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Enhance Mental Health Outcomes of Doctoral Students through A Dynamic Performance Governance approach

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Abstract

Doctoral education plays a central role in advancing national research capacity, innovation, and academic excellence. However, an increasing body of evidence reveals that doctoral students globally experience high levels of psychological stress, anxiety, and depression. This study focuses on understanding the systemic causes of these mental health challenges, with particular attention to the Chinese context, where rapid expansion, centralized governance, and strong socio-cultural expectations create a uniquely high-pressure academic environment.

Drawing upon the Dynamic Performance Governance (DPG) framework and Dynamic Performance Management (DPM) principles, this thesis develops a Causal Loop Diagram (CLD) to model the complex feedback structures influencing doctoral students' mental health. The DPG model highlights the dynamic interactions among strategic resources (e.g., personal time, social norms, and institutional capacity), performance drivers (e.g., workload, supervision, and social pressure), and mental health outcomes. The Chinese model extends the global structure by incorporating contextual factors such as power distance, family responsibility, social bias against mental health issues, and governmental and institutional capacity for collaborative policy interventions.

The findings reveal that doctoral mental health cannot be effectively addressed through isolated measures or individual coping strategies alone. Instead, it requires collaborative governance, involving active coordination among government agencies, higher education institutions, supervisors, and students. The study identifies key balancing loops that shape the dynamic equilibrium between academic performance and mental health, such as those related to work-life balance, supervisory relationships, and social expectations.

Based on the system analysis, this thesis recommends a set of collaborative policy interventions aimed at strengthening institutional mental health services, reforming supervisory practices, reducing stigma, and promoting well-being as an integral part of doctoral education governance. The research contributes both theoretically and practically by extending the application of DPG to the field of doctoral education and offering a dynamic, governance-based framework for enhancing mental health sustainability in China's research system.

Keywords: Doctoral education, mental health, China, Dynamic Performance Governance (DPG), Causal Loop Diagram (CLD), system dynamics, collaborative governance, higher education policy

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Chapter 1. Research background design

1.1 Introduction

It is globally recognized that doctoral education is the cornerstone of advanced research and innovation systems (Barry et al., 2018). Doctoral students are expected to commit to cutting-edge research, develop new knowledge, and become future leaders in academia and industry (Cornwall et al., 2019; Wassell & Dodge, 2015).

However, since 1980s, the New Public Management (NPM) has been widely used in the field of higher education, followed by strengthened performance management and academic competition, which led to growing academic pressure to higher education students (Chandler et al., 2002). These students are often reported facing high levels of stress, competition and performance demands, and with significant mental health challenges such as anxiety, depression, and burnout (Evans et al., 2018; Levecque et al., 2017; Satinsky et al., 2021). Mental health is a umbrella term, as it described by the World health Organization(WHO) (Herrman et al., 2005, p2), which refers to " a state of mental well-being that enables people to cope with the stresses of life, realize their abilities, learn well and work well, and contribute to their community". This definition stresses not limited to the absence of mental disorders (Herrman et al., 2005), but a holistic wellbeing that include emotional, psychological, and social balance (Keyes, 2002)

In recent years, there has been an increasing global awareness of the mental health crisis among doctoral students (e.g.: Barry et al., 2018; Hazell et al., 2020; Jackman et al., 2022). Studies conducted in several countries and regions, including the United States, Europe and Australia, have shown the prevalence of mental health problems in this population, with wide-ranging and far-reaching impacts on their personal well-being, academic performance and the productivity of research institutions.

Levecque et al. (2017) conducted a large-scale study among PhD students across various disciplines, found that nearly half of the participants reported experiencing psychological distress, with 32% at risk of developing a psychiatric disorder. Students often contend with high academic demands, uncertain career prospects, and pressure to produce significant original research (Zhang & Zhao, 2022).

Several factors have been identified as contributors to poor mental health among doctoral students. Firstly, the isolating nature of doctoral work often leads to feelings of loneliness and detachment, which can exacerbate mental health problems (Pifer & Baker, 2016; Jairam & Kahl Jr., 2012). Additionally, the competitive environment within academia fosters a high level of comparison and self-doubt, sometimes leading to imposter syndrome (Craddock et al., 2011). Financial instability is another significant stressor, as many doctoral students receive limited funding, leading to economic pressure that can heighten anxiety and reduce overall well-being (Barry et al., 2018; Levecque et al., 2017). The supervisory relationship also plays a critical role in the mental health of PhD students. Effective mentorship has been associated with lower levels of psychological distress, whereas poor supervision can increase stress levels (Jin & Yang, 2021; Liu et al., 2019; Zhang & Zhao, 2022). Finally, career uncertainty and concerns about the future employment prospect also add to the anxiety level of doctoral students, especially in such a growing competitive academic job market (Evans et al., 2018; Sverdlik et al., 2018a)

There is a crucial need for targeted interventions to support doctoral students' mental health. Barry et al (2019) implemented a mindfulness intervention that showed only modest short-term effects on stress and anxiety, indicating the need for more complete support strategies. Other researchers indicate that early interventions and support policies that give priorities to mental health awareness and prevention strategies within academic institutions are critical (Metcalfe et al., 2018). Mental health governance is urgently required to prevent and mitigate mental health problems in doctoral students. It also clarifies that public management research is Scarce, even more so in relation to dynamic models.

1.2 Problem statement in China

In China, the mental health issues of doctoral students are particularly prominent (Feng, 2021; Jin & Yang, 2021). While doctoral students in China need to deal with the same pressure that impact their peers across the world, the characteristics of cultural, economic background and education system distinguishes additional psychological pressure that Chinese doctoral students face.

The growth of higher education in China has produced a highly competitive atmosphere (Zeng & Zhang, 2023; Zhao, 2022), where achieving academic success is closed attached to

personal identity and social expectations. The motivations to succeed are not limited to personal aspirations but more to live up to familial and societal expectations. In addition, China aims to present itself as a global leader in innovation and research, thus doctorate students undertake more pressure to conduct high impact research that can advance the national goal (Wei & Liu, 2015). These pressures, coupled with limited access to mental health resources and support network, make Chinese doctorate students susceptible to mental health problems. This stated issue has become a pressing social concern (Jin & Yang, 2021).

As the prevalence and severity of the mental health issues increase, this not only affects the individual wellbeing of students, but also poses challenges to the entire education system and research system (Feng, 2021). Although some psychological support measures exist, these measures are often insufficient to cope with the complex and changing environment faced by doctoral students (Zhang & Zhao, 2022).

As seen both from globally and from China, doctoral mental health problem has been of great concern of individuals, institutions and society, which worths of research from new dimensions and perspectives. This is the point at which this study began, a new perspective of Dynamic Performance Governance (DPG) on the collaborative setting is embraced to tackle the complexity and particularity of the doctoral students 'mental health issue, which is also necessary and urgently needed due to the prevalence and severity of the mental health issues around the world and specially in China.

Collaborative governance refers to a governance approach where various stakeholders from different sectors work together to achieve shared goals through consensus-oriented decision-making process (Ansell & Gash, 2008). Comparing to other single dimensional approaches, collaborative governance approach is typically used to solve complex public issues, which perfectly fits into our research scenario where multiple stakeholders are involved in the doctoral student's mental health issue.

A DPG approach is employed to identify the cause-and-effect relationships that lead to mental health problems for doctoral students. This strategy considers various intangible parameters, such as social expectations, stress levels, satisfaction, career uncertainty prospect, and various factors which are essential to attaining sustainable results and policy suggestions for interventions of mental health issues of doctoral students. In addition, DPG charts and

Causal Loop Diagrams (CLD) are also constructed to show the comprehensive map of the feedback structure of the mental health issue system, which makes DPG approach stands out of many other approaches when it comes to research about Doctoral mental health problems.

1.3 Research objectives

The main objective of this study is to analyze, from the perspective of the DPG, which interventions can help prevent and mitigate mental health problems among doctoral students in China. The research aims to support decision makers to create sustainable policies, and decision makers to execute the policies effectively, to enhance the community wellbeing and research system in general. In addition, this research explores how collaborative governance can contribute to addressing this issue and counteract the mental health issues and enhance community sustainability.

To fulfill its objective, this research pursues those secondary objectives:

1. Examine the key factors that influence mental health outcomes of doctoral students and employ system dynamics to analyze the interrelationships between.

2. Evaluate the impacts of mental health toward personal wellbeing, educational performance, and research productivity.

3. To propose governance strategies that fit different stakeholders from various sectors, which can foster mental health outcomes, and promote a resilient research environment.

1.4 Research strategies:

This research adopts a combined method of quantitative and qualitative research methodology.

1.4.1 Secondhand data quantitative research

Quantitative research is a research methodology based on numerical data and is usually used to measure the prevalence, magnitude, and relevance of a phenomenon (Bryman, 2016). Quantitative research collect data through experiments, surveys and questionnaires, among others, and after that uses statistical analysis to draw conclusions, focuses on solving the questions of “how much” and “what effect” (Creswell, 2014)

To reach the above goals, this research will adopt secondhand survey data to perform quantitative analysis, which is derived from a highly authoritative source: *Nature*. The *Nature* team has run a biennial PhD career survey since 2011, and we adopt the data from the latest "Nature PhD Survey 2019". The online survey was developed in collaboration with Nature and sent to their database and subscribers via several channels. It was translated into 4 languages in addition to English to boost response in specific regions. A usable sample of 6320 out of a total number of 14260 responses was selected to present the survey results; all the respondents were current PhD students by the time of year 2019 from across the world.

The reason why this research adopts secondhand data is: Nature's survey covers a wider range and reaches a larger target population. It is difficult for an ordinary researcher or organization to obtain more than 6,000 valid data from worldwide. Furthermore, credibility is ensured through rigorous data collection methodologies by *Nature* and reinforced by the source's recognized expertise and reputation in the field. In this way, the data's accuracy and applicability are more ensured than any survey the writer can conduct.

The large dataset will be used to analyze and quantify the distribution, relationship, and influence between the phenomenon and variables of doctoral mental health issues. The main findings from data analysis will be described and supported by numerical evidence, for example, graphs and charts. In addition, the high influencing factors will be used later for the construction of Causal Loop Diagrams and Dynamic Performance Governance Models.

There are pros but also cons to adopting quantitative research. Quantitative research uses standardized tools and statistical methods to enhance objectivity and reduce subjective bias (Creswell, 2014), but at the same time has difficulties in capturing the complexity and deeper reflection of personal experiences (Barry et al., 2018). For mental health problems, it is more subjective to complex personal feelings and deep meaning. Thus, a qualitative research method is also used in this study to fill out this shortcoming of quantitative research.

1.4.2 Firsthand data qualitative research:

Qualitative research is an exploratory research methodology that aims to investigate the causes, perspectives, and complexities inherent in phenomena (Patton, 2015). It adopts many ways to collect texts or non-numerical data, such as the use of observations, focus groups, group modeling, in-depth interviews, and more (Bryman, 2016). These mediums can help

the researchers to understand more in-depth about the subjective experiences and social contexts of the research participants or subjects. Qualitative research focuses on the questions of “how” and “why”, instead of “how much" (Denzin & Lincoln, 2011).

In addition to the second data source, a set of semi-structured interviews, as a qualitative research method, will be conducted to obtain firsthand data. The interviewees are doctoral students who are in the middle of their doctoral education in China, and who had finished doctoral education and graduated within three years in China. The interviewees are selected from different disciplines and backgrounds to enhance the applicability of the interview data. In addition, the semi-structured interview questions will be extracted from literature to be consistent with established standard research, to make sure of the credibility and reliability of the data.

