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Research Article

Proself or Prosocial? The Indonesian Academics Motive to Commercializing University Research

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Abstract: Commercialization represents an important way for academics to contribute to economy and society.This study aimed to investigate the motivation of Indonesian academics to commercialize their research findings. A model linking proself and prosocial with scientific entrepreneurship was used to assess the motivation of Indonesian academics to commercialize their research finding. A quantitative method with survey design was used, and the data were collected through an online self-administered questionnaire. Furthermore, the respondents were academics from ten universities with legal entity status (PTNBH) in Indonesia with a scientific backgrounds in engineering, science, and health. Descriptive analysis with central tendency was carried out using SPSS 24. Meanwhile, to investigate the relationships between the variables, the inferential statistical analysis using SEM PLS was carried out using the Smart PLS 3. The results showed that the motivation of Indonesian academics to commercialize university research was influenced by proself, but the effect was restricted to the intention to commercialize and did not directly affect research commercialization. Meanwhile, prosocial motivation had no significant impact on the intention to commercialize. This showed that Indonesian academics had a strong desire to engage in research commercialization, but only few had been successful through licensing or creating startups. The majority had a hybrid and entrepreneurial orientation toward university-industry links.

Keywords: Commercialization intention; Entrepreneurial university; Proself motivation; Prosocial motivation; Research commercialization

1. Introduction

Higher education is increasingly compelled to engage in economic activities in addition to its traditional teaching and research duties (Redford and Fayolle, 2014). University responsibilities have continued to expand, approaching business fields. Moreover, knowledge capitalization is currently the third mission of higher education (Perkmann et al., 2013). This aims to strengthen ties between university and knowledge consumers, positioning university as an agent of economic development. Governments at national and municipal levels have requested that university plays a larger role in the economy by forming knowledge-based firms rooted in academic research and providing entrepreneurial training (Breznitz et al., 2022; Compagnucci and Spigarelli, 2020).

Universities are increasingly expected to contribute to socioeconomic development in the communities, regions, and countries where they are based (Surjandari, 2015). Changing political and social contexts require universities to justify their access to public funding by demonstrating their positive socio-economic impact (Breznitz et al., 2022; Compagnucci and Spigarelli, 2020).

This third mission positions university as an economic actor with rights. The increasing in the third mission of the university was also highlighted by previous literature reviews ((Galvão et al.,

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2018; Hayter et al., 2018; Mascarenhas et al., 2017; Schmitz et al., 2017; Venkataraman, 2004; Gorman et al., 1997). This shift from focusing solely on teaching and research to economic and social growth marks the most recent and crucial phase of academic development. The phenomenon of the shifting function is known as the "entrepreneurial university" (Etzkowitz et al., 2012).

The process of transitioning into an entrepreneurial university is a challenging endeavor (Passaro et al., 2018; M'Chirgui et al., 2016; De Cleyn et al., 2015; Mian, 2014; Bienkowska and Klofsten, 2012; Svensson et al., 2012; Klofsten, 2008). University has fundamental role to create a qualified human capital with entrepreneurial skill. To achieve this aim, the university needs the modernisation of its degree programs, the reconfiguration of its processes, the adoption of innovative education tools and practices, the development of publicprivate partnerships (Venkataraman, 2004).

According to Etzkowitz and Zhou (2008), for a university to be classified as an entrepreneurial, it should have several challenges showing a greater role in the direct and proactive diffusion of academic research. University is believed to have a general socioeconomic role and a public responsibility, particularly toward local communities and stakeholders (Jongbloed et al., 2008, Arbo and Paul, 2007). Lecturers contribute significantly to institutions intellectual capital. Taleb and Pheniqi (2021) stated that Intellectual Capital (IC) is essential for organizations to cultivate and scale innovation performance capacities to ensure organizational growth and sustainability. University professors research activities generate a substantial amount of intellectual property with commercialization possibilities. Academic research has grown in complexity as societal problems become more complex, leading to innovations that play important roles in societal and industry fields (Whulanza, 2023). The utilization of inventions derived from academic research is transferred to society and industries through commercialization (Audretsch and Aldridge, 2009; Etzkowitz et al., 2000b), therefore, commercialization holds a significant role in the entrepreneurial university .

