00461143  0.905805
ENTEXP*TECHNO*MARKET*FINANC                      0.516764    0.00650901  0.915816
BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET               0.474647    0.00300676  0.921385
BUSCON*IPSTR*TECHNO*MARKET*FINANC                0.458657    0.00175107  0.92669
BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC      0.451269    0.00628567  0.909123
BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC        0.438761    0.0039835   0.923212
BUSCON*IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC        0.423085    0.00482064  0.921783
BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC        0.434338    0.00531596  0.922559
~BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*FINANC        0.422331    0.00385094  0.913863
solution coverage: 0.715592
solution consistency: 0.887794



Cases with greater than 0.5 membership in term BUSCON*IPSTR*ENTEXP*TECHNO: P138 (0.75,0.83),
  P222 (0.75,0.87), P4 (0.501,0.78), P9 (0.501,0.9),
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  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P29 (0.501,0.03), P30 (0.501,0.03),
  P33 (0.501,0.87)
Cases with greater than 0.5 membership in term BUSCON*NEWBUS*ENTEXP*TECHNO: P222 (0.75,0.87),
  P3 (0.501,0.75), P8 (0.501,0.61), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P17 (0.501,0.85), P18 (0.501,0.6),
  P19 (0.501,0.03), P21 (0.501,0.33), P22 (0.501,0.03),
  P23 (0.501,0.03), P24 (0.501,0.03), P25 (0.501,0.03),
  P26 (0.501,0.55), P27 (0.501,0.03), P28 (0.501,0.49),
  P29 (0.501,0.03)
Cases with greater than 0.5 membership in term IPSTR*NEWBUS*ENTEXP*TECHNO: P14 (0.75,0.58),
  P222 (0.75,0.87), P3 (0.501,0.75), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P16 (0.501,0.62),
  P18 (0.501,0.6), P19 (0.501,0.03), P21 (0.501,0.33),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P29 (0.501,0.03), P30 (0.501,0.03), P37 (0.501,0.84),
  P41 (0.501,0.34)
Cases with greater than 0.5 membership in term NEWBUS*ENTEXP*TECHNO*MARKET: P163 (0.75,0.39),
  P222 (0.75,0.87), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P28 (0.501,0.49), P29 (0.501,0.03), P30 (0.501,0.03),
  P37 (0.501,0.84), P40 (0.501,0.28), P46 (0.501,0.5),
  P49 (0.501,0.44), P50 (0.501,0.72), P52 (0.501,0.25),
  P53 (0.501,0.85)
Cases with greater than 0.5 membership in term BUSCON*NEWBUS*TECHNO*FINANC: P1 (0.501,0.49),
  P2 (0.501,0.68), P3 (0.501,0.75), P9 (0.501,0.9),
  P12 (0.501,0.63), P13 (0.501,0.44), P14 (0.501,0.58),
  P18 (0.501,0.6), P19 (0.501,0.03), P20 (0.501,0.33),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P28 (0.501,0.49), P29 (0.501,0.03),
  P30 (0.501,0.03)
Cases with greater than 0.5 membership in term IPSTR*ENTEXP*TECHNO*FINANC: P13 (0.75,0.44),
  P2 (0.501,0.68), P3 (0.501,0.75), P9 (0.501,0.9),
  P14 (0.501,0.58), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P29 (0.501,0.03), P30 (0.501,0.03),
  P33 (0.501,0.87), P36 (0.501,0.68), P41 (0.501,0.34),
  P44 (0.501,0.44)
Cases with greater than 0.5 membership in term ENTEXP*TECHNO*MARKET*FINANC: P53 (0.75,0.85),
  P9 (0.501,0.9), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P28 (0.501,0.49), P29 (0.501,0.03), P30 (0.501,0.03),
  P42 (0.501,0.78), P46 (0.501,0.5), P49 (0.501,0.44),
  P50 (0.501,0.72), P54 (0.501,0.41), P57 (0.501,0.82),
  P59 (0.501,0.77)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET: P5
(0.501,0.43),
  P17 (0.501,0.85), P20 (0.501,0.33), P28 (0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P65 (0.501,0.39),
  P67 (0.501,0.49), P71 (0.501,0.47), P80 (0.501,0.47),
  P86 (0.501,0.65), P91 (0.501,0.67), P92 (0.501,0.79),
  P109 (0.501,0.83), P117 (0.501,0.87), P127 (0.501,0.51),
  P129 (0.501,0.68), P145 (0.501,0.66), P172 (0.501,0.34),
  P179 (0.501,0.28)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*TECHNO*MARKET*FINANC: P1 (0.501,0.49),
  P9 (0.501,0.9), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P29 (0.501,0.03), P30 (0.501,0.03), P45 (0.501,0.76),
  P47 (0.501,0.61), P51 (0.501,0.89), P59 (0.501,0.77),
  P76 (0.501,0.28), P77 (0.501,0.89), P78 (0.501,0.42),
  P79 (0.501,0.65)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC: P12
(0.501,0.63),
  P68 (0.501,0.31), P160 (0.501,0.48), P243 (0.501,0.82),
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  P249 (0.501,0.21)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC: P37
(0.501,0.84),
  P43 (0.501,0.37), P61 (0.501,0.82), P82 (0.501,0.48),
  P155 (0.501,0.37), P164 (0.501,0.92), P201 (0.501,0.95),
  P244 (0.501,0.93), P245 (0.501,0.33)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC: P2
(0.501,0.68),
  P3 (0.501,0.75), P13 (0.501,0.44), P14 (0.501,0.58),
  P21 (0.501,0.33), P31 (0.501,0.44), P32 (0.501,0.5),
  P41 (0.501,0.34), P48 (0.501,0.83), P97 (0.501,0.55),
  P111 (0.501,0.82), P137 (0.501,0.33), P153 (0.501,0.74),
  P158 (0.501,0.8), P161 (0.501,0.43), P239 (0.501,0.7)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC: P28
(0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P63 (0.501,0.72),
  P65 (0.501,0.39), P67 (0.501,0.49), P72 (0.501,0.53),
  P75 (0.501,0.3), P86 (0.501,0.65), P91 (0.501,0.67),
  P117 (0.501,0.87), P127 (0.501,0.51), P129 (0.501,0.68),
  P172 (0.501,0.34), P202 (0.501,0.46), P225 (0.501,0.88),
  P236 (0.501,0.8), P242 (0.501,0.6), P247 (0.501,0.84),
  P248 (0.501,0.96)
Cases with greater than 0.5 membership in term ~BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*FINANC: P34
(0.501,0.76),
  P46 (0.501,0.5), P49 (0.501,0.44), P69 (0.501,0.43),
  P110 (0.501,0.36), P116 (0.501,0.33), P130 (0.501,0.41),
  P133 (0.501,0.3), P157 (0.501,0.44), P203 (0.501,0.84),
  P214 (0.501,0.87), P230 (0.501,0.37)
```

**Appendix C. Truth table analysis for unsatisfactory final evaluation ~ENDTOT (fsQCA generated)**