Undoubtedly, there are also pros and cons as it comes to qualitative research, for example, the amount of subjectivity is hard to monitor, and the research results might be influenced by the prejudices of the research participants. Therefore, this research adopts a combined method of quantitative and qualitative research, which to the most extent enhanced the objectivity and in-depth complexities of the research.

The main research questions rooted in this research are built upon the above research objectives:

1 What are the main factors that influence doctoral students’ mental health outcomes?

2 How do doctoral students’ mental health outcomes affect personal wellbeing, academic performance and research productivity?

3 How do mental health challenges among doctoral students' impact China’s educational and research systems? And what are the systemic factors contributing to and perpetuating these challenges?

4 What are the primary stressors (cultural, societal and policy driven factors) for doctoral students in China, and how do they differ from those in other countries?

5 How can the employment of Dynamic Performance Governance help to mitigate the doctoral students' mental health issue in Chinese context?

1.5 Research significance

This study targets to contribute both at a theoretical and practical level.

1.5.1 Theoretical significance:

The focus of current research about doctoral mental health is about influencing factors analysis, and intervention solutions proposals which are rigid, static, and single dimensional. This study will present a new perspective for the academic discussion of doctoral students' mental health issues, especially in the Chinese context. By introducing a DPG approach, this thesis adopts a flexible, system-based approach that integrates dynamic modeling, continuous feedback and strategic alignment (Bianchi, 2016), to analyze the doctoral students' mental health issues, which can contribute to the resilience of the research institutions and education systems.

The DPG approach combines system dynamics and governance frameworks to dynamically analyze and regulate performance elements in complex systems. Applying DPG to doctoral mental health research firstly contributes to a deeper theoretical understanding of the systemic factors influencing mental health. While traditional mental health research usually analyzes single variables or independent factors from a static perspective, the DPG approach, through tools such as feedback loops and causal diagrams of system dynamics, views doctoral students' mental health as a dynamic system consisting of multidimensional factors (e.g., academic pressure, financial instabilities, and social expectations) interacting with each other, so as to reveal the interactions of these factors and their overall impact on mental health (Bianchi, 2016). The application of DPG can help to gain a deeper understanding of the mechanisms of mental health problems by constructing Causal Loop Diagrams and dynamic models to reveal the feedback relationships and key 'leverage points' between these factors (Sterman, 2000).In addition, the application of DPG theory can help academic organizations to understand the role of mental health in the education system in a more comprehensive way, which in turn can contribute to the further development of mental health governance research.

1.5.2 Practical significance

From the practical point of view, this research aims to propose a dynamic, flexible and multidimensional perspective of doctoral students' mental issue in China. With the assistance of DPG modeling, key stakeholders are involved in the decision making process in which

shows a comprehensive and clear map of the problem of the statement, and reveals the dynamics changes of the system, which enable decision makers to create sustainable policies for the students community and enable policy practitioners to conduct the policies in a more friendly way. In practice, the DPG approach can provide data-driven decision support for mental health management in universities. Through the DPG model, universities can identify key factors affecting the mental health of doctoral students, such as workload, financial support, supervisor relationship, and career development prospects. The dynamic feedback mechanism allows universities to monitor changes in these factors and policy feedback and take early preventive measures to avoid exacerbation of mental health problems. This governance approach not only helps universities optimize resource allocation and enhance the effectiveness of mental health services but also enhances the university's responsiveness to students' needs and reduces the negative impact of mental health problems on doctoral students' academic performance.

In addition, through the implementation of DPGs, universities can promote mental health interventions more effectively and reduce the risk of doctoral students dropping out or abandoning their research due to mental health problems, thus contributing to the stability of the academic system and the ability to innovate. This has far-reaching implications for enhancing the overall well-being and academic output of doctoral students, especially in countries such as China, where mental health problems among doctoral students have become an important factor affecting the sustainability of the education system as the scale of doctoral education expands.

1.6 Scope of the study

This study is divided into two perspectives, global and China, but also these two dimensions are inseparable. By studying the globalized issue of doctoral students' mental health, a DPG research model is formed, and will be refined and applied to the study of doctoral students' mental health in the Chinese context. China's doctoral mental health problem has its unique cultural, economic, and structural characteristics, and by studying and refining the content of these specificities, the existing DPG research model can be enriched. This study strives to propose a more systematic, resilient, and sustainable solution on the basis of this extended model.

Global context:

In the global dimension, this study adopts the data from the Nature PhD Survey 2019 implemented by Nature, through which the data from the survey results are used to distill the influencing factors and outcomes of doctoral students' mental health, and to examine the dynamic relationship between these factors through literature reviews. Based on this, this paper will create a causal loop diagram about the mental health problems of doctoral students to build a dynamic system of multiple factors interacting with each other, thus revealing the overall impact of the interaction of these factors on mental health. In addition, this study will construct a dynamic performance governance model that will allow researchers and institutional administrators to monitor and evaluate key indicators of doctoral student mental health, optimize resource allocation, and influence the outcome of policy implementation. The results of this assessment will be used again to adjust the allocation of strategic elements to achieve dynamic equilibrium.

Chinese context:

In the Chinese context, this study will conduct semi-structured interviews with about 12-15 Chinese doctoral students who are currently studying or have graduated within 3 years and use this to distill the specific influences and performance drivers that affect the mental health of Chinese doctoral students. These new factors will be incorporated into the established dynamic performance governance model to provide a more comprehensive understanding of the mental health issues of doctoral students in China's specific context. This study also applies the collaborative governance model to the mental health governance issue, as it involves the collaboration of multiple sectors, including education management, social mental health services, and economic policy support, to optimize the allocation of resources to provide systematic and effective mental health support for doctoral students. This interdisciplinary governance model ensures the optimal allocation of resources for mental health services and improves overall effectiveness (Emerson et al., 2012).

It is worth noting that the dynamic model constructed in this study is a dynamic performance governance model, not a system dynamics model. The reason for not constructing a system dynamics model is due to the limitations of the research on this issue, in addition to the fact that dynamic governance models are already well suited to help study this issue. System

dynamics models usually use the structure of inventory and flow to simulate the dynamic behavior of the system and require a large amount of historical data and longitudinal study data to support the construction of the model. Mental health problems, on the other hand, as an intangible parameter, involve many parameters that are also intangible, and it is difficult to conduct parameter construction through questionnaire data and semi-structured interview data. Perhaps textual data can be quantified through the Lister scale, but it can only show the static data at a single time, not the longitudinal historical data. This limitation determines that this study is not applicable to system dynamics modeling, while dynamic performance governance modeling can solve this problem well.

1.7 Thesis structure

This research is divided into 6 chapters, as follows:

Chapter 1 presents an overview of the current state and context of mental health issues among doctoral students globally. First, a brief review of the prevalent mental health challenges faced by doctoral students during their academic careers is presented, including phenomena such as anxiety, depression, and burnout, as well as the global prevalence of these phenomena. Meanwhile, complex factors affecting the mental health of doctoral students, such as academic pressure, financial instabilities, and insufficient social support, are being demonstrated. Then, focusing on the specific situation in China, this chapter analyzes the unique challenges of mental health of Chinese doctoral students under the rapid expansion of higher education and the added social expectations, which further leads to the core questions and research implications of the study. Finally, the research objectives, research methodology, and research structures of this dissertation are clarified.

Chapter 2 will review the existing literature and relevant studies about mental health of doctoral students. First, it will analyze the influencing factors, symptomatic manifestations, and possible intervention strategies for doctoral students' mental health problems from a global perspective. Then, studies related to the mental health of doctoral students in China will be explored, including the effects of China-specific cultural backgrounds, educational systems, and family expectations on mental health. Subsequently, the theoretical frameworks of Dynamic Performance Governance (DPG) and System Dynamics will be introduced to explore their potential application in the governance of complex mental health problems. The

goal of this chapter is to construct a solid theoretical foundation for this study and to explore the potential for applying DPG in mental health research.

Chapter 3 will provide the methodologies adopted in this research, which involves a combined application of Dynamic Performance Governance, System Dynamics, and Collaborative Governance. Firstly, the central role of the adoption of DPG is illustrated, exploring how it can help to analyze and intervene in PhD students' mental health issues through system modeling and performance monitoring. Next, the steps of constructing a Causal Loop Diagram will be described, including the selection of key variables. This chapter will also introduce the data collection method that is being used in this research, for example surveys and interviews.

Chapter 4 will provide an in-depth analysis of the causes and influences of mental health among doctoral students worldwide. Firstly, the mental health challenges faced by doctoral students globally will be analyzed and interventions and support systems in different countries will be discussed. Along with the analysis, the Nature 2019 survey results will be used to analyze as well as to extract factors to construct a CLD diagram to present a dynamic and comprehensive overview of the problem. With the assistance of CLD, a Dynamic Performance Governance model will be formed to track strategic resources, performance drivers and end results, and to analyze the effects of intervention strategies and policies.

Chapter 5 will explore the unique pressures faced by Chinese students when it comes to mental health problems, such as family and social expectations, supervisory relationships in Confucius cultural background, job uncertainties, and other factors will be analyzed in the context of China's educational, social and cultural background. The quantitative and qualitative research will be explained in detail in this part. Moreover, a new causal loop diagram and DPG model will be constructed on the basics of the established models from chapter 4 and the Chinese context analysis, to show the dynamic interactions of these factors, and show the impact of intervention strategies in Chinese context. The analysis will provide institutions and policy maker in China with a more comprehensive options to address the complexity of this doctoral mental health issues.

Chapter 6 will summarize the key findings of the study and make policy and practice recommendations. First, it reviews the dynamic factors of doctoral students' mental health

and their interactions as revealed by this study through the DPG model and system dynamics. Then, policy recommendations are presented. Second, the theoretical and practical contributions of the study will be elaborated. Finally, the chapter will explore the limitations of this study and directions for future research, emphasizing the need for further research and improvement in the governance of the issue.

Chapter 2 literature review

The goal of this chapter is to review current research regarding health, mental health, and well-being, with particular focus on doctoral students and education. It also elaborates on how dynamic performance governance can help enhance the mental well-being of doctoral students.

By exploring current definition, theoretical models, and empirical findings, this chapter is defined to establish a foundation for mental health and academic education, and to identify the gaps of current studies and justify this research.

2.1 Health and well-being

2.1.1 Definitions and research about health and well-being

Health and well-being are major topics in academia research, public policies, and social practices. There are varied definitions, attributes of health, and well-being. “A state of complete physical, mental, and social well-being and not merely the absence of disease or infirmity” (World Health Organization, 1948) is how the World Health Organization (WHO) defines health in its constitution. This concept transcends the limited view of health in conventional medicine and highlights the diversified nature of health.

The following three fundamental dimensions can be used to categorize the diverse attributes of health: physical health, mental health, and social health (World Health Organization, 1948). Those attributes are interrelated and interacting, together determining individuals' health status. Physical health includes preventing sickness, maintaining body functioning and upholding biological indicators (Blaxter, 2003; Hahn & Truman, 2015; Vuorisalmi et al., 2006). Mental health emphasizes the capacity to balance social adaption, emotional regulation, and cognitive ability (Keyes, 2002). Social health focuses on social networking, social support, and social adaption abilities (Berkman et al., 2000). Various research has proved the interrelations between physical health and mental health.