In addition to student tuition payments, research commercialization can be a strategic revenue source for a university. The commercialization of academic research results is considered a part of university role as an innovator. The results include dissemination, patent registration, granted patents, licensing, and spin-off company (Rahal and Rabelo, 2006). Commercialization is the act of introducing innovation to the market. Furthermore, it is a process in which ideas, knowledge, and innovations are converted into tangible assets, providing significant benefits to society and the economy (Khademi and Ismail, 2013).

According to Belitski (2019), commercialization can be analyzed at three levels, include individual level (researcher/academics), organizational level (business incubator, TTO, science technopark) and system level (venture capital, private capital, public institution and government). Business incubator plays a significant role in developing businesses, including commercialization (Gozali et al., 2020). However, Lam (2011) stated that academics (lecturers) were crucial as primary actors in the commercialization process. The study classified academics into four categories based on their orientation in the university-industry relationship, namely traditional, pragmatic, hybrid, and entrepreneurial (figure 1).

Academics are encouraged to take on the role of academic entrepreneur in addition to the traditional duties as lecturers and research experts. Academics, who were formerly employees of a university, are currently faced with new roles as entrepreneurs with new entities (start-ups/spin-offs) and engage in business activities like licensing and collaboration with industrial partners. According to Lam (2011), a lecturer with dual roles as an academician and an entrepreneur is known as a hybrid entrepreneur. This is an individual who engages in entrepreneurial activities (research commercialization through licensing or university spin-off) while simultaneously holding a salaried position (university employee) (Folta et al., 2010).

1.1. Concept of Motivation Proself and Prosocial

Motivation is the force or energy that causes an individual to act in a qualitatively distinct manner (Fowler, 2014). Some motivational factors tend to be beneficial while others are not.

Academics have acknowledged that the motivations for scientific entrepreneurship are complex and multifaceted (Mahto and McDowell, 2018), including financial rewards, reputation, and knowledge curiosity (Lam, 2011; Shane, 2004). Most of these motivations, however, are proself motivations, which are based on achieving self- or business-related objectives (Miller, 2012). Prosocial motivations, which drive individuals to make social changes and benefit others, have been largely neglected (Zeng, 2018; Renko, 2012). This is unfortunate because scientific entrepreneurship in particular, is socially situated and aims to foster social development. In addition, Nguyen (2020) found that prosocial and proself motivations could play a role in fostering scientific entrepreneurship.

Prosocial motivation is a psychological condition in which individuals are driven to help others out of care for their well-being (Miller, 2012; Renko, 2012). It is also the motivation to devote effort based on a concern for assisting or contributing to other people (Grant, 2007). Several studies have viewed prosocial motivation as an individual value that drives all action (Grant and Berry, 2011) and as a specific form of intrinsic motivation (Grant, 2008).

Prosocial motivation, which refers to the motivation to make social improvements and/or to benefit others, has been generally disregarded in studies of scientific entrepreneurship (Nguyen et al., 2020; Miller, 2012; Renko, 2012). Scholars have agreed that academics can have high degrees of both prosocial and proself motives when engaged in commercialization activities, such as venture creation (Renko, 2012; Grant, 2008; 2007).

1.2. Concept of Research Commercialization

Bercovitz and Feldman (2007) state that commercialization can be carried out through several mechanisms, including research sponsorship, licensing, recruiting students, and creating spin-off companies. Freitas et al. (2013) distinguished two interaction modes in the multi-level commercialization process, that is institutional and private contract modes. The institutional mode entails interactions between a university and ecosystem stakeholders such as industry, government, non-profit organizations, and angel investors. In contrast, the private contract mode is a formal and informal collaboration between stakeholders, ecosystems, and research experts, which can occur with or without the direct participation of a university (Belitski, 2019).