```
*** ERROR(Quine-McCluskey): The 1 Matrix is Empty. ***

Algorithm: Quine-McCluskey

--- COMPLEX SOLUTION ---
frequency cutoff: 2
consistency cutoff: 1
**********************
*TRUTH TABLE ANALYSIS*
**********************



Model: ~ENDTOT = f(BUSCON, IPSTR, NEWBUS, ENTEXP, TECHNO, MARKET, FINANC)
Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---
frequency cutoff: 2
consistency cutoff: 1
                     raw       unique
                   coverage    coverage   consistency
                  ----------  ----------  ----------
~TECHNO           0.659165    0.0114906   0.760185
BUSCON            0.676068    0.000700295 0.669532
ENTEXP            0.745893    0.00255054  0.677568
MARKET            0.728004    0.0164102   0.668294
IPSTR*~FINANC     0.739556    0.00387353  0.781131
IPSTR*~NEWBUS     0.723803    0.00102025  0.786226
NEWBUS*~FINANC    0.750329    0           0.774883
~NEWBUS*FINANC    0.74157     0           0.798581
solution coverage: 0.90185
solution consistency: 0.599795



Cases with greater than 0.5 membership in term ~TECHNO: P58 (0.97,0.63),
  P34 (0.9,0.24), P72 (0.9,0.47), P149 (0.9,0.66),
  P203 (0.9,0.16), P31 (0.75,0.56), P32 (0.75,0.5),
  P35 (0.75,0.13), P38 (0.75,0.56), P43 (0.75,0.63),
  P63 (0.75,0.28), P73 (0.75,0.76), P75 (0.75,0.7),
  P99 (0.75,0.64), P114 (0.75,0.62), P119 (0.75,0.26),
  P122 (0.75,0.59), P123 (0.75,0.66), P132 (0.75,0.54),
  P133 (0.75,0.7)
Cases with greater than 0.5 membership in term BUSCON: P31 (0.9,0.56),
  P100 (0.9,0.35), P113 (0.9,0.14), P4 (0.9,0.22),
  P17 (0.9,0.15), P80 (0.9,0.53), P144 (0.9,0.55),
  P153 (0.9,0.26), P212 (0.9,0.1), P248 (0.9,0.04),
  P63 (0.75,0.28), P35 (0.75,0.13), P86 (0.75,0.35),
  P67 (0.75,0.51), P118 (0.75,0.19), P71 (0.75,0.53),
  P18 (0.75,0.4), P72 (0.75,0.47), P91 (0.75,0.33),
  P120 (0.75,0.1)
Cases with greater than 0.5 membership in term ENTEXP: P94 (0.9,0.54),
  P74 (0.9,0.47), P28 (0.9,0.51), P49 (0.9,0.56),
  P143 (0.9,0.29), P31 (0.9,0.56), P126 (0.9,0.36),
  P165 (0.9,0.62), P208 (0.9,0.31), P48 (0.75,0.17),
  P13 (0.75,0.56), P14 (0.75,0.42), P15 (0.75,0.47),
  P16 (0.75,0.38), P17 (0.75,0.15), P50 (0.75,0.28),
  P114 (0.75,0.62), P53 (0.75,0.15), P80 (0.75,0.53),
  P82 (0.75,0.52)
Cases with greater than 0.5 membership in term MARKET: P173 (0.99,0.14),
  P92 (0.97,0.21), P4 (0.97,0.22), P120 (0.97,0.1),
  P85 (0.9,0.61), P106 (0.9,0.15), P96 (0.9,0.15),
  P104 (0.9,0.5), P53 (0.9,0.15), P71 (0.9,0.53),
  P214 (0.9,0.13), P163 (0.9,0.61), P166 (0.9,0.66),
  P192 (0.9,0.14), P216 (0.9,0.12), P228 (0.9,0.47),
  P11 (0.75,0.57), P15 (0.75,0.47), P60 (0.75,0.44),
  P91 (0.75,0.33)
Cases with greater than 0.5 membership in term IPSTR*~FINANC: P37 (0.75,0.16),
  P52 (0.75,0.75), P11 (0.75,0.57), P15 (0.75,0.47),
  P123 (0.75,0.66), P128 (0.75,0.31), P89 (0.75,0.7),
  P155 (0.75,0.63), P181 (0.75,0.5), P192 (0.75,0.14),
  P215 (0.75,0.65), P226 (0.75,0.6), P43 (0.501,0.63),
  P61 (0.501,0.18), P82 (0.501,0.52), P90 (0.501,0.46),
```