Health is not only determined by genetics and personal behavior, but also significantly impacted by societal and environmental factors. WHO demonstrated the theory of social determinants of health (SDOH), which noted that social factors such as gender, wealth

distribution, education level, cultural background, and environmental circumstances are especially significant for the long-term effects of health. Marmot (2005) also indicates social determinants such as social and economic status, cultural background deeply influences individuals' health and well-being, and the negative correlation between poverty and health outcomes, therefore public policy should improve to take those social determinants of health into considerations for further interventions and solutions (Marmot, 2005).

Well-being is a multi-dimensional and multi-disciplinary but also dynamic concept, and the research interest in this field started in the 1950s. It is initially focused on economic indexes such as GDP, to evaluate societal development. However, the improvement and promotion of wellbeing is indeed the primary goal of sustainable development, instead of economic development, which is just an important measure to achieve the goal.

Its definition and measurement vary in different fields of study. Many researchers use different words and models to capture the complexity of the concept. In psychological research fields, well-being is considered subjective, a balance between three components: life satisfaction, positive effect, and negative effect (Diener et al., 1999). In the fields of sociology and economics, more attention is on objective well-being, such as the economics of happiness (Casinillo et al., 2021; Stutzer & Frey, 2012), social determinants (Marmot, 2005). Objective well-being is often based on social and economic statistics, such as health, education and incomes, and are often measured by indexes such as the human development index (HDI) (United Nations Development Programme, 2015).

Economic indicators were the focus of early well-being research, which progressively evolved into a multifaceted framework. According to Sen (1999), fundamental necessities, capacity building, and social support are all essential components of well-being(Sen, 2001). For instance, according to Maslow's (1954) hierarchy of needs theory, social capital and education offer the capacity to attain well-being (Maslow, 1954), but meeting physiological, safety, and belonging needs is the foundation of well-being (Bjørnskov, 2003).

In recent years, there are more research about the relationships between ecosystems and human well-being, which highlights the environmental impacts on human being's life quality

(Huang et al., 2016). The United Nations' Millennium Ecosystem Assessment (2005) shed light on the crucial role of ecosystem services in human well-being, underscoring the impact of factors such as resource quality and green space on health and happiness (Millennium Ecosystem Assessment, 2005). For instance, climate change and biodiversity loss have the potential to diminish the quality of ecosystem services, which could, in turn, pose a challenge to well-being (Costanza et al., 2014).

Well-being research is moving towards multi-level and interdisciplinary integration; therefore, future studies should investigate the variations in well-being under different cultural backgrounds and specific populations in unique fields. In addition, incorporating well-being into the policy framework and assisting policy makers in creating people-oriented policies are also important objectives of well-being research (Kates et al., 2001).

Health and well-being are closely related, but not exactly the same. Health is an important foundation for achieving well-being, and improving well-being in turn encourages better health. According to Marmot (2005), individual health and well-being are significantly impacted by social determinants, including socioeconomic status, cultural background, and environmental circumstances (Marmot, 2005).

2.1.2 The importance of health and wellbeing

Health and well-being are fundamental parts of human life. The importance of health and well-being is multi-level, including impacts on the individual, societal, and global scales.

For individuals, physical health is the milestone of overall well-being, motivating them to engage in daily activities and accomplish personal objectives. The quality of life of people is directly influenced by their health and well-being, which have a substantial impact on their mental and social skills in addition to their physical condition. Research indicates that physical activity significantly reduces the risk of anxiety and depression while improving wellbeing and cognitive function (Rebar et al., 2015; Schuch et al., 2018). In addition, healthy eating and enough sleep are significant factors in sustaining psychological stability and fostering well-being (Chaput et al., 2018; Jacka et al., 2017; Spencer et al., 2017).

According to Ryff and Singer (1998), those who are happier tend to be more socially adaptive and psychologically resilient (Masten, 2001), when faced with difficulties (Ryff &

Singer, 1998). In the workplace, for instance, workers who are in good health and well-being conditions tend to be more productive and satisfied with their careers, and they are also less likely to experience burnout (Bakker & Demerouti, 2007; Huppert, 2009). Additionally, studies have shown that people who are happy are more inclined to engage in social welfare initiatives, which strengthens their feeling of self-worth and interpersonal relationships (Keyes, 2002; Wilson, 2012).

At the societal level, social stability and economic growth are significantly influenced by health and well-being. According to Bloom and Canning (2000), a healthy workforce not only has higher productivity and lower work absence rate, but also more adapted to complex tasks and working pressure. In addition to this, a healthy workforce also lowers social welfare and health care expenses (Bloom & Canning, 2000). According to research, funding public health initiatives (including immunization and health education) can greatly slow the spread of disease, enhance societal health generally, and make national economies more resilient.

In societal level, health and well-being are key factors for social stability and economic development. A healthy workforce not only increases productivity but also reduces health care costs and social welfare burdens (Bloom & Canning, 2000). Research shows that investing in public health programs (such as vaccination and health education) can significantly reduce the spread of disease, improve the overall health of society, and increase the resilience of national economies (Jamison et al., 2013).

Furthermore, high levels of social well-being can reduce crime rates and social inequality problems (Marmot, 2005). For example, strong social support networks in a community can reduce the incidence of violent crime while improving the living conditions of disadvantaged groups (Wilkinson & Pickett, 2009). Social equity and inequality in health distribution are also core issues in well-being research, especially in low- and middle-income countries, where insufficient public policy investment in health will further exacerbate social stratification (Solar & Irwin, 2010).

In the context of globalization and climate change, the role of health and well-being is becoming increasingly important. Global health initiatives, such as the Global Program to Fight Infectious Diseases, demonstrate that improvements in health and well-being not only

save lives but also contribute to global economic growth (World Bank, 2016). For example, during the 2014 Ebola epidemic, deficiencies in the public health system not only affected West African countries but also caused ripple effects on the global economy and security (Gostin & Friedman, 2015).

Health and well-being are also important foundations for combating climate change. Studies have pointed out that natural disasters and ecological damage caused by climate change will significantly affect human health, including psychological stress, malnutrition, and disease transmission (Watts et al., 2018). Therefore, strengthening global cooperation and promoting green and healthy development and environmental protection policies are crucial to achieving sustainable development goals (United Nations, 2015).

2.2 Mental health

2.2.1 Defining mental health

Mental health has increasingly been understood as a multidimensional construct that encompasses more than the absence of psychological disorders. The World Health Organization (WHO, 2004) defines health as "a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmity." This holistic view situates mental health as an essential component of overall health, interlinked with physical and social domains. Similarly, the American Psychological Association (American Psychological Association, 2025) emphasizes that positive mental health represents a state of emotional well-being and behavioral adjustment characterized by resilience, autonomy, and the ability to form meaningful relationships. Both definitions converge on the idea that mental health is dynamic and context-dependent, involving the capacity to adapt, function productively, and contribute to one's community.

Mental health cannot be reduced to pathology or symptoms of absence. Instead, it must be understood as a continuum that reflects the equilibrium between an individual's internal states and their environmental context. This broader conceptualization provides the foundation for key theoretical frameworks that inform contemporary mental health research and practice.

2.2.2 Conceptual frameworks of mental health

2.2.2.1 The Dual Continua Model: Mental Health and Mental Illness as Distinct Dimensions

The Dual Continua Model (Westerhof & Keyes, 2010) has become a cornerstone of positive psychology and modern mental health theory. Contrary to earlier models that positioned mental health and mental illness on a single bipolar continuum, this framework posits two correlated but distinct continua. One represents the presence or absence of mental illness, while the other represents levels of positive mental health. According to this model, the absence of mental illness does not necessarily imply the presence of mental health (Barry, 2013); individuals may be free of diagnosable disorders but still experience low well-being or "languishing" (Keyes, 2013a).

Within this framework, positive mental health comprises three interrelated dimensions:

- Emotional Well-being (Hedonic): Encompasses positive affect, happiness, and life satisfaction, focusing on subjective experiences of pleasure and balance between positive and negative emotions (Danner et al., 2001; Hernández-Torrano et al., 2020).
- Psychological Well-being (Eudaimonic): Emphasizes optimal functioning and personal growth, including autonomy, self-acceptance, purpose in life, and mastery over one's environment (Ryff & Singer, 1998).
- Social Well-being: Extends the notion of well-being to the societal level, reflecting individuals' perceptions of their social integration, contribution, and coherence within communities (Keyes, 1998, 2005)

Based on these dimensions, individuals can be classified as flourishing (high levels of well-being and absence of mental illness), moderately mentally healthy, or languishing (low well-being without mental illness). Empirical studies have shown that flourishing individuals tend to experience better physical health, greater productivity, and lower healthcare utilization compared to those who are languishing (Keyes, 2002). This model thus underscores that fostering mental health requires promoting well-being, not merely preventing illness.

2.2.2.2 Ecological and Systemic Frameworks: Contextual Determinants of Mental Health
While the Dual Continua Model focuses on individual-level functioning, ecological and systemic frameworks emphasize that mental health is shaped by complex, multi-level interactions between individuals and their environments. Rooted in Bronfenbrenner's (1979) ecological systems theory, these frameworks conceptualize mental health as dynamically influenced by nested systems, from the immediate microsystem of family and peers to broader macrosystemic factors such as culture, socioeconomic policy, and societal norms (Bronfenbrenner, 1979).

- The Socio-Ecological Framework extends this idea by organizing determinants of well-being into hierarchical levels:
- Individual factors, such as coping skills, self-esteem, and biological predispositions.
- Interpersonal factors, including family relationships, social networks, and support systems.
- Community and institutional contexts, such as workplace culture or educational environments.
- Societal and policy influences, including public health policies, socioeconomic inequalities, and cultural attitudes toward mental illness.

This perspective underscores that interventions aimed at promoting mental health must operate at multiple levels simultaneously. For example, individual therapeutic approaches may be complemented by community-based programs and policies that address systemic barriers to well-being.

The salutogenic model (Antonovsky, 1979) offers an alternative lens by focusing on the origins of health rather than the causes of disease (pathogenesis). Central to this approach is the concept of the Sense of Coherence (SOC), defined as the extent to which individuals perceive their lives as comprehensible, manageable, and meaningful. High SOC is associated with greater resilience and adaptability in the face of stress, making it a key psychological resource for maintaining mental well-being. Rather than framing mental health through a deficit-based lens, the salutogenic approach emphasizes resource-building and empowerment, which aligns closely with positive psychology's emphasis on flourishing and growth (Antonovsky, 1979).

2.2.2.3 Synthesis and Implications

Taken together, these frameworks reveal that mental health is a multi-dimensional, contextually embedded, and dynamic construct. The Dual Continua Model highlights the internal and subjective dimensions of well-being, while ecological and salutogenic frameworks situate these experiences within broader environmental and systemic contexts. The convergence of these perspectives suggests that effective mental health promotion requires both intrapersonal development (e.g., enhancing emotional and psychological resources) and structural change (e.g., fostering supportive communities and equitable policies).

In research and practice, this integrated understanding calls for approaches that move beyond symptom reduction toward holistic well-being promotion. This includes addressing environmental determinants such as poverty, discrimination, and social exclusion, while simultaneously cultivating individual strengths and resilience. Ultimately, mental health must be understood as a dynamic balance between the self and the social world, the one that supports human flourishing in its fullest sense.

2.3 Mental health as a wicked problem

2.3.1 Wicked problem

The term “wicked problems” is often used in public management studies, but it was first introduced by Rittel and Webber (1973) on a classic paper “Dilemmas in a General Theory of Planning”. They pointed out that traditional “tame problems” can be solved by linear and straightforward solutions, but complex problems in the fields such as public policies and urban planning are fundamentally different, which can be called “wicked problems”. Wicked problems feature no clear boundaries, no ultimate solutions, irreversible and uniqueness (Rittel & Webber, 1973).