Wood (2011) argued that the most typical commercialization technique used by a university to transfer intellectual property to outside parties was a technology licensing agreement and the formation of new businesses, commonly referred to as a 'spin-off.' Technology licensing agreements have proven to be a successful mechanism for university invention commercialization (Thursby and Thursby, 2007; Agrawal, 2006). From a university's perspective, technology licensing is preferable because it expedites market penetration, optimizes multi-partner agreements, and reduces financial risks (Kim and Vonortas, 2006; Zhao, 2004). A spin-off is a new firm created as a result of academic innovation, which may be wholly owned by the institution or created in collaboration with outside partners (Shane and Stuart, 2002). Studies have shown that commercialization through spin-off is most successful when it includes brand-new innovations, requiring extensive face-to-face communication throughout the knowledge transfer process (Thursby and Thursby, 2007; Shane, 2004; DiGregorio and Shane, 2003). The current study restricted commercialization to two activities, namely licensing and business creation (spin-off).

From a university's perspective, technology licensing are preferable since they expedite market penetration, optimize multi-partner agreements, and reduce financial risks (Kim and Vonortas, 2006; Zhao, 2004). A spin-off is an entirely new firm produced as a result of academic innovation, which may be wholly owned by the institution or created in collaboration with outside partners (Shane and Stuart, 2002). A distinguishing characteristic of spinoffs is that the innovator's discoverer is frequently heavily involved in the spinoff's technological development (Bercovitz and Feldman, 2007). This tight relationship facilitates the transfer of tacit knowledge from academics to people responsible for the day-to-day operations of the enterprise. According to previous research, commercialization in the form of spin-offs is most successful when it is used to commercialize

brand-new innovations, and this type of innovation requires extensive face-to-face communication throughout the knowledge transfer process (Thursby and Thursby, 2007; Shane, 2004; DiGregorio and Shane, 2003).

1.3. Measurement and Hypothesis

Commercialization is a conscious act or behaviour. Similar to entrepreneurial behavior, Javier et al. (2017) and Hisrich et al. (2017) identified intention as the strongest and sole predictor of entrepreneurial behavior. Therefore, it is important to examine lecturers' intention to engage in commercialization in order to understand their commercialization behavior. Intention can capture the motivational variables that drive action by showing the challenges individuals face and the amount of effort directed toward conduct. The following hypothesis were formulated based on the discussion:

H1 Intention to commercialize (Commercialization intention) is positively associated with research commercialization (behavior)

Measurement of proself motivation refers to Lam (2011), which focuses on three aspects Include financial rewards (gold), reputation (ribbon), and knowledge curiosity (Puzzle). Lam (2011) find that academics are driven to engage in commercialization due to proself motivation. Most of the academics are driven by the traditional rewards of the ribbon in their commercial activities, whereas only a small minority considers gold to be essential. Beyond the ribbon and gold, he underlines the relevance of puzzle-solving-like intrinsic drive in motivating the commercial ambitions of many of the scientists surveyed. The following hypotheses were formulated based on the discussion:

H2 proself motivation is positively associated with commercialization intention

H3 proself motivation is positively associated with research commercialization

Prosocial motivation influences research commercialization in various ways. Academics with superior technology and high prosocial motivation might promote the technology to companies with similar social values and a large consumer base (Nguyen, 2020). The following hypotheses were formulated based on the discussion:

H4 prosocial motivation is positively associated with commercialization intention

H5 prosocial motivation is positively associated with research commercialization

The following figure shows the relationship between proself and prosocial motivation and research commercialization (figure 2).

2. Methods

This study used a quantitative method with survey design and was conducted using a self-administered questionnaire on the Google Forms platform (Bryman, 2012). The data were obtained using a 7-point Likert scale ranging from 1 ‘strongly disagree’ to 7 ‘strongly agree’ as shown in Table 6. Furthermore, the population comprised university academics (lecturers) from the faculties of engineering, science and ten health at State Universities with Legal Entities (PTNBH) in Indonesia. A purposive sampling was used with the following criteria:

- Both permanent (full-time) and non-permanent lecturers from PTNBH
- Lecturers from the engineering, science, and health faculties

Holley and Watson (2017) assumed that faculties science and technology has contribute the most patents than other and have a high potential to be involved in research commercialization activities in universities. This is consistent with the findings of Holley and Watson (2017), who found that the science faculties have four eminence to study:

- Is the most active knowledge group in university knowledge transfer
- In general, the science faculties receive the most money for academic research.
- The science faculties integrate distinct challenges and opportunities from industry, academia, government, and the non-profit sector

- Scientific endeavors are seen as intriguing and are not publicly known

The study was conducted during the COVID-19 pandemic, necessitating online distribution of questionnaires, as face-to-face interviews were not possible. Out of the 1,500 questionnaires distributed through email to lecturers at 10 PTNBH universities, only 155 were eligible and willing to engage in this study. The detailed data are presented in Table 1, and SPSS software was used for descriptive analysis, while SEM-PLS path analysis with SMART PLS software was used to examine the correlation between the variables.