```
  P103 (0.501,0.55), P104 (0.501,0.5), P114 (0.501,0.62),
  P134 (0.501,0.42)
Cases with greater than 0.5 membership in term IPSTR*~NEWBUS: P87 (0.75,0.32),
  P15 (0.75,0.47), P123 (0.75,0.66), P118 (0.75,0.19),
  P44 (0.75,0.56), P79 (0.75,0.35), P128 (0.75,0.31),
  P192 (0.75,0.14), P204 (0.75,0.53), P221 (0.75,0.56),
  P215 (0.75,0.65), P220 (0.75,0.46), P226 (0.75,0.6),
  P114 (0.501,0.62), P119 (0.501,0.26), P124 (0.501,0.53),
  P132 (0.501,0.54), P134 (0.501,0.42), P141 (0.501,0.35),
  P147 (0.501,0.55)
Cases with greater than 0.5 membership in term NEWBUS*~FINANC: P163 (0.75,0.61),
  P188 (0.75,0.2), P206 (0.75,0.16), P244 (0.75,0.07),
  P16 (0.501,0.38), P17 (0.501,0.15), P37 (0.501,0.16),
  P39 (0.501,0.61), P40 (0.501,0.72), P43 (0.501,0.63),
  P52 (0.501,0.75), P56 (0.501,0.52), P61 (0.501,0.18),
  P71 (0.501,0.53), P80 (0.501,0.53), P82 (0.501,0.52),
  P89 (0.501,0.7), P92 (0.501,0.21), P104 (0.501,0.5),
  P126 (0.501,0.36)
Cases with greater than 0.5 membership in term ~NEWBUS*FINANC: P33 (0.501,0.13),
  P36 (0.501,0.32), P42 (0.501,0.22), P44 (0.501,0.56),
  P57 (0.501,0.18), P58 (0.501,0.63), P79 (0.501,0.35),
  P87 (0.501,0.32), P106 (0.501,0.15), P108 (0.501,0.59),
  P118 (0.501,0.19), P119 (0.501,0.26), P122 (0.501,0.59),
  P124 (0.501,0.53), P132 (0.501,0.54), P141 (0.501,0.35),
  P147 (0.501,0.55), P150 (0.501,0.35), P156 (0.501,0.5),
  P159 (0.501,0.51)
*** ERROR(Quine-McCluskey): The 1 Matrix is Empty. ***

Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 2
consistency cutoff: 1
Assumptions:
```

**Appendix D. Robustness test 1 (fsQCA generated)**

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**********************
*TRUTH TABLE ANALYSIS*
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Model: ENDTOT = f(BUSCON, IPSTR, NEWBUS, ENTEXP, TECHNO, MARKET, FINANC)
Algorithm: Quine-McCluskey

--- COMPLEX SOLUTION ---
frequency cutoff: 2
consistency cutoff: 0.907028
                                                    raw       unique
                                                  coverage    coverage   consistency
                                                 ----------  ----------  ----------
BUSCON*IPSTR*ENTEXP*TECHNO                       0.514294    0.0152784   0.924179
BUSCON*NEWBUS*ENTEXP*TECHNO                      0.519024    0.00525331  0.923899
BUSCON*NEWBUS*TECHNO*FINANC                      0.513764    1.39475e-05 0.91499
BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET               0.474647    0.00300688  0.921385
NEWBUS*ENTEXP*TECHNO*MARKET*~FINANC              0.513611    0.0159272   0.908363
~NEWBUS*ENTEXP*TECHNO*MARKET*FINANC              0.501988    0.0165969   0.917278
BUSCON*IPSTR*TECHNO*MARKET*FINANC                0.458657    0.00175112  0.92669
BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC      0.451269    0.00628579  0.909123
BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC        0.438761    0.00398356  0.923212
BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC        0.434338    0.00531608  0.922559
solution coverage: 0.690233
solution consistency: 0.897926



Cases with greater than 0.5 membership in term BUSCON*IPSTR*ENTEXP*TECHNO: P138 (0.75,0.83),
  P222 (0.75,0.87), P4 (0.501,0.78), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P29 (0.501,0.03), P30 (0.501,0.03),
  P33 (0.501,0.87)
Cases with greater than 0.5 membership in term BUSCON*NEWBUS*ENTEXP*TECHNO: P222 (0.75,0.87),
  P3 (0.501,0.75), P8 (0.501,0.61), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P17 (0.501,0.85), P18 (0.501,0.6),
  P19 (0.501,0.03), P21 (0.501,0.33), P22 (0.501,0.03),
  P23 (0.501,0.03), P24 (0.501,0.03), P25 (0.501,0.03),
  P26 (0.501,0.55), P27 (0.501,0.03), P28 (0.501,0.49),
  P29 (0.501,0.03)
Cases with greater than 0.5 membership in term BUSCON*NEWBUS*TECHNO*FINANC: P1 (0.501,0.49),
  P2 (0.501,0.68), P3 (0.501,0.75), P9 (0.501,0.9),
  P12 (0.501,0.63), P13 (0.501,0.44), P14 (0.501,0.58),
  P18 (0.501,0.6), P19 (0.501,0.03), P20 (0.501,0.33),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P28 (0.501,0.49), P29 (0.501,0.03),
  P30 (0.501,0.03)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET: P5
(0.501,0.43),
  P17 (0.501,0.85), P20 (0.501,0.33), P28 (0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P65 (0.501,0.39),
  P67 (0.501,0.49), P71 (0.501,0.47), P80 (0.501,0.47),
  P86 (0.501,0.65), P91 (0.501,0.67), P92 (0.501,0.79),
  P109 (0.501,0.83), P117 (0.501,0.87), P127 (0.501,0.51),
  P129 (0.501,0.68), P145 (0.501,0.66), P172 (0.501,0.34),
  P179 (0.501,0.28)
Cases with greater than 0.5 membership in term NEWBUS*ENTEXP*TECHNO*MARKET*~FINANC: P163
(0.75,0.39),
  P17 (0.501,0.85), P37 (0.501,0.84), P40 (0.501,0.28),
  P52 (0.501,0.25), P56 (0.501,0.48), P61 (0.501,0.82),
  P71 (0.501,0.47), P80 (0.501,0.47), P82 (0.501,0.48),
  P92 (0.501,0.79), P126 (0.501,0.64), P145 (0.501,0.66),
  P151 (0.501,0.7), P177 (0.501,0.45), P185 (0.501,0.33),
  P188 (0.501,0.8), P201 (0.501,0.95), P244 (0.501,0.93),
  P259 (0.501,0.77)
Cases with greater than 0.5 membership in term ~NEWBUS*ENTEXP*TECHNO*MARKET*FINANC: P42
```