This term has been applied in several research since then. Following scholars further developed the theoretical framework of “wicked problems”, emphasizing its connection with multi-stakeholder opinions, uncertainty and social complexity. Scholars in the public management field broadly applied this concept into governance and policy issues, especially those challenges that need multi-sector collaboration and adaptive policy making. Conklin (2006) indicated that wicked problems are closely connected with social

complexity and need to be solved through collaboration and dialogues (Conklin, 2006). There are other researchers who combined wicked problems with the theory of complex adaptive systems (CAS), arguing that its solution requires dynamic adaption and iterative learning (Snowden & Boone, 2007).

Collaborative governance is considered as the mainstream solution pathway, emphasizing cross-sectoral cooperation and coordination of interests (Ansell & Gash, 2008). A number of other methodologies were given to cope with ‘wicked problems'. For example, system thinking should be adopted to analyze interrelations of problems. Transition management theory indicates that experimental intervention can push forward systemic changes. Design thinking theory emphasizes iteratively exploring user-centered solutions.

Social "wicked" problems (e.g. unemployment, poverty, crime, homelessness, pollution) are a significant source of fragmentation in public policy design and implementation, leading to poor community outcomes (Bianchi, 2021). Mental health is a worldwide acknowledged social "wicked" problem, or at least increasingly recognized social ‘wicked problem’, a complex issue that is resistant to linear and straightforward solutions because of its interrelations with multi-sectoral factors. Mental health challenges showcase key features of the concept of ‘wicked problems’ introduced by Rittel and Webber (1973), which are ambiguity, stakeholder conflicts, and interdependencies.

2.3.2 Mental health as a wicked problem

Mental health, when viewed through a systemic lens, can be understood as a “wicked problem”. This classification captures the intricate interdependencies between individual experiences of mental distress and broader social, institutional, and structural determinants. Framing mental health as a wicked problem is particularly relevant in contexts such as doctoral education, where individual psychological struggles are often intertwined with institutional pressures, precarious employment conditions, and societal expectations around productivity and success.

Wicked problems are defined by their multidimensional nature, spanning across multiple levels, actors, and sectors (Head & Alford, 2015; Lægreid & Rykkja, 2014). Mental health fits this description, as it cannot be neatly contained within the boundaries of a single discipline, organization, or administrative system. Rather, it operates across personal,

relational, institutional, and societal domains (Bianchi & Williams, 2015; Lægreid & Rykkja, 2014). For example, in the context of PhD education, structural issues such as academic culture, supervisory relationships, and institutional policies contribute to individual mental health outcomes. These factors interact dynamically, producing feedback loops that make simple interventions, such as providing more counseling services, insufficient to address underlying causes. Instead, an ecological approach is needed, one that situates mental health within the wider environment of social, economic, and institutional influences(Berry et al., 2020; Satinsky et al., 2021; Wilkins-Yel et al., 2024).

Another defining feature of wicked problems is the ambiguity surrounding their definition and the competing values involved in potential solutions (Head & Alford, 2015). Mental health is not a universally agreed-upon concept; it is interpreted through medical, psychological, social, and cultural lenses, each carrying distinct value assumptions. In the case of PhD students, for example, what constitutes "well-being" may vary among stakeholders: universities might prioritize productivity and completion rates, whereas students may emphasize personal fulfillment and balance. Solutions to mental health challenges are therefore not judged as "true or false" but as "good or bad," depending on the normative frameworks and institutional priorities of those involved. This value of pluralism complicates policymaking and intervention design, often resulting in fragmented or contradictory approaches.

Bianchi emphasized that ignoring the dynamic complexity of wicked problems often leads to policy resistance, where well-intentioned interventions produce unintended consequences (Bianchi, 2016, 2021; Bianchi & Rivenbark, 2014). In mental health, policy responses that treat symptoms rather than systemic causes can reinforce the very conditions they seek to improve. For instance, policies that focus narrowly on individual resilience or stress management without addressing workload, financial insecurity, or systemic inequities may inadvertently shift responsibility away from institutions and toward individuals (Bianchi & Williams, 2015). This phenomenon has been observed in higher education, where well-being programs coexist with intensifying academic pressures, creating a paradoxical environment that may exacerbate mental strain rather than alleviate it.

Given their complexity and scope, wicked problems require collaborative and cross-sectoral approaches (Head & Alford, 2015; Klijn & Koppenjan, 2000; Peters & Pierre, 1998). No single institution or discipline can effectively manage the systemic dimensions of mental health. Collaborative governance models, which brings together universities, health services, policymakers, and community organizations, are increasingly recognized as essential to tackling mental health challenges holistically (Ansell & Gash, 2008). In doctoral education, this might involve integrating mental health considerations into research training, supervisory practices, and institutional cultures, rather than isolating them as peripheral support services. Such collaboration demands shared responsibility and a long-term commitment to systemic change, emphasizing collective learning and adaptability.

Viewing mental health as a wicked problem highlights the need for integrated, systemic, and collaborative approaches that move beyond traditional, isolated responses. In contexts like PhD education, where personal and institutional factors are deeply interwoven, this framework helps illuminate why mental health interventions often fall short and how more sustainable, multi-level strategies might be developed. Recognizing mental health as a complex, value-laden, and dynamically resistant issue encourages a shift from reactive problem-solving toward continuous, cooperative learning and systemic reflection.

2.4 Mental well-being of Doctoral students

2.4.1 Characteristics of doctoral education system globally and in China

The doctoral education system has undergone significant transformation worldwide, shaped by changing academic structures, career expectations, and institutional frameworks. While globally there exists substantial diversity in how doctoral education is organized and delivered, China's system stands out for its unprecedented expansion and centralized governance. Understanding these contrasting systems provides critical insight into the evolving landscape of doctoral education and its implications for academic culture, research quality, and student well-being.

Doctoral education across the world varies widely in structure, duration, and purpose. In North America, PhD programs typically span five to seven years, often incorporating substantial coursework, comprehensive examinations, and postdoctoral training, especially

in the sciences (Golde & Dore, 2001). In contrast, the UK and Australia favor shorter, research-intensive models emphasizing dissertation work over formal coursework (Sverdlik et al., 2018b). Many European countries, such as Sweden, integrate structured research publication requirements prior to dissertation submission, reflecting an increasing focus on scholarly productivity and research dissemination(Andres et al., 2015)

A defining trend in global doctoral education is massification, the rapid increase in doctoral enrollment worldwide (Andres et al., 2015; MacMillan et al., 2023). According to the OECD (2021), PhD student numbers in developed nations have risen by approximately 40% over the past two decades (Pizuńska et al., 2021). This expansion has been driven by both governmental investment in knowledge economies and the growing perception of doctoral education as a means of economic mobility. However, the growing number of doctoral graduates has far outpaced the availability of academic positions, resulting in a major shift in career trajectories (Germain-Alamartine, 2019; Guerin, 2020). In most developed countries, including the United States, Canada, and those in the European Union, between 60% and 75% of PhD graduates now pursue non-academic careers (Pyhältö et al., 2025). This shift challenges traditional assumptions that doctoral education primarily prepares students for academia, highlighting the need for broader, more transferable skill development and redefinition of doctoral outcomes.

Institutional models further differentiate doctoral experiences. For example, in Sweden, PhD candidates are considered employees of the university, enjoying formal salaries, full labor protections, and guaranteed funding for the entire four-year duration (Keloharju et al., 2024; Levecque et al., 2017). This structure ensures stability and allows doctoral candidates to integrate more fully into the research community as professionals rather than students. In contrast, U.S. doctoral programs often rely on competitive funding through assistantships and fellowships, creating uneven financial support and prolonged completion times (Levecque et al., 2017). The U.S. system’s combination of public and private funding contributes to institutional inequality and variable student experiences, reflecting broader socioeconomic disparities within higher education.

China’s doctoral education system is both a reflection of its historical legacy and a product of its rapid modernization. Following massive higher education reforms initiated in 1998,

China experienced unprecedented expansion, becoming the world's largest higher education system (Gu et al., 2018). The gross enrollment rate reached 51.6% in 2019, marking its entry into the universal higher education stage (Ministry of Education of the People's Republic of China, 2020). With over 100,000 doctoral students enrolling annually and more than 380,000 total PhD candidates by 2018, China's growth has been described as "massification at scale" (Ma et al., 2024).

Governance in Chinese higher education remains highly centralized, reflecting its roots in the state bureaucratic tradition. Historically, universities functioned as instruments of the state, designed to produce officials and intellectuals aligned with national goals (Yang, 2013). Although reforms have increased institutional diversity, decision-making power largely resides with the Ministry of Education, which appoints presidents of leading universities and maintains strong oversight over curricula, research priorities, and funding distribution. Compared to Western models that value academic autonomy and shared governance, Chinese higher education institutions (HEIs) operate under tighter governmental control and stronger alignment with national policy objectives.

Elite university initiatives such as Project 211, Project 985, and the Double First-Class Plan have been central to China's strategy for achieving world-class status (Li, 2012). These programs funnel significant funding toward selected universities to enhance global rankings, research output, and competitiveness (Zhao & You, 2021).While such initiatives have elevated China's international profile, they have also intensified internal inequalities and pressures for performance metrics, emphasizing publication quantity and citation impact over creativity and intellectual risk-taking (Salmi, 2009)

Despite its achievements, China's doctoral education faces systemic challenges linked to quality, academic culture, and student experience. Rapid expansion has stretched supervisory capacity, and a results-driven environment has encouraged short-term research goals over innovative, long-term inquiry (Mohrman, 2003). Surveys indicate low satisfaction among doctoral students, with one study reporting only 60% overall satisfaction, which is one of the lowest globally (Nature, 2019). Many Chinese PhD candidates report excessive workloads, often exceeding 80 hours per week, as well as a strong perception that doctoral education functions primarily as a career advancement tool

rather than a research-driven pursuit. This utilitarian orientation, coupled with hierarchical supervision and limited institutional autonomy, has been associated with burnout, low well-being, and limited creativity among doctoral students.

2.4.2 Comparative insights and implications

Comparing China's centralized, expansion-driven system with more decentralized Western models reveals both convergence and divergence. On one hand, the massification of doctoral education and growing non-academic career orientation are global phenomena. On the other, China's system is distinguished by its top-down governance and performance-driven culture, which contrasts with the pluralistic and competitive frameworks seen in North America and Europe (Marginson, 2022) The Chinese model's success in scaling access and boosting output demonstrates the potential of coordinated national strategies, but it also highlights the risks of over-centralization, particularly regarding academic freedom, research originality, and student well-being.

Addressing these challenges requires systemic reform that balances state coordination with institutional flexibility, fosters genuine academic inquiry, and prioritizes the holistic development of doctoral candidates. Whether through collaborative governance approaches or improved performance management systems, future reforms must navigate the tension between national strategic goals and the diverse, creative nature of doctoral research.

2.5 Mental health in the context of UN2030 Sustainable Development Agenda

The United Nations 2030 Agenda for Sustainable Development, adopted by the United Nations General Assembly in its resolution 70/1 of 25 September 2015, is a plan for people, planets and prosperity. The agenda expresses the need for all countries and stakeholders to work together to implement this plan without prejudice and without leaving any country or individual behind.

By announcing 17 sustainable development goals and 169 targets, the agenda demonstrates the scale and determination of this new global agenda. These goals galvanize humanity to take action in areas of critical importance to people and the planet over the period 2015-

2030. The figure below illustrates these 17 goals, and here the author will address a few of the goals that are relevant to this study.