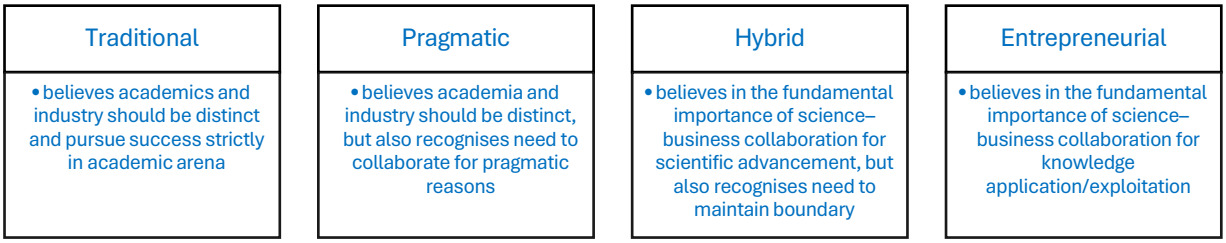

Figure 1 Academics Orientation towards University-Industry links

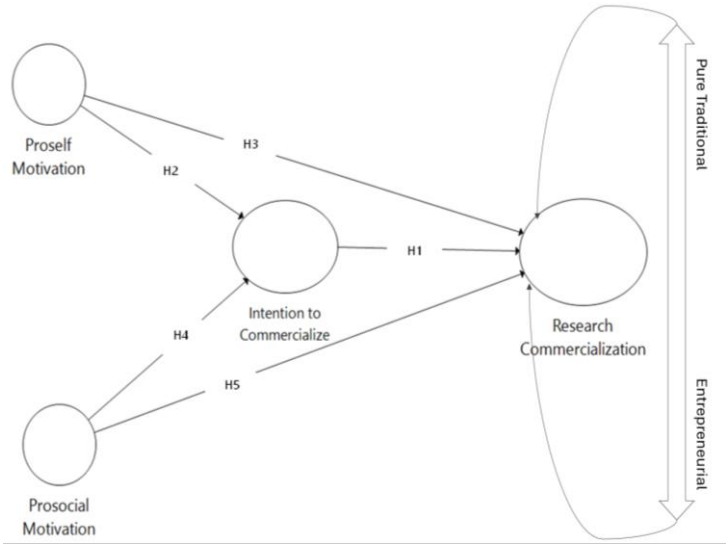

Figure 2 Research Framework

Table 1 Respondents in Survey and Indepth Interview

No	University	Number of Respondents in survey
1	Institut Pertanian Bogor	12
2	Institut Teknologi Bandung	15
3	Institut Teknologi Sepuluh Nopember	10
4	Universitas Airlangga	10
5	Universitas Diponegoro	21
6	Universitas Gadjah Mada	11
7	Universitas Hasanudin	15
8	Universitas Indonesia	36
9	Universitas Padjajaran	14
10	Universitas Sumatera Utara	11

3. Results and Discussion

The survey results showed that the majority of respondents were males (56.1%), more than 60% were over 40 years old, and most held doctoral degrees (72.9%) as presented in Table 2. From a

scientific perspective, most responses were from the science faculty, particularly agriculture, biology, and marine sciences. Referring to Lam (2011), the value preference (orientation) for lecturer engagement in commercialization was divided into four types, namely traditional, traditional pragmatic, hybrid, and entrepreneurial. Furthermore, the majority of PTNBH lecturers in Indonesia were hybrid (55.5%) and entrepreneurial (27%) (Figure 3). This showed more than 50% of academics agreed that science-business collaboration for scientific progress was essential, while also acknowledging the necessity to keep science and business separate (hybrid type).