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(0.501,0.78),
  P57 (0.501,0.82), P79 (0.501,0.65), P87 (0.501,0.68),
  P118 (0.501,0.81), P124 (0.501,0.47), P141 (0.501,0.65),
  P150 (0.501,0.65), P169 (0.501,0.6), P175 (0.501,0.37),
  P178 (0.501,0.38), P182 (0.501,0.48), P189 (0.501,0.43),
  P191 (0.501,0.75), P205 (0.501,0.46), P219 (0.501,0.87),
  P220 (0.501,0.54), P221 (0.501,0.44), P233 (0.501,0.71),
  P257 (0.501,0.74)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*TECHNO*MARKET*FINANC: P1
(0.501,0.49),
  P9 (0.501,0.9), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P29 (0.501,0.03), P30 (0.501,0.03), P45 (0.501,0.76),
  P47 (0.501,0.61), P51 (0.501,0.89), P59 (0.501,0.77),
  P76 (0.501,0.28), P77 (0.501,0.89), P78 (0.501,0.42),
  P79 (0.501,0.65)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC:
P12 (0.501,0.63),
  P68 (0.501,0.31), P160 (0.501,0.48), P243 (0.501,0.82),
  P249 (0.501,0.21)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC: P37
(0.501,0.84),
  P43 (0.501,0.37), P61 (0.501,0.82), P82 (0.501,0.48),
  P155 (0.501,0.37), P164 (0.501,0.92), P201 (0.501,0.95),
  P244 (0.501,0.93), P245 (0.501,0.33)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC: P28
(0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P63 (0.501,0.72),
  P65 (0.501,0.39), P67 (0.501,0.49), P72 (0.501,0.53),
  P75 (0.501,0.3), P86 (0.501,0.65), P91 (0.501,0.67),
  P117 (0.501,0.87), P127 (0.501,0.51), P129 (0.501,0.68),
  P172 (0.501,0.34), P202 (0.501,0.46), P225 (0.501,0.88),
  P236 (0.501,0.8), P242 (0.501,0.6), P247 (0.501,0.84),
  P248 (0.501,0.96)
*** ERROR(Quine-McCluskey): The 1 Matrix Contains All Configurations. ***

Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---
frequency cutoff: 2
consistency cutoff: 0.907028
**********************
*TRUTH TABLE ANALYSIS*
**********************


Model: ENDTOT = f(BUSCON, IPSTR, NEWBUS, ENTEXP, TECHNO, MARKET, FINANC)
Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 2
consistency cutoff: 0.907028
Assumptions:
                                                raw       unique
                                           coverage    coverage   consistency
                                          ----------  ----------  ----------
BUSCON*IPSTR*ENTEXP*TECHNO                0.514294    0.0152784   0.924179
BUSCON*NEWBUS*ENTEXP*TECHNO               0.519024    0.00525331  0.923899
BUSCON*NEWBUS*TECHNO*FINANC               0.513764    1.39475e-05 0.91499
BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET        0.474647    0.00300688  0.921385
NEWBUS*ENTEXP*TECHNO*MARKET*~FINANC       0.513611    0.0159272   0.908363
~NEWBUS*ENTEXP*TECHNO*MARKET*FINANC       0.501988    0.0165969   0.917278
BUSCON*IPSTR*TECHNO*MARKET*FINANC         0.458657    0.00175112  0.92669
BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC 0.451269  0.00628579  0.909123
BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC 0.438761    0.00398356  0.923212
BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC 0.434338    0.00531608  0.922559
solution coverage: 0.690233
solution consistency: 0.897926
```