The United Nations 2030 Agenda for Sustainable Development aims to provide a blueprint for addressing global development challenges, including human well-being and mental health issues. As we know from the previous discussion, the doctoral student population is a very special and vulnerable group, and not a few of them face serious mental health problems and challenges such as stress, anxiety, overwork and depression. Research on the mental health of doctoral students is closely related to the SDG 3 topic, which aims to ensure healthy lifestyles and promote well-being for people of all ages, and the mental health and well-being of the doctoral student population needs to receive more attention. For example, at some universities in Sweden, there are free psychological counselling sessions tailored to the doctoral student population, aimed at ensuring that their mental health is guarded during their academic development.

Failing to address the widespread mental health issues in this population undermines the sustainability of the academic ecosystem and the global knowledge economy. Doctoral candidates are critical for knowledge production and innovation, and poor mental health among trainees represents a critical public health and social issue due to diminished productivity, unfinished degrees, and graduates leaving the field

SDG4 Ensure inclusive and equitable quality education and lifelong learning opportunities for all. A PhD is more than just a degree; it is an extended learning process that requires institutional support. Many PhD students encounter discrimination and exclusionary behaviors along the way, especially international students, first-generation scholars, and women in STEM fields. This coincides with SDG 4's focus on the importance of inclusive and equitable education for the doctoral community.

SDG 8 is intended to promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all. Most PhD students typically work often more hours than the average full-time job but face lower and unstable project funding and uncertainty about job prospects after graduation, which often lead to mental health problems.

SDG 10 Reduce inequalities between states and countries. The relevance of this goal to mental health problems of doctoral students is mainly seen in certain minority representation groups, such as women, minorities, people with disabilities and international students, among others. These groups often face discrimination due to non-representation in the academic community, language barriers for international students, visa and grant funding barriers, and low acceptance of women and minorities. These are all relevant to the topics discussed in SDG 10.

SDG 17 Strengthen the means of implementation and reinvigorate the global partnership for sustainable development. Because the mental health and wellbeing of doctoral students is not just an issue for one university institution, its solution requires the combined efforts of academia, industry, and government. Global partnerships are particularly important here.

SDGs	Relevance to PhD mental health issue
SDG 3 Good health and well-being	Targets mental health is a key aspect of human well-being
SDG 4 Quality Education	Encourage inclusive and supported education, which includes PhD education
SDG 8 Decent work and Growth	Focuses on work-life balance, job security and fair pay, crucial for PhD students transitioning into academia
SDG 10 Reduced inequalities	PhD students from Underrepresented backgrounds such as minorities and international students face more barriers that cause mental health problems.
SDG 17 Partnerships for the goals	Institutional collaboration is called to enhance heathier academic societies.

Figure 1: Mapping of SDGs and the relevance to PhD mental health and well-being issue

2.6 Influencing factors and stressors of Mental health of doctoral students

2.6.1 Introduction

Doctoral education has long been recognized as intellectually demanding, but recent global evidence highlights a growing mental health crisis among PhD candidates. Academic and occupational pressures, ranging from excessive workloads and publication demands to financial precarity and career uncertainty, emerge as primary determinants of psychological distress in this population (Evans et al., 2018; Forrester, 2021; Satinsky et al., 2021). These pressures are systemic rather than individual, rooted in the structure of academia itself, which often normalizes overwork and instability as markers of scholarly commitment. Consequently, the academic environment can foster chronic stress, emotional exhaustion, and an increased risk of attrition (Devine & Hunter, 2016; Jackman et al., 2022).

2.6.2 Academic and occupational pressures as determinants of doctoral student mental health

2.6.2.1 Workload and time pressure

Doctoral education is characterized by exceptional workloads and psychological intensity. Many students report working well beyond standard full-time hours, often exceeding 40 to 60 hours per week (Evans et al., 2018). These extended hours, coupled with constant time pressure, erode work–life balance and increase stress levels (Peluso et al., 2011a). The inability to disconnect from academic obligations has been consistently associated with emotional fatigue and burnout, positioning workload as a core determinant of poor mental health outcomes among doctoral researchers (Sverdlik et al., 2020).

2.6.2.2 Performance metric and evaluation

Modern academic systems rely heavily on performance metrics such as Key Performance Indicators (KPIs) and citation counts. While intended to measure productivity, these systems often heighten anxiety and self-doubt among PhD students (Gill, 2016). The constant need to meet externally imposed targets undermines intrinsic motivation and creativity, which are the main qualities academia aims to cultivate. Furthermore, the lack of recognition for the dynamic and non-linear nature of research contributes to what has been

described as “policy resistance,” where institutional performance policies paradoxically inhibit genuine academic progress (Bianchi, 2016).

2.6.2.3 The Publish or Perish Culture

Perhaps the most pervasive source of stress within academia is the “publish or perish” paradigm. The expectation to publish early and often, even before completing one’s degree, has created a climate of urgency and competition (Nature Editorial, 2019). Surveys indicate that between 10% and 40% of PhD students cite publication pressure as a major concern (Woolston, 2020). This culture can drive perfectionism and anxiety, while discouraging collaborative or innovative research that does not yield immediate publication results (Lawrence, 2003).

2.6.2.4Work–life balance and control

A poor work–life balance consistently predicts poor mental health among PhD students. The academic workload frequently consumes personal time, leading to guilt and conflict over non-academic activities (Pyhältö et al., 2012). Equally significant is the perceived lack of autonomy or control over one’s work. Job strain theory suggests that limited decision latitude amplifies stress, particularly in environments with high demands and low flexibility (R. A. Karasek, 1979)

2.6.2.5 Financial insecurity

Financial stress remains one of the most significant yet under-discussed factors in doctoral well-being. Many PhD students experience unstable or insufficient funding, leading to delays in research, deferred life plans, and chronic anxiety (Barry et al., 2018). The end of a fixed-term scholarship often coincides with heightened distress, especially when combined with unclear career prospects (Levecque et al., 2017).

2.6.2.6 Career uncertainty

The competitive nature of academic employment fuels uncertainty and dissatisfaction regarding future careers. A lack of clear professional pathways beyond academia leads many students to experience hopelessness and burnout (Sverdlik et al., 2020). This uncertainty is a key predictor of both anxiety and attrition among doctoral candidates (Woolston, 2020).

2.6.2.7 Relational stressors

The supervisory relationship is among the most critical factors in a PhD student's experience. Poor supervision, lack of feedback, or experiences of neglect and harassment can significantly increase emotional exhaustion (McAlpine & McKinnon, 2013). Conversely, supportive supervisory and institutional relationships serve as protective factors for mental health (Peluso et al., 2011b)

2.6.2.8 Psychological strain and the impostor syndrome

The psychological toll of doctoral education is compounded by internalized self-doubt. The Impostor syndrome, where individuals feel fraudulent despite clear competence, has been identified as a strong predictor of depression, anxiety, and suicidality among PhD students (Craddock et al., 2011). This internal strain interacts with external stressors, forming a feedback loop that undermines confidence and well-being.

2.6.3 Specific stressors determinants of Chinese doctoral students 'mental health.

Doctoral students in China face a distinctive constellation of stressors that reflect the intersection of rapid educational expansion, systemic academic demands, and deeply rooted cultural expectations. While global discussions of PhD student well-being often emphasize workload and performance pressures (Evans et al., 2018; Levecque et al., 2017), Chinese doctoral researchers experience these stressors within a uniquely complex sociocultural framework. China's higher education system, which defined by its scale, competitiveness, and Confucian relational hierarchies, creates an environment where academic success is not only a professional goal but also a moral and familial obligation. This combination of structural intensity and cultural expectation amplifies the risk of emotional exhaustion, anxiety, and low life satisfaction among doctoral candidates.

2.6.3.1 Systemic pressures in doctoral education

Chinese doctoral students often experience extreme workloads that surpass even the already demanding global norms for doctoral education. Reports indicate that some students work upwards of 80 hours per week, reflecting the pervasive intensity of academic life. Only about 60% of Chinese doctoral candidates report overall satisfaction with their academic

experience, a rate significantly influenced by excessive working hours and constant pressure to meet strict institutional expectations.

The structural expansion of doctoral education in China has been accompanied by an increasingly competitive “publish or perish” environment. Between 2009 and 2018, doctoral enrollment increased by 48%, while publication output in core journals declined by 22.65%, intensifying the race for high-quality publications (Ministry of Education of China, 2020). This has fostered a results-driven academic culture that prioritizes rapid publication over thoughtful or innovative research (Tian et al., 2016). Such pressures have been linked to elevated stress, burnout, and diminished creativity among students.

Motivational misalignment also contributes to emotional strain. Many Chinese doctoral students pursue the PhD primarily as a means of improving employability rather than from intrinsic interest in research (Shi et al., 2023). Driven by China’s competitive labor market, this instrumental motivation can erode engagement and satisfaction, especially when academic demands become overwhelming.

2.6.3.2 Societal and familial expectations

In China, the PhD has become an increasingly important credential for upward mobility, particularly in government, academia, and state-owned enterprises (Niu & Xiao, 2025). This perception transforms doctoral education into a social obligation, where success is equated with family pride and social legitimacy. Consequently, students internalize immense external pressure to succeed, often at the cost of mental well-being (Li et al., 2023).

Family expectations also shape the doctoral experience. Traditional cultural values place strong emphasis on filial duty, stability, and social reputation, creating tension for doctoral students who must balance academic responsibilities with familial obligations (Maunula, 2017). For single female PhD students, the social pressure surrounding marriage or “marriage anxiety” adds an additional emotional burden (Xu & Shen, 2025) . Moreover, cultural norms emphasizing restraint and emotional moderation (“the doctrine of the golden mean”) can make it difficult for students to express distress openly or seek support (Ning et al., 2022).

2.6.3.3 Cultural and relational dimensions of doctoral Stress

A defining feature of doctoral education in China is the hierarchical nature of supervisory relationships, which reflects the influence of Confucian cultural values emphasizing respect for authority and deference to superiors (Chou, 2013)This power distance creates an uneven dynamic in which students may feel dependent, anxious, or reluctant to voice concerns. Supervisory conflict or neglect can thus become a major source of distress, yet students rarely report problems due to fear of reputational or academic repercussions (Tian et al., 2016). The lack of institutional oversight in managing supervisor-student relationships further exacerbates this issue (Ministry of Education of China, 2020).

Chinese doctoral students studying domestically or abroad often encounter challenges related to socialization and cultural adjustment, who struggle to engage fully with academic staff or peers due to cultural and linguistic barriers. These barriers hinder access to informal support networks that are crucial for emotional regulation and academic integration. Moreover, differences in cultural norms surrounding well-being and expression of distress limit the applicability of Western psychological assessment models (Ning et al., 2022).

2.6.3.4 Gender and mental health inequalities

Female doctoral students, in China as elsewhere, report significantly lower well-being and higher anxiety levels compared to their male counterparts (Bao et al., 2023). These disparities are attributed to the dual demands of academic performance and social role fulfillment, including caregiving and domestic expectations (Sun, 2020). Women are more likely to report sleep disorders, emotional exhaustion, and difficulties balancing competing social roles, suggesting that gendered expectations amplify the overall mental health burden (Wang & Liu, 2021).

2.6.3.5 Inadequacy of mental health interventions

Despite growing awareness of mental health challenges among Chinese doctoral students, institutional support remains limited. China’s psychological service infrastructure is insufficient to meet demand, particularly within universities where counseling resources are often scarce or culturally misaligned (Liang & Wang, 2020). Biomedical doctoral students

report being unable to seek help due to the time intensity of their training programs (Zhang & Li, 2021).