Table 2 Demographics of Respondents

Characteristic	Category	Number of Respondents	Percentages (%)	Characteristic	Category	Number of Respondents
Gender	Female	87	56.1	Education	Magister	42
	Male	68	43.9		Doctoral	90
					Professor	23
Age	27-40	51	32.9	Disciplines	Engineering	51
	41-51	56	36.1		Science	67
	52-66	48	31		Health	37
Characteristic	Category	Number of Respondents	Percentages (%)	Characteristic	Category	Number of Respondents
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	41-51	56	36.1		Science	67
	52-66	48	31		Health	37
Characteristic	Category	Number of Respondents	Percentages (%)	Characteristic	Category	Number of Respondents

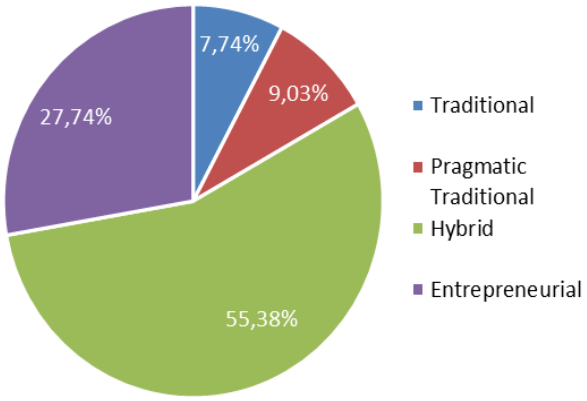

Figure 3 Indonesian Lecturer Orientation toward University-Industry link

The validity test results for all items showed that the AVE value exceeded 0.5 and the outer loading exceeded 0.7 (Hair et al., 2020). The Fornell-Larcker Criterion calculation and the 'cross loading' value also showed that the discriminant validity had been met and all indicators were valid. In addition, the reliability test showed that all indicators were reliable, with composite reliability and Cronbach's alpha values exceeding 0.70. (Hair et al., 2020) (Table 7-9 in the attachment).

SEM-PLS test results showed that several hypotheses were rejected, hence, there was no significant effect on most of the variables. Statistical data generally showed that research commercialization activities carried out by academics were not influenced by pro-self and pro-social motivations. However, research commercialization was significantly influenced by the intention to commercialize, which was also significantly influenced by proself motivation. Prosocial

motivation, on the other hand, had no influence on either the intention to commercialize or research commercialization.