```
Cases with greater than 0.5 membership in term BUSCON*IPSTR*ENTEXP*TECHNO: P138 (0.75,0.83),
  P222 (0.75,0.87), P4 (0.501,0.78), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P29 (0.501,0.03), P30 (0.501,0.03),
  P33 (0.501,0.87)
Cases with greater than 0.5 membership in term BUSCON*NEWBUS*ENTEXP*TECHNO: P222 (0.75,0.87),
  P3 (0.501,0.75), P8 (0.501,0.61), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P17 (0.501,0.85), P18 (0.501,0.6),
  P19 (0.501,0.03), P21 (0.501,0.33), P22 (0.501,0.03),
  P23 (0.501,0.03), P24 (0.501,0.03), P25 (0.501,0.03),
  P26 (0.501,0.55), P27 (0.501,0.03), P28 (0.501,0.49),
  P29 (0.501,0.03)
Cases with greater than 0.5 membership in term BUSCON*NEWBUS*TECHNO*FINANC: P1 (0.501,0.49),
  P2 (0.501,0.68), P3 (0.501,0.75), P9 (0.501,0.9),
  P12 (0.501,0.63), P13 (0.501,0.44), P14 (0.501,0.58),
  P18 (0.501,0.6), P19 (0.501,0.03), P20 (0.501,0.33),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P28 (0.501,0.49), P29 (0.501,0.03),
  P30 (0.501,0.03)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET: P5
(0.501,0.43),
  P17 (0.501,0.85), P20 (0.501,0.33), P28 (0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P65 (0.501,0.39),
  P67 (0.501,0.49), P71 (0.501,0.47), P80 (0.501,0.47),
  P86 (0.501,0.65), P91 (0.501,0.67), P92 (0.501,0.79),
  P109 (0.501,0.83), P117 (0.501,0.87), P127 (0.501,0.51),
  P129 (0.501,0.68), P145 (0.501,0.66), P172 (0.501,0.34),
  P179 (0.501,0.28)
Cases with greater than 0.5 membership in term NEWBUS*ENTEXP*TECHNO*MARKET*~FINANC: P163
(0.75,0.39),
  P17 (0.501,0.85), P37 (0.501,0.84), P40 (0.501,0.28),
  P52 (0.501,0.25), P56 (0.501,0.48), P61 (0.501,0.82),
  P71 (0.501,0.47), P80 (0.501,0.47), P82 (0.501,0.48),
  P92 (0.501,0.79), P126 (0.501,0.64), P145 (0.501,0.66),
  P151 (0.501,0.7), P177 (0.501,0.45), P185 (0.501,0.33),
  P188 (0.501,0.8), P201 (0.501,0.95), P244 (0.501,0.93),
  P259 (0.501,0.77)
Cases with greater than 0.5 membership in term ~NEWBUS*ENTEXP*TECHNO*MARKET*FINANC: P42
(0.501,0.78),
  P57 (0.501,0.82), P79 (0.501,0.65), P87 (0.501,0.68),
  P118 (0.501,0.81), P124 (0.501,0.47), P141 (0.501,0.65),
  P150 (0.501,0.65), P169 (0.501,0.6), P175 (0.501,0.37),
  P178 (0.501,0.38), P182 (0.501,0.48), P189 (0.501,0.43),
  P191 (0.501,0.75), P205 (0.501,0.46), P219 (0.501,0.87),
  P220 (0.501,0.54), P221 (0.501,0.44), P233 (0.501,0.71),
  P257 (0.501,0.74)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*TECHNO*MARKET*FINANC: P1
(0.501,0.49),
  P9 (0.501,0.9), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P29 (0.501,0.03), P30 (0.501,0.03), P45 (0.501,0.76),
  P47 (0.501,0.61), P51 (0.501,0.89), P59 (0.501,0.77),
  P76 (0.501,0.28), P77 (0.501,0.89), P78 (0.501,0.42),
  P79 (0.501,0.65)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC:
P12 (0.501,0.63),
  P68 (0.501,0.31), P160 (0.501,0.48), P243 (0.501,0.82),
  P249 (0.501,0.21)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC: P37
(0.501,0.84),
  P43 (0.501,0.37), P61 (0.501,0.82), P82 (0.501,0.48),
  P155 (0.501,0.37), P164 (0.501,0.92), P201 (0.501,0.95),
  P244 (0.501,0.93), P245 (0.501,0.33)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC: P28
(0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P63 (0.501,0.72),
  P65 (0.501,0.39), P67 (0.501,0.49), P72 (0.501,0.53),
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P75 (0.501,0.3), P86 (0.501,0.65), P91 (0.501,0.67),
P117 (0.501,0.87), P127 (0.501,0.51), P129 (0.501,0.68),
P172 (0.501,0.34), P202 (0.501,0.46), P225 (0.501,0.88),
P236 (0.501,0.8), P242 (0.501,0.6), P247 (0.501,0.84),
P248 (0.501,0.96)

**Appendix E. Robustness test 2 (fsQCA generated)**

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**********************
*TRUTH TABLE ANALYSIS*
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Model: ENDTOT = f(BUSCON, IPSTR, NEWBUS, ENTEXP, TECHNO, MARKET, FINANC)
Algorithm: Quine-McCluskey

--- COMPLEX SOLUTION ---
frequency cutoff: 2
consistency cutoff: 0.864341
                                                          raw       unique
                                                         coverage   coverage   consistency
                                                        ---------- ---------- ----------
NEWBUS*TECHNO*FINANC                                    0.582712   0.00351614 0.885269
~BUSCON*IPSTR*NEWBUS*TECHNO                             0.516206   0.00511372 0.882235
BUSCON*IPSTR*ENTEXP*TECHNO                              0.514294   0.00875539 0.924179
BUSCON*NEWBUS*ENTEXP*TECHNO                             0.519024   0.00351614 0.923899
NEWBUS*ENTEXP*TECHNO*MARKET                             0.519401   0.00335562 0.908593
IPSTR*ENTEXP*TECHNO*FINANC                              0.521264   2.09212e-05 0.905805
ENTEXP*TECHNO*MARKET*FINANC                             0.516764   0.00477189 0.915816
BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET                      0.474647   0.00300688 0.921385
BUSCON*IPSTR*TECHNO*MARKET*FINANC                       0.458657   0.00175112 0.92669
~BUSCON*~IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC             0.443428   0.00230223 0.890547
BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC             0.451269   0.00161856 0.909123
BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC               0.438761   0.00398356 0.923212
BUSCON*IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC               0.423085   0.00308359 0.921783
BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC               0.434338   0.00350219 0.922559
~BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*FINANC               0.422331   0.00211382 0.913863
~BUSCON*~IPSTR*~NEWBUS*~ENTEXP*TECHNO*~MARKET*~FINANC   0.500104   0.0097391  0.864341
solution coverage: 0.757625
solution consistency: 0.863884