Cultural stigma remains one of the strongest barriers to help-seeking. In many Chinese contexts, mental illness is associated with personal weakness or family shame (Yang et al., 2019). As a result, students may self-diagnose under non-stigmatizing terms such as neurasthenia to express psychological distress without labeling it as a mental health problem (Kleinman, 1986). Moreover, fear of academic repercussions further discourages students from disclosing mental health struggles, because it appears to be “unfit” for doctoral study (Bao et al., 2023).

2.7 Chapter conclusion

This chapter has reviewed the literature on mental health from a broader perspective to a more focused perspective, to build a clear foundation for this study. It started with general understandings of health and well-being, showing that mental health is not simply the absence of illness, but a dynamic and multidimensional state shaped by personal, social, and institutional factors. Existing theories and frameworks consistently suggest that these factors are deeply interconnected rather than independent.

The review then framed mental health as a *wicked problem*. This perspective is important because it reflects the reality that mental health issues are complex, difficult to define clearly, and cannot be addressed through simple or linear solutions. This complexity becomes even more visible in the context of doctoral education. Doctoral students face a unique combination of academic pressure, career uncertainty, and personal challenges, all of which are embedded within broader institutional and cultural systems. The discussion of doctoral education systems, including insights from China, highlights how these pressures are shaped by structural conditions and not just individual circumstances.

A key takeaway from the literature is that the mental health of doctoral students is influenced by multiple interacting stressors, such as workload, supervision, financial concerns, and work–life balance. These factors often reinforce each other over time. For example, prolonged academic pressure can reduce well-being, which in turn affects productivity and increases stress further. This kind of feedback process is difficult to

capture using traditional research approaches that tend to isolate variables rather than examine how they interact.

For this reason, the review explored the use of Systems Thinking and System Dynamics in mental health research. The existing studies show that these approaches are increasingly used to deal with complex social and health issues, especially where feedback loops, delays, and unintended consequences are important. They also offer practical value in supporting policy design and stakeholder engagement.

Based on this, System Dynamics is considered a suitable method for this study. It allows for a more realistic representation of how different factors influencing doctoral students' mental health interact over time. Instead of looking at isolated causes, it helps to understand the system as a whole, including how problems develop and how interventions might work in the long term. This is particularly relevant for mental health, where changes are often gradual and influenced by multiple interconnected elements.

Overall, the literature highlights both the complexity of doctoral students' mental health and the limitations of more traditional approaches in fully capturing this complexity. In this context, System Dynamics provides a useful way to move beyond static analysis and towards a deeper, system-level understanding that can better inform research and practice.

Chapter 3 Conceptual framework and methodologies

3.1 Introduction

This study adopts a Dynamic Performance Management (DPM) and Dynamic Performance Governance (DPG) approach to explore and model the complex, systemic factors influencing PhD students' mental health and well-being within higher education institutions. The choice of DPM/DPG is grounded in its ability to capture dynamic interactions, feedback effects, and causal mechanisms that traditional, static approaches to performance management often overlook (Bianchi, 2016; Bianchi & Rivenbark, 2014). By integrating System Dynamics (SD) modeling principles with performance management theory, this methodology provides a structured yet flexible framework for understanding how individual, institutional, and systemic factors interact over time to affect doctoral students' mental health outcomes.

3.2 System dynamics and its fundamentals

System Dynamics (SD) is a foundational methodology that underpins the Dynamic Performance Management (DPM) and Dynamic Performance Governance (DPG) frameworks. Originally developed in the 1950s by Jay W. Forrester at the Massachusetts Institute of Technology, SD offers a scientific approach to understanding and managing complex systems characterized by feedback, nonlinearity, and dynamic change (Forrester, 1961). In the context of DPM and DPG, SD provides the conceptual and analytical tools needed to study so-called "wicked problems", those that are multifaceted, socially embedded, and resistant to simple solutions, such as issues related to public governance, sustainability, and mental health (Bianchi, 2016; Sterman, 2000).

3.2.1 Stock and flows

A central feature of SD modeling in DPM/DPG is the use of stocks and flows to represent how resources accumulate and change.

Stock and flow are two ways of measuring system economic or system variables: a stock is a quantity measured at a specific point in time, like a bank account balance, while a flow is

a quantity measured over time, like monthly income. Stocks are the accumulation of past flows, and changes to a stock are the result of inflows and outflows (flows).

Stocks represent the system's current state-what has been built up or depleted over time. In DPM, these stocks often include strategic resources, such as human skills, organizational capacity, or reputation. These resources are not static; they grow or decline depending on how effectively they are managed.

Flows represent the rate at which these resources change, essentially, how fast something is being added to or drained from a stock. For example, the inflow of new skilled staff or the outflow of employee turnover affects the overall "stock" of human capital.

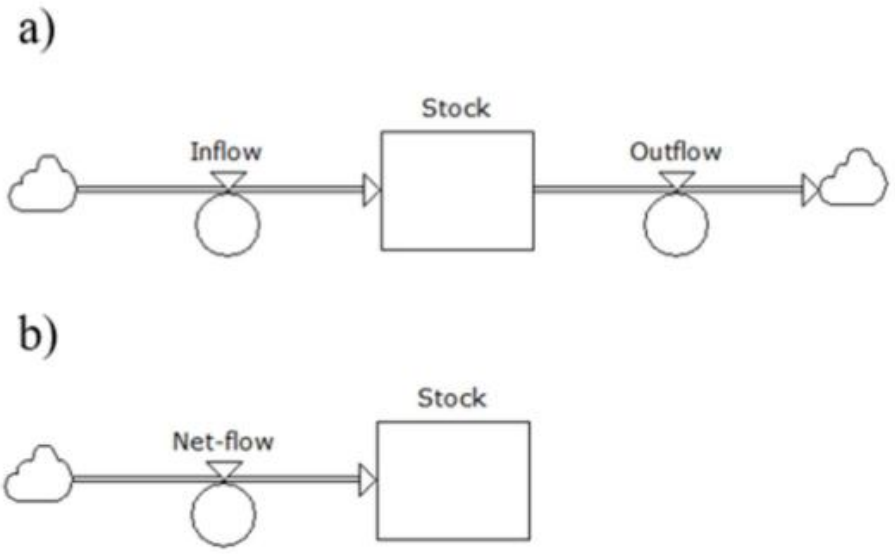

Figure 2: Stock and Flow structure, adapted from Sterman (2000).

The interaction between stocks and flows captures how strategic resources evolve. Moreover, outcomes or policy results, such as improved service quality or innovation, feed back into the system, influencing the future level of resources. This feedback structure forms a performance cycle, illustrating how today's actions shape tomorrow's capacity for success.

3.2.2 Feedback loops

Another essential feature of SD in DPM/DPG is the use of feedback loops to show how different variables influence each other over time. These relationships are often visualized

through Causal Loop Diagrams (CLDs), which help identify how multiple factors interact within a system.

A feedback loop is a system or a process in which the output or result of an action is continuously fed back into the system as new input, influencing future actions or operations. This cyclical process allows systems to be self-regulating, adapting, and optimizing their performance over time. There are two main types of feedback loops:

Reinforcing loops (R) amplify or accelerate changes within a system, pushing it further away from its initial state, leading to exponential growth or decline. Balancing loops (B) work to stabilize a system by counteracting or dampening changes, bringing the system back toward a desired set point or state of equilibrium.

By analyzing these loops, decision-makers can recognize delays, trade-offs, and unintended consequences that often arise in complex systems. This perspective encourages a shift from a static way of thinking ("What are the results now?") to a dynamic mindset.

3.2.3 Applying CLD to PhD mental health modeling

The application of systems thinking (ST) and system dynamics (SD) in mental health research has expanded significantly in recent years, evolving from theoretical frameworks to sophisticated computational models used for policy evaluation and service design (Lawson et al., 2022; Valkenburg et al., 2026). The following review of the sources provided supports the feasibility and utility of these methodologies within the mental health field.

Mental health is increasingly conceptualized as a complex dynamic system where population-level outcomes are non-linear, emergent, and driven by interdependent feedback loops (Cox, 2024; Fanali et al., 2024). Traditional linear methods, such as regression models, often fail to account for the deep social drivers and dynamic features of chronic mental illness (Silverman et al., 2015). In contrast, systems-based approaches explicitly model the interactions between biological, psychological, and social-environmental factors, allowing researchers to explore how interventions interact with the underlying system over time (Alvarado et al., 2023; Ebrahimi, 2023; Fanali et al., 2024).

A primary use of SD in the sources is the evaluation of public health policies and the optimization of service delivery. Researchers argue for a systems approach to decode how climate-related disasters (e.g., flooding, heatwaves) aggravate root causes of mental illness by straining public resources and community functioning (Berry et al., 2018). Causal Loop Diagrams (CLDs) have been used to hypothesize how nature-based solutions impact mental health through pathways like stress recovery and attention restoration (Alvarado et al., 2023). These models identify system archetypes like "Fixes that Fail," where planting trees in disadvantaged areas may exacerbate inequities if sustained resources for maintenance are not included.

System dynamics models have been used to simulate the impact of direct access to specialist care in Australia, demonstrating that increasing service capacity alone may be insufficient if waiting times lead to patient disengagement and poorer outcomes (Vacher et al., 2023). SD modeling has estimated the service demand generated by universal depression screening in schools, providing a "virtual world" to test compensatory approaches like staffing increases before real-world implementation (Lyon et al., 2016). Systems thinking has been applied to transform qualitative clinical models, such as the Collaborative Care Model, into quantified system models that clarify clinician workflows and identify collaborative "leverage points" (Khayal, 2019). Protocols exist for equipping SD models with economic analysis capabilities, such as return-on-investment and cost-benefit metrics, to support regional decision-makers in allocating scarce resources for youth mental health (Lawson et al., 2022).

The feasibility of SD is further evidenced by its successful application in fragile and low-resource contexts. In Afghanistan, community-based system dynamics (CBSD) elicited a common vision of factors perpetuating low service utilization, revealing that clinical capacity must be addressed concurrently with poverty and stigma (Trani et al., 2016). In Lebanon, researchers integrated qualitative interviews with Group Model Building (GMB) to develop causal loop diagrams (CLDs) of the factors affecting mental health seeking behaviors among Syrian refugees and host communities(Noubani et al., 2020). Systematic reviews indicate that while few studies explicitly use SD tools for task shifting, systems

thinking characteristics, such as capturing unintended consequences, are vital for strengthening community mental health systems (Javadi et al., 2017).

Literature highlights several methodologies that make SD a feasible and robust research strategy. Group Model Building (GMB) and participatory SD empower stakeholders, including frontline staff, leadership, and those with lived experience, to steer the model's purpose and ensure its validity (Noubani et al., 2020; Trani et al., 2016; Zimmerman et al., 2016). The use of Causal Loop Diagrams (CLDs) helps visualize hypothesized causal relationships and feedback loops (Alvarado et al., 2023; Noubani et al., 2020; Trani et al., 2016; Valkenburg et al., 2026). Stock and flow diagrams then facilitate the quantitative simulation of how quantities (e.g., number of patients) change over time (Lyon et al., 2016; Zimmerman et al., 2016). Participatory system dynamics (PSD) can replace trial-and-error implementation by simulating the impacts of proposed changes, such as intake duration or referral streamlining, prior to execution (Zimmerman et al., 2016).Validity and Calibration: Models can be calibrated using historical data and validated through sensitivity analysis and expert consensus, ensuring they are "fit for purpose" in supporting decision-making (Vacher et al., 2023).