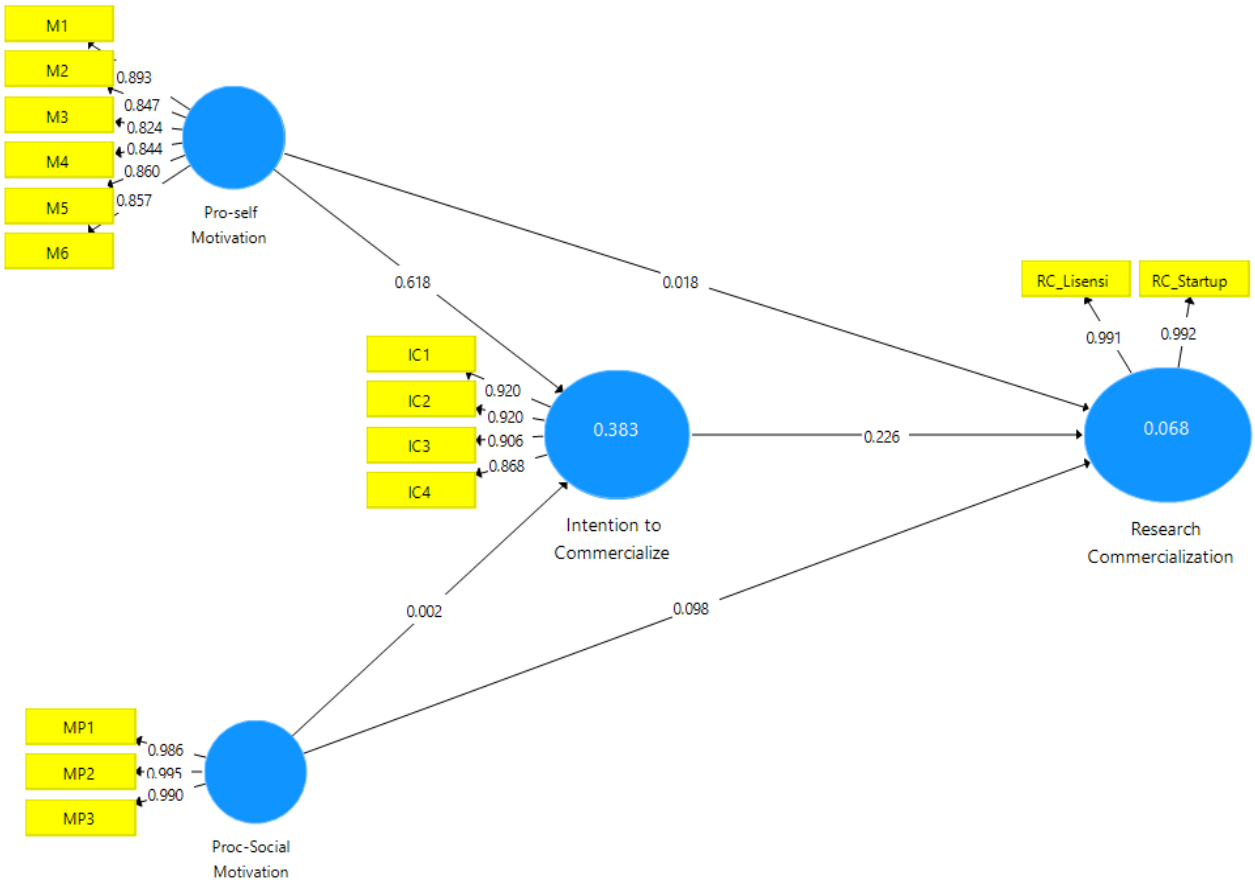

Figure 4 Outer Model

3.1. Research Intention and Commercialization

Based on Table 5, the category labeled "Decided to commercialize research in the future" had the highest mean value for the intention to commercialize research variable. This showed most of the PTNBH academics in Indonesia were interested in engaging in commercialization. However, several lecturers were not able to participate due to various challenges. Only 26 respondents were successful in commercializing inventions through licensing (12 respondents) and the creation of new businesses (spin-off) (14 respondents).

The results showed a path coefficient between intention to commercialize and research commercialization of 0.226 with a P value of 0.015. This confirmed the acceptance of the hypothesis and a positive correlation between commercialization intention and research commercialization (behaviour). However, the strength between the two factors fell into the weak category (Hair et.al, 2011). The value of R square for this relationship was 0.068, showing that intentions, proself motivation, and prosocial motivation could explain 6.8% of the research commercialization (in form of licenses and spin-offs). However, the remaining 93.2% could be explained by other factors transcending motivation and intention to commercialize.

Ansari et al. (2016) and Hanid et al. (2019) found that the success of commercialization and university-industry collaboration depended on a wide variety of parameters. According to Ansari et al. (2016), the factors that ranked highest as challenges to commercialization were inappropriate perspectives and policymaking, barriers to financial investment, mistrust, and poor communication. Conversely, factors related to the participation of the private sector ranked among the lowest as challenges. According to Hanid et al. (2019), the primary variables in ensuring the

success of university-industry collaboration were the quality of the research experts involved, the level of commitment shown by both parties, and the availability of financial support.

3.2. Proself Motivation, Commercialization Intention & Research Commercialization

The path coefficient between proself motivation and research commercialization was 0.018, with a P value of 0.857 (> 0.05), confirming the rejection of the hypothesis. However, the path coefficient between proself motivation and commercialization intention was 0.618, with a P value of 0.000 (see Table 3). This showed the acceptance of the hypothesis and a significant positive relationship between proself motivation and the intention to commercialize. The degree of relationship between both variables fell into the moderate category, which was quite close to the substantial category (Hair et al., 2011).

The results corresponded with Satriadi et al. (2022), Lam (2011), and Shane (2004), who found that proself motivation, comprising financial rewards, reputation, and knowledge curiosity, had an effect on commercialization activities. Statistical findings also showed that pro-self motivation only influenced intentions and not commercialization behavior. While the majority of PTNBH academics in Indonesia were enthusiastic about engaging in commercialization, not all had the skills required for successful commercialization. This was evidenced by the small number of respondents (a total of 26) who had successfully monetized innovations through licenses or launched new businesses (spin-off) (Satriadi et al., 2022).