Cases with greater than 0.5 membership in term NEWBUS*TECHNO*FINANC: P1 (0.501,0.49),
  P2 (0.501,0.68), P3 (0.501,0.75), P6 (0.501,0.58),
  P9 (0.501,0.9), P12 (0.501,0.63), P13 (0.501,0.44),
  P14 (0.501,0.58), P18 (0.501,0.6), P19 (0.501,0.03),
  P20 (0.501,0.33), P21 (0.501,0.33), P22 (0.501,0.03),
  P23 (0.501,0.03), P24 (0.501,0.03), P25 (0.501,0.03),
  P26 (0.501,0.55), P27 (0.501,0.03), P28 (0.501,0.49),
  P29 (0.501,0.03)
Cases with greater than 0.5 membership in term ~BUSCON*IPSTR*NEWBUS*TECHNO: P46 (0.75,0.5),
  P11 (0.501,0.43), P49 (0.501,0.44), P52 (0.501,0.25),
  P55 (0.501,0.19), P62 (0.501,0.67), P69 (0.501,0.43),
  P70 (0.501,0.32), P81 (0.501,0.32), P84 (0.501,0.7),
  P89 (0.501,0.3), P93 (0.501,0.23), P101 (0.501,0.45),
  P102 (0.501,0.68), P104 (0.501,0.5), P110 (0.501,0.36),
  P116 (0.501,0.33), P125 (0.501,0.3), P130 (0.501,0.41),
  P142 (0.501,0.03)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*ENTEXP*TECHNO: P138 (0.75,0.83),
  P222 (0.75,0.87), P4 (0.501,0.78), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P29 (0.501,0.03), P30 (0.501,0.03),
  P33 (0.501,0.87)
Cases with greater than 0.5 membership in term BUSCON*NEWBUS*ENTEXP*TECHNO: P222 (0.75,0.87),
  P3 (0.501,0.75), P8 (0.501,0.61), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P17 (0.501,0.85), P18 (0.501,0.6),
  P19 (0.501,0.03), P21 (0.501,0.33), P22 (0.501,0.03),
  P23 (0.501,0.03), P24 (0.501,0.03), P25 (0.501,0.03),
  P26 (0.501,0.55), P27 (0.501,0.03), P28 (0.501,0.49),
  P29 (0.501,0.03)
Cases with greater than 0.5 membership in term NEWBUS*ENTEXP*TECHNO*MARKET: P163 (0.75,0.39),
  P222 (0.75,0.87), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P28 (0.501,0.49), P29 (0.501,0.03), P30 (0.501,0.03),
  P37 (0.501,0.84), P40 (0.501,0.28), P46 (0.501,0.5),
```

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  P49 (0.501,0.44), P50 (0.501,0.72), P52 (0.501,0.25),
  P53 (0.501,0.85)
Cases with greater than 0.5 membership in term IPSTR*ENTEXP*TECHNO*FINANC: P13 (0.75,0.44),
  P2 (0.501,0.68), P3 (0.501,0.75), P9 (0.501,0.9),
  P14 (0.501,0.58), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P29 (0.501,0.03), P30 (0.501,0.03),
  P33 (0.501,0.87), P36 (0.501,0.68), P41 (0.501,0.34),
  P44 (0.501,0.44)
Cases with greater than 0.5 membership in term ENTEXP*TECHNO*MARKET*FINANC: P53 (0.75,0.85),
  P9 (0.501,0.9), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P28 (0.501,0.49), P29 (0.501,0.03), P30 (0.501,0.03),
  P42 (0.501,0.78), P46 (0.501,0.5), P49 (0.501,0.44),
  P50 (0.501,0.72), P54 (0.501,0.41), P57 (0.501,0.82),
  P59 (0.501,0.77)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET: P5
(0.501,0.43),
  P17 (0.501,0.85), P20 (0.501,0.33), P28 (0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P65 (0.501,0.39),
  P67 (0.501,0.49), P71 (0.501,0.47), P80 (0.501,0.47),
  P86 (0.501,0.65), P91 (0.501,0.67), P92 (0.501,0.79),
  P109 (0.501,0.83), P117 (0.501,0.87), P127 (0.501,0.51),
  P129 (0.501,0.68), P145 (0.501,0.66), P172 (0.501,0.34),
  P179 (0.501,0.28)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*TECHNO*MARKET*FINANC: P1 (0.501,0.49),
  P9 (0.501,0.9), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P29 (0.501,0.03), P30 (0.501,0.03), P45 (0.501,0.76),
  P47 (0.501,0.61), P51 (0.501,0.89), P59 (0.501,0.77),
  P76 (0.501,0.28), P77 (0.501,0.89), P78 (0.501,0.42),
  P79 (0.501,0.65)
Cases with greater than 0.5 membership in term ~BUSCON*~IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC: P73
(0.501,0.24),
  P74 (0.501,0.53), P98 (0.501,0.3), P149 (0.501,0.34),
  P165 (0.501,0.38), P187 (0.501,0.72)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC: P12
(0.501,0.63),
  P68 (0.501,0.31), P160 (0.501,0.48), P243 (0.501,0.82),
  P249 (0.501,0.21)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC: P37
(0.501,0.84),
  P43 (0.501,0.37), P61 (0.501,0.82), P82 (0.501,0.48),
  P155 (0.501,0.37), P164 (0.501,0.92), P201 (0.501,0.95),
  P244 (0.501,0.93), P245 (0.501,0.33)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC: P2
(0.501,0.68),
  P3 (0.501,0.75), P13 (0.501,0.44), P14 (0.501,0.58),
  P21 (0.501,0.33), P31 (0.501,0.44), P32 (0.501,0.5),
  P41 (0.501,0.34), P48 (0.501,0.83), P97 (0.501,0.55),
  P111 (0.501,0.82), P137 (0.501,0.33), P153 (0.501,0.74),
  P158 (0.501,0.8), P161 (0.501,0.43), P239 (0.501,0.7)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC: P28
(0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P63 (0.501,0.72),
  P65 (0.501,0.39), P67 (0.501,0.49), P72 (0.501,0.53),
  P75 (0.501,0.3), P86 (0.501,0.65), P91 (0.501,0.67),
  P117 (0.501,0.87), P127 (0.501,0.51), P129 (0.501,0.68),
  P172 (0.501,0.34), P202 (0.501,0.46), P225 (0.501,0.88),
  P236 (0.501,0.8), P242 (0.501,0.6), P247 (0.501,0.84),
  P248 (0.501,0.96)
Cases with greater than 0.5 membership in term ~BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*FINANC: P34
(0.501,0.76),
  P46 (0.501,0.5), P49 (0.501,0.44), P69 (0.501,0.43),
  P110 (0.501,0.36), P116 (0.501,0.33), P130 (0.501,0.41),
  P133 (0.501,0.3), P157 (0.501,0.44), P203 (0.501,0.84),
  P214 (0.501,0.87), P230 (0.501,0.37)
Cases with greater than 0.5 membership in term
~BUSCON*~IPSTR*~NEWBUS*~ENTEXP*TECHNO*~MARKET*~FINANC: P139 (0.75,0.27),
  P229 (0.75,0.43)
*** ERROR(Quine-McCluskey): The 1 Matrix Contains All Configurations. ***
```

```
Algorithm: Quine-McCluskey

--- PARSIMONIOUS SOLUTION ---
frequency cutoff: 2
consistency cutoff: 0.864341
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*TRUTH TABLE ANALYSIS*
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```
Model: ENDTOT = f(BUSCON, IPSTR, NEWBUS, ENTEXP, TECHNO, MARKET, FINANC)
Algorithm: Quine-McCluskey

--- INTERMEDIATE SOLUTION ---
frequency cutoff: 2
consistency cutoff: 0.864341
Assumptions:
```