System dynamics is a feasible and powerful methodology for the mental health field because it decodes system complexity, allows for the simulation of policy impacts in a risk-free environment, and fosters stakeholder consensus (Berry et al., 2018). It is particularly effective for addressing "messy" or "wicked" problems that traditional linear analysis cannot resolve (Silverman et al., 2015; Trani et al., 2016).

System Dynamics can be applied at different levels of complexity depending on data availability and research objectives. Qualitative or Insight Modeling uses CLDs to represent relationships and feedback structures conceptually. This approach is particularly valuable in the early stages of research, when the goal is to generate insight rather than to predict outcomes (Wolstenholme, 1999). It allows researchers to map out hypotheses and test whether their mental models capture the system’s real-world complexity.

Quantitative or Simulation Modeling builds on this foundation by translating qualitative diagrams into mathematical stock-and-flow models. These models use equations and time-based simulations to test policy interventions, identify unintended consequences, and detect

counterintuitive behaviors (Sterman, 2000). For instance, SD simulations have shown how short-term gains can lead to long-term declines when systemic feedback is ignored, for example boosting productivity may drain the long-term increase or development.

Together, qualitative and quantitative modeling provide a complementary approach: the former promotes understanding, while the latter supports decision-making and experimentation in complex policy contexts (Bianchi, 2016).

This research adopts the qualitative modeling, which is Causal loop diagrams to carry out feedback-based reasoning, as an indispensable tool for addressing the “wicked Problem” in doctoral students' mental health, sustainability and governance.

3.3 Methodological framework: DPM/DPG

3.3.1 Dynamic performance management and dynamic performance governance

The Dynamic Performance Management (DPM) framework is designed to represent how performance evolves over time by linking key strategic resources, performance drivers, and end results in a feedback-driven model (Bianchi, 2010). In this study, DPM is used to identify and model the causal chains affecting PhD students’ mental health across three levels:

1. Strategic Resources (Stocks): These include the key assets that institutions and doctoral students rely on to maintain mental health and performance, such as mental health outcome, supervisory relationship, work time, personal time, financial resources, and institutional resources. These resources accumulate or deplete over time, depending on internal and external influences (Bianchi, 2016).
2. Performance Drivers: These represent the critical factors that influence changes in mental health outcomes, such as workload balance, funding stability, research resources availability, research system resilience, and public mental health support projects ratio. These variables are modeled as ratios comparing current states to desired benchmarks, serving as early indicators of system imbalances or stress (Bianchi & Rivenbark, 2014).

3. End Results (Flows): These refer to the outcomes that manifest from the system's operations, such as mental health outcome, overall wellbeing, academic satisfaction, and scientific outputs. End results feed back into the system by influencing the availability and quality of strategic resources, creating continuous feedback loops.

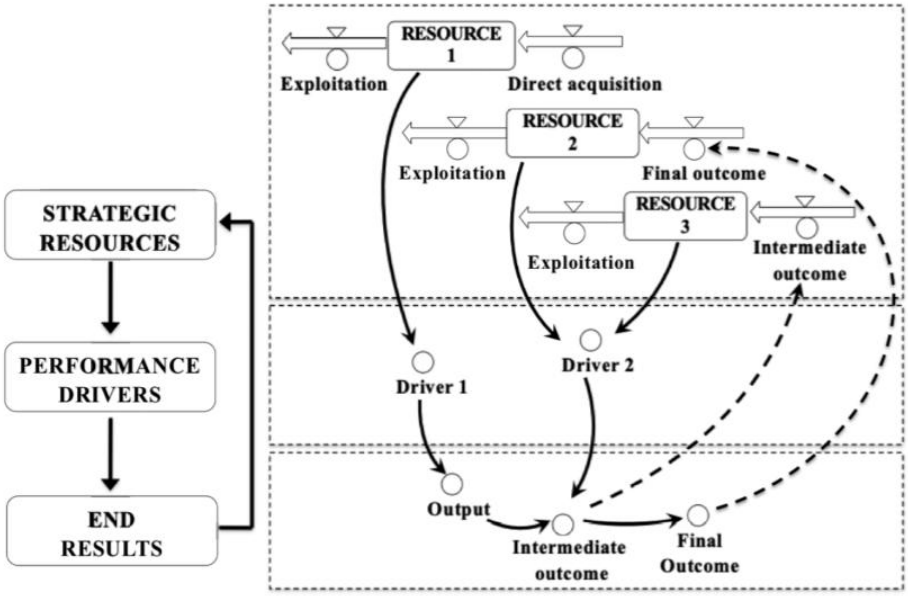

Figure 3: The dynamic performance chart (Bianchi 2020, p.338)

The Dynamic Performance Governance (DPG) framework extends DPM to a multi-actor policy context, emphasizing collaborative governance and shared accountability (Bianchi, 2022). In the context of doctoral education, DPG provides a lens for analyzing how universities, supervisors, government bodies, and students themselves interact to co-produce mental health outcomes. By taking an "outside-in" view, DPG highlights how local institutional conditions and policy environments shape collective performance, aligning individual well-being goals with institutional and policy-level objectives.

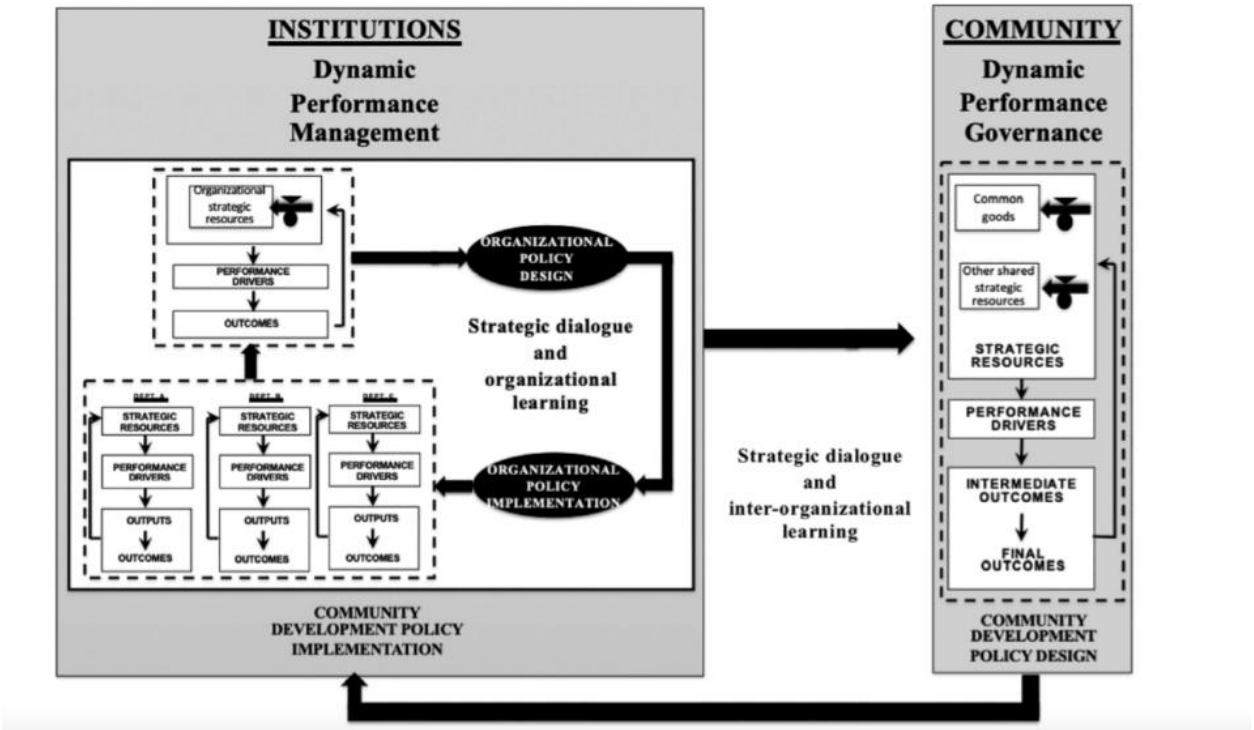

Figure 4: “Outside in” approach to combining DPM and DPG at an institution and community level (Bianchi 2020, p.342.)

3.3.2 Collaborative governance

Collaborative governance is a theory where public, private, and nonprofit actors jointly engage in decision-making and problem-solving to create public value that cannot be achieved by one sector alone. It involves a process of institutionalized interaction between multiple stakeholders to jointly address complex issues like climate change or poverty, by coordinating goals, sharing resources, and developing collective responses. This approach moves beyond traditional government or market-centric models to foster cooperation and shared accountability(Ansell, 2012).

Shared responsibility is one of the key concepts, where public, private, and non-profit organizations work together, and share accountability for policy and service delivery. Thus, different actors, including citizens, interest groups, and government agencies, can collaborate to tackle “wicked "problems that cannot be solved alone by any single entity due to the complexity. It involves institutional interactions and dialogues to create common grounds and establish shared goals. Different stakeholders are brought together to create

more effective and legitimate solutions. The ultimate goal is to create values for the public that cannot be achieved by any individual and adversarial actions(McNaught, 2024; Voets et al., 2021).

3.3.3 Dynamic Performance Governance (DPG) and Performance management

Dynamic Performance Governance (DPG) is an approach that integrates dynamic performance management with system dynamics modeling to provide a holistic and outcome-oriented view of complex systems, especially in public administration and policymaking. While traditional performance management often focuses on a linear, static view of goals and results, DPG recognizes that performance is driven by a web of interconnected factors, including intangible elements like trust and collaboration. This approach uses modeling to visualize the feedback loops and relationships that influence outcomes, helping stakeholders understand cause-and-effect dynamics and foster collaborative, resilience-focused solutions to complex problems(Bianchi & Tomaselli, 2015).

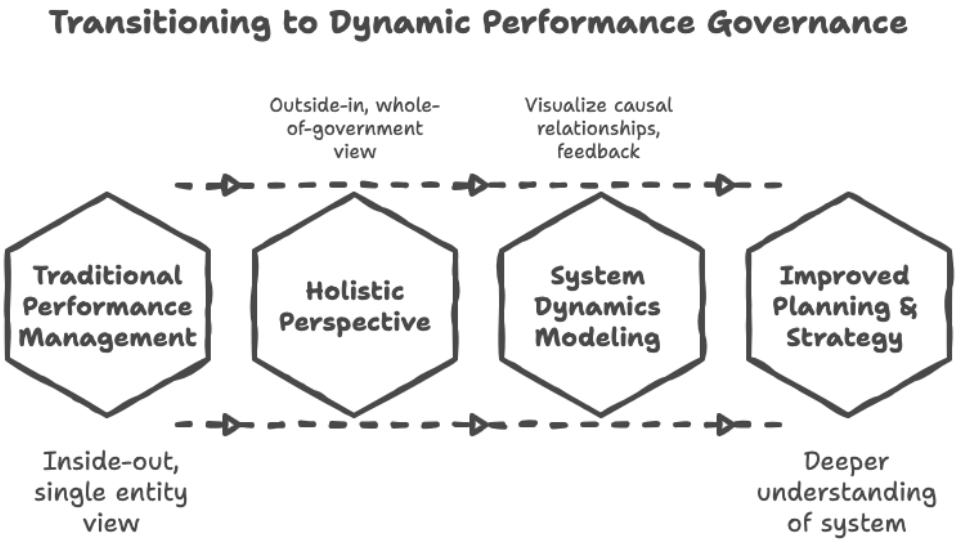

Figure 5: Transitioning from Performance Management to Dynamic Performance Governance (Source: Sketched by author)

Traditional performance management often focuses on organization’s internal goals, process and outputs, using measures to follow up on performances and instruct on improvements. It typically takes an “inside-out” view, where policies are usually designed from a single perspective. The aim is to use performance data for periodical reporting and to make changes to process and policy to improve service delivery (Noto, 2014).