Table 3 Path Coefficient

	Path Coefficient	T Statistics (|O/STDEV|)	P Values
Intention to Commercialize -> Research Commercialization	0.226	2.451	0.015
Proself Motivation -> Research Commercialization	0.018	0.180	0.857
Prosocial Motivation -> Research Commercialization	0.098	1.279	0.202
Proself Motivation -> Intention to Commercialize	**0.618**	21.801	0.000
Prosocial Motivation -> Intention to Commercialize	**0.002**	0.036	0.971

Table 4 R^2 (R Square) Value

Variables	R Square	R Square Adjusted
Intention to Commercialize	0.383	0.374
Research Commercialization	0.068	0.050

3.3. Prosocial Motivation, Commercialization Intention & Research Commercialization

The hypothesis was rejected when the path coefficient between prosocial motivation and research commercialization was 0.098 and the P value was 0.202 (> 0.05). Similarly, the path coefficient between prosocial motivation and commercialization intention was 0.002, with the significance level for the relationship being 0.971 (Table 3). This showed the rejection of the hypothesis, the absence of correlation between prosocial motivation and the intention to commercialize as well as between prosocial motivation and research commercialization. The degree of relationship between both variables fell into the weak category (Hair et al., 2011).

According to Table 5, the indicator with the highest mean value of prosocial motivation was "Interested in commercializing research to benefit and help a number of people." Therefore, academics could be motivated to pursue research commercialization by humanistic concerns. Scientists driven by altruistic objectives tended to have a broader conception of the benefits of their work and prioritize the needs of others. Moreover, there was often a positive externality associated with commercialization (Nguyen, 2020).

Table 5 Mean of Indicator Proself Motivation, Prosocial Motivation and intention to Commercialize

Variable	Indicator	Mean
Proself Motivation	Interested in commercializing research to increase funding and resources for research	5.77
	Interested in commercializing research to apply and exploit research outcomes	5.79
	Interested in commercializing research to improve the transfer of knowledge	6.12
	Interested in commercializing research in order to satisfy intellectual curiosity	5.67
	Interested in commercializing research to build personal and professional networks	5.88
	Interested in commercializing research to provide job opportunities for students	6.19
Prosocial Motivation	Interested in commercializing research to contribute to economic growth	5.67
	Interested in commercializing research with the aim of benefiting and helping a lot of people	6.28
	Interested in commercializing research to repay the social investment society has made in me, and to facilitate my professional growth	5.80
Intention to Commercialize	Decided to commercialize research in the future	5.21
	Plans to commercialize research outcomes through licensing and transforming into a startup company (university spin-off)	4.88
	Want to be an academic entrepreneur	4.90
	Finding information on licensing and launching a startup to commercialize research results	4.14

4. Conclusions

In conclusion, this study showed a significant relationship between intention to commercialize and research commercialization, as well as between proself motivation and intention to commercialize. However, prosocial motivation had no significant effect on the intention to commercialize and research commercialization. These results showed Indonesian academics had a strong desire to engage in research commercialization, but only a few had successfully participated through licensing or establishing startups. The survey showed that the majority of PTNBH academics from the Health, Science, and Engineering faculties had a hybrid and entrepreneurial orientation toward university-industry links, while a minority had a traditional orientation. Academics with an entrepreneurial orientation were more likely to be from the Engineering faculty and less likely to be from the Health faculty, while academics with a traditional orientation were less likely to be from the Engineering and the science faculties. Research commercialization could be categorized into individual, organizational, and system levels. Unlike these perspectives, the current study was limited by focusing on the individual level only, particularly motivational background. Therefore, future studies were recommended to include all factors influencing research commercialization at the organizational and system levels.

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Author Contributions

Nurul Safitri: Gathering survey and Interviews, data processing and analysis, as well as writing and revising the manuscript. Martani Huseini: supervising the research idea, research process and writing process. Retno Kusumastuti: refining the research framework and managing the research progress.

Conflict of Interest

The authors report there are no conflict of Interest to declare.

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