| | raw coverage | unique coverage | consistency |
|---|---|---|---|
| NEWBUS*TECHNO*FINANC | 0.582712 | 0.00351614 | 0.885269 |
| ~BUSCON*IPSTR*NEWBUS*TECHNO | 0.516206 | 0.00511372 | 0.882235 |
| BUSCON*IPSTR*ENTEXP*TECHNO | 0.514294 | 0.00875539 | 0.924179 |
| BUSCON*NEWBUS*ENTEXP*TECHNO | 0.519024 | 0.00351614 | 0.923899 |
| NEWBUS*ENTEXP*TECHNO*MARKET | 0.519401 | 0.00335562 | 0.908593 |
| IPSTR*ENTEXP*TECHNO*FINANC | 0.521264 | 2.09212e-05 | 0.905805 |
| ENTEXP*TECHNO*MARKET*FINANC | 0.516764 | 0.00477189 | 0.915816 |
| BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET | 0.474647 | 0.00300688 | 0.921385 |
| BUSCON*IPSTR*TECHNO*MARKET*FINANC | 0.458657 | 0.00175112 | 0.92669 |
| ~BUSCON*~IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC | 0.443428 | 0.00230223 | 0.890547 |
| BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC | 0.451269 | 0.00161856 | 0.909123 |
| BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC | 0.438761 | 0.00398356 | 0.923212 |
| BUSCON*IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC | 0.423085 | 0.00308359 | 0.921783 |
| BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC | 0.434338 | 0.00350219 | 0.922559 |
| ~BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*FINANC | 0.422331 | 0.00211382 | 0.913863 |
| ~BUSCON*~IPSTR*~NEWBUS*~ENTEXP*TECHNO*~MARKET*~FINANC | 0.500104 | 0.0097391 | 0.864341 |

```
solution coverage: 0.757625
solution consistency: 0.863884
```

```
Cases with greater than 0.5 membership in term NEWBUS*TECHNO*FINANC: P1 (0.501,0.49),
  P2 (0.501,0.68), P3 (0.501,0.75), P6 (0.501,0.58),
  P9 (0.501,0.9), P12 (0.501,0.63), P13 (0.501,0.44),
  P14 (0.501,0.58), P18 (0.501,0.6), P19 (0.501,0.03),
  P20 (0.501,0.33), P21 (0.501,0.33), P22 (0.501,0.03),
  P23 (0.501,0.03), P24 (0.501,0.03), P25 (0.501,0.03),
  P26 (0.501,0.55), P27 (0.501,0.03), P28 (0.501,0.49),
  P29 (0.501,0.03)
Cases with greater than 0.5 membership in term ~BUSCON*IPSTR*NEWBUS*TECHNO: P46 (0.75,0.5),
  P11 (0.501,0.43), P49 (0.501,0.44), P52 (0.501,0.25),
  P55 (0.501,0.19), P62 (0.501,0.67), P69 (0.501,0.43),
  P70 (0.501,0.32), P81 (0.501,0.32), P84 (0.501,0.7),
  P89 (0.501,0.3), P93 (0.501,0.23), P101 (0.501,0.45),
  P102 (0.501,0.68), P104 (0.501,0.5), P110 (0.501,0.36),
  P116 (0.501,0.33), P125 (0.501,0.3), P130 (0.501,0.41),
  P142 (0.501,0.03)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*ENTEXP*TECHNO: P138 (0.75,0.83),
  P222 (0.75,0.87), P4 (0.501,0.78), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P29 (0.501,0.03), P30 (0.501,0.03),
  P33 (0.501,0.87)
Cases with greater than 0.5 membership in term BUSCON*NEWBUS*ENTEXP*TECHNO: P222 (0.75,0.87),
  P3 (0.501,0.75), P8 (0.501,0.61), P9 (0.501,0.9),
  P10 (0.501,0.4), P13 (0.501,0.44), P14 (0.501,0.58),
  P16 (0.501,0.62), P17 (0.501,0.85), P18 (0.501,0.6),
  P19 (0.501,0.03), P21 (0.501,0.33), P22 (0.501,0.03),
  P23 (0.501,0.03), P24 (0.501,0.03), P25 (0.501,0.03),
  P26 (0.501,0.55), P27 (0.501,0.03), P28 (0.501,0.49),
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  P29 (0.501,0.03)
Cases with greater than 0.5 membership in term NEWBUS*ENTEXP*TECHNO*MARKET: P163 (0.75,0.39),
  P222 (0.75,0.87), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P28 (0.501,0.49), P29 (0.501,0.03), P30 (0.501,0.03),
  P37 (0.501,0.84), P40 (0.501,0.28), P46 (0.501,0.5),
  P49 (0.501,0.44), P50 (0.501,0.72), P52 (0.501,0.25),
  P53 (0.501,0.85)
Cases with greater than 0.5 membership in term IPSTR*ENTEXP*TECHNO*FINANC: P13 (0.75,0.44),
  P2 (0.501,0.68), P3 (0.501,0.75), P9 (0.501,0.9),
  P14 (0.501,0.58), P18 (0.501,0.6), P19 (0.501,0.03),
  P21 (0.501,0.33), P22 (0.501,0.03), P23 (0.501,0.03),
  P24 (0.501,0.03), P25 (0.501,0.03), P26 (0.501,0.55),
  P27 (0.501,0.03), P29 (0.501,0.03), P30 (0.501,0.03),
  P33 (0.501,0.87), P36 (0.501,0.68), P41 (0.501,0.34),
  P44 (0.501,0.44)
Cases with greater than 0.5 membership in term ENTEXP*TECHNO*MARKET*FINANC: P53 (0.75,0.85),
  P9 (0.501,0.9), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P28 (0.501,0.49), P29 (0.501,0.03), P30 (0.501,0.03),
  P42 (0.501,0.78), P46 (0.501,0.5), P49 (0.501,0.44),
  P50 (0.501,0.72), P54 (0.501,0.41), P57 (0.501,0.82),
  P59 (0.501,0.77)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*TECHNO*MARKET: P5
(0.501,0.43),
  P17 (0.501,0.85), P20 (0.501,0.33), P28 (0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P65 (0.501,0.39),
  P67 (0.501,0.49), P71 (0.501,0.47), P80 (0.501,0.47),
  P86 (0.501,0.65), P91 (0.501,0.67), P92 (0.501,0.79),
  P109 (0.501,0.83), P117 (0.501,0.87), P127 (0.501,0.51),
  P129 (0.501,0.68), P145 (0.501,0.66), P172 (0.501,0.34),
  P179 (0.501,0.28)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*TECHNO*MARKET*FINANC: P1 (0.501,0.49),
  P9 (0.501,0.9), P18 (0.501,0.6), P19 (0.501,0.03),
  P22 (0.501,0.03), P23 (0.501,0.03), P24 (0.501,0.03),
  P25 (0.501,0.03), P26 (0.501,0.55), P27 (0.501,0.03),
  P29 (0.501,0.03), P30 (0.501,0.03), P45 (0.501,0.76),
  P47 (0.501,0.61), P51 (0.501,0.89), P59 (0.501,0.77),
  P76 (0.501,0.28), P77 (0.501,0.89), P78 (0.501,0.42),
  P79 (0.501,0.65)
Cases with greater than 0.5 membership in term ~BUSCON*~IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC: P73
(0.501,0.24),
  P74 (0.501,0.53), P98 (0.501,0.3), P149 (0.501,0.34),
  P165 (0.501,0.38), P187 (0.501,0.72)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*~ENTEXP*TECHNO*~MARKET*FINANC: P12
(0.501,0.63),
  P68 (0.501,0.31), P160 (0.501,0.48), P243 (0.501,0.82),
  P249 (0.501,0.21)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*~FINANC: P37
(0.501,0.84),
  P43 (0.501,0.37), P61 (0.501,0.82), P82 (0.501,0.48),
  P155 (0.501,0.37), P164 (0.501,0.92), P201 (0.501,0.95),
  P244 (0.501,0.93), P245 (0.501,0.33)
Cases with greater than 0.5 membership in term BUSCON*IPSTR*NEWBUS*ENTEXP*~MARKET*FINANC: P2
(0.501,0.68),
  P3 (0.501,0.75), P13 (0.501,0.44), P14 (0.501,0.58),
  P21 (0.501,0.33), P31 (0.501,0.44), P32 (0.501,0.5),
  P41 (0.501,0.34), P48 (0.501,0.83), P97 (0.501,0.55),
  P111 (0.501,0.82), P137 (0.501,0.33), P153 (0.501,0.74),
  P158 (0.501,0.8), P161 (0.501,0.43), P239 (0.501,0.7)
Cases with greater than 0.5 membership in term BUSCON*~IPSTR*NEWBUS*ENTEXP*MARKET*FINANC: P28
(0.501,0.49),
  P50 (0.501,0.72), P53 (0.501,0.85), P63 (0.501,0.72),
  P65 (0.501,0.39), P67 (0.501,0.49), P72 (0.501,0.53),
  P75 (0.501,0.3), P86 (0.501,0.65), P91 (0.501,0.67),
  P117 (0.501,0.87), P127 (0.501,0.51), P129 (0.501,0.68),
  P172 (0.501,0.34), P202 (0.501,0.46), P225 (0.501,0.88),
  P236 (0.501,0.8), P242 (0.501,0.6), P247 (0.501,0.84),
  P248 (0.501,0.96)
Cases with greater than 0.5 membership in term ~BUSCON*IPSTR*NEWBUS*ENTEXP*MARKET*FINANC: P34
(0.501,0.76),
  P46 (0.501,0.5), P49 (0.501,0.44), P69 (0.501,0.43),
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P110 (0.501,0.36), P116 (0.501,0.33), P130 (0.501,0.41),
P133 (0.501,0.3), P157 (0.501,0.44), P203 (0.501,0.84),
P214 (0.501,0.87), P230 (0.501,0.37)
Cases with greater than 0.5 membership in term
~BUSCON*~IPSTR*~NEWBUS*~ENTEXP*TECHNO*~MARKET*~FINANC: P139 (0.75,0.27),
P229 (0.75,0.43)

| Variable | Mean | Std. Dev. | Minimum | Maximum | N Cases | Missing |
|---|---|---|---|---|---|---|
| BUSCON | 0.4509228 | 0.2084109 | 0.03 | 0.9 | 259 | 0 |
| IPSTR | 0.4545483 | 0.1729828 | 0.1 | 0.75 | 259 | 0 |
| NEWBUS | 0.4520193 | 0.1465026 | 0.1 | 0.9 | 259 | 0 |
| ENTEXP | 0.4915946 | 0.191874 | 0.03 | 0.9 | 259 | 0 |
| TECHNO | 0.6127799 | 0.2020263 | 0.03 | 0.97 | 259 | 0 |
| MARKET | 0.4864633 | 0.2282901 | 0.03 | 0.99 | 259 | 0 |
| FINANC | 0.4342896 | 0.1286935 | 0.03 | 0.75 | 259 | 0 |
| ENDTOT | 0.5534363 | 0.2188284 | 0.03 | 0.96 | 259 | 0 |