Dynamic performance governance extends performance management by explicitly addressing the dynamic, complex, and interconnected nature of real-world systems, especially those involving multiple actors and stakeholders. It takes a holistic, "outside-in" or "whole-of-government" perspective, considering how different actors and sectors interact and influence each other. The goal is to improve planning, strategy, and policy design by providing decision-makers with a deeper understanding of the system's underlying structure, feedback loops, and long-term consequences. It often uses tools like System Dynamics modeling to visualize causal relationships and feedback loops, enabling better communication and shared understanding among stakeholders.

Chapter 4 Designing Dynamic Performance Governance in the doctoral students mental health sector in the global context

4.1 Introduction

Nature conducted research with a group of PhD students in 2019, which aimed to survey PhD students' career intentions and programmed satisfactions. The survey reveals a cohort that is cautiously optimistic on the surface but carrying significant structural pressures beneath it. Three quarters of respondents were glad they pursued a PhD, and a similar proportion reported being at least partially satisfied with their experience.

In the survey, students were presented with a list of concerns and were asked to rank them in relation to their own experiences (see below the figure as the result of the survey). The survey then identified several key stressors affecting doctoral candidates globally, most of which align with the dynamic relationships outlined in the Dynamic Performance Management (DPG) framework. Within this model, these stressors represent negative causal loops that reduce well-being and performance. Understanding them through a systems lens helps illustrate how government capacity, institutional support, and individual coping mechanisms interact to shape mental health outcomes.

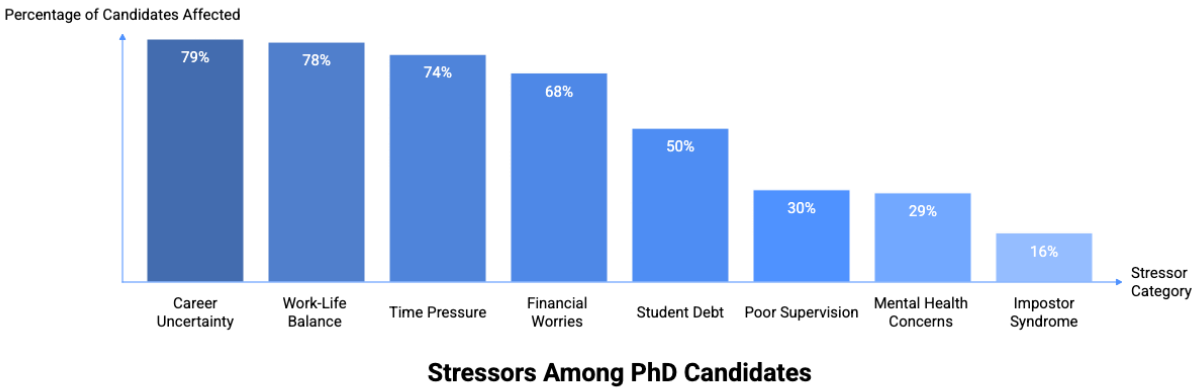

Figure 6: Stressors Among PhD candidates (Source: *Nature* PhD Survey, 2019)

Career uncertainty ranked as the single greatest concern among students globally. Career Uncertainty and Limited Job Prospects are reported by 79% of students. Career uncertainty is consistently identified as one of the most severe stressors among PhD candidates (Nature, 2023; Levecque et al., 2017). The scarcity of academic positions and the competitive postdoctoral job market contribute to chronic anxiety and reduced well-being. Only 29% had received useful advice on non-academic career paths, and just a quarter felt their program was preparing them for careers outside research. At a time when the majority of PhD graduates will not enter academia, this represents a fundamental misalignment between what doctoral programs offer and what students actually need.

Work–Life Balance Difficulties is reported by 78%. Balancing research, personal life, and financial responsibilities is a major contributor to PhD stress (Sverdlik et al., 2018). Many students report long working hours, unclear boundaries, and the pressure to publish.

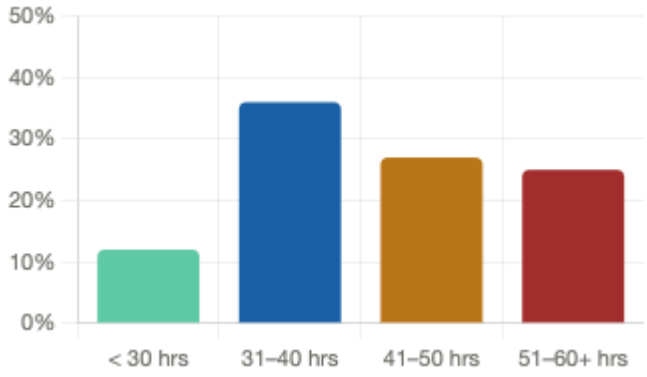

Figure 7: Weekly working hours on PhD program globally (Source: *Nature* PhD Survey, 2019)

74% of students reported inability to finish studies on time as their top concern. Time pressure is both an academic and psychological stressor students are under. Delays often stem from funding limitations, poor supervision, or unrealistic project design (Cornér et al., 2017).

Institutions play a key role here by improving supervisory structures, project planning, and progress monitoring systems, thus shortening the feedback delay and improving both academic outcomes and student well-being.

68% of students chose difficult getting funding and financial worries as their top concerns. Financial insecurity remains one of the most common and persistent doctoral stressors (Nature, 2019; Byrom, 2020). Insufficient stipends, inconsistent funding, and post-PhD financial anxiety all contribute to poor mental health outcomes. Limited funding means reduced resources that lead to stress and lower productivity, thereby weakening both institutional and national research performance.

The strongest predictor of satisfaction was the supervisor relationship, and here the data is mixed. While the majority reported a positive relationship with their PI, one in four said they would change their supervisor if starting over, and over half of those who experienced bullying identified their supervisor as the primary source. This places the advisor relationship at the center of both the best and worst PhD experiences globally. Poor Supervision and Institutional Support are chosen by 30% of students. The quality of the supervisory relationship is one of the strongest predictors of PhD satisfaction and mental health (Peluso et al., 2011; Pyhältö et al., 2012). Poor supervision creates emotional strain, delays, and conflicts.

Mental health emerges as perhaps the most pressing concern. More than a third of respondents had sought help for anxiety or depression connected to their studies, a figure that, given the stigma around help-seeking in many academic cultures, likely understates the true prevalence. Yet institutional support consistently fell short: long wait times, insufficient counsellors, and services poorly adapted to the specific pressures of doctoral study were widely reported. Mental Health Concerns and Impostor Syndrome are reported as 29% and 16%. Concerns about mental health and impostor feelings are interconnected (Nature, 2019; Cohen et al., 2021). Many PhD candidates feel inadequate despite high achievement levels, leading to anxiety and burnout.

Student Debt and Financial Pressure are reported by 50% of students. Debt burden, especially in countries with limited scholarship coverage, increases chronic stress (Stubb et al., 2011). Financial stress links to both mental health outcome and government capacity; poorly funded education systems produce graduates with high debt and lower research productivity, which in turn reduces the perceived value of government investment.

Increasing stipends, providing housing support, and offering debt relief could transform this into a reinforcing effect of well-being and productivity.

Each stressor functions as a causal variable within the DPM and Dynamic Performance Governance (DPG) framework. They interact through feedback loops connecting government policy, institutional capacity, and individual well-being. This dynamic representation allows policymakers to identify leverage points where interventions can generate the greatest systemic improvements.

4.2 A Dynamic Performance Governance analysis of doctoral students' mental health outcomes

The Dynamic Performance Governance (DPG) model (Bianchi, 2016; Barile & Saviano, 2018) is designed to understand the complex, systemic relationships influencing PhD students' mental health outcomes. The DPG model combines elements of Dynamic Performance Management (DPM) (Bianchi, 2010) and system dynamics modeling (Forrester, 1961) to visualize how different actors and feedback mechanisms interact over time. The charts below represent the global scenario of PhD students' mental health outcomes and identify the key stakeholders who can engage in collaborative governance to improve these outcomes.

In this model, four main stakeholder groups are central to improving doctoral students' mental well-being: governments, institutions, active citizens, and PhD students themselves. Each group plays a distinct yet interconnected role in the governance structure, contributing to the feedback loops that shape mental health, performance, and system resilience.

The DPG framework also integrates empirical evidence on doctoral stressors identified in the Nature (2019) global PhD mental health survey. The top reported challenges: career uncertainty (79%), work–life balance difficulties (78%), limited academic job availability (70%), and low funding success rates (68%), are directly represented in the DPM chart. These stressors feed into reinforcing loops that affect mental health outcomes, career prospects, and research productivity. Through dynamic feedback, these loops illustrate how unresolved systemic pressures can either destabilize or, when properly governed, stabilize the doctoral ecosystem over time.

The checkered symbol in the DPG charts represents various outcomes that directly impact strategic resources, which are shared by different stakeholders. Those strategic resources have a direct impact on the performance drivers, which then subsequently have impacts on the final outcomes within the specified system (Bianchi, 2016). It is essential to adopt a methodology capable of identifying the key factors that drive performance and shape the distribution and flow of critical resources. Within this framework, the Dynamic Performance Governance (DPG) chart serves as a valuable tool for assessing performance indicators by comparing them against established benchmarks or target values. These indicators are therefore central to the broader goal of effective performance management (Bianchi, 2016).

The DPG model presented in this study illustrates the interconnected relationships among strategic resources, performance drivers, and outcomes, which together form the foundation for understanding how collaborative governance can enhance the mental health outcomes of doctoral students. Through the integration of multiple stakeholders and their shared responsibilities, the framework highlights how persuasive and well-coordinated collaboration can address the diverse factors contributing to the mental health challenges faced by doctoral candidates.

By adopting an “outside in” view, the figure below frames different levels of related outcomes as an effect of collaborative intervention policies aimed at affecting academia community outcomes that leads to a final outcome of a more sustainable research system.

Within this system, one key performance driver is the “% Enforced Institutional Policy Ratio,” which represents the proportion of mental health and academic support interventions effectively implemented by higher education institutions. This driver affects several intermediate outcomes, such as the quality of supervisory relationships, the level of peer competition, access to research resources, and the availability of career development programs. When institutional policies are strongly enforced and well-aligned with student needs, these intermediate outcomes improve, leading to enhanced mental health outcomes. Improved mental well-being further strengthens research productivity and creativity, generating higher scientific output and academic achievement. These positive outcomes, in turn, contribute to institutional capacity, which enhances reputation, graduate

employability, and institutional rankings, therefore reinforces a virtuous cycle of performance improvement.

For example, career uncertainty emerged as one of the most persistent and multidimensional concerns across the dataset. Students expressed anxiety about their future prospects from several different angles simultaneously: the scarcity of available academic positions, concern that their doctoral productivity may not be competitive enough for an academic career, a lack of structured guidance for careers outside academia, and genuine uncertainty about the long-term trajectory of their own research field and etc. One student working in cancer immunology, for instance, spoke of not being able to see clearly where the field would be in ten years, and therefore not being able to see clearly where they would be either. What unites these anxieties is not a lack of student effort or ambition, but a lack of institutional response. Each of these concerns, whether about academic job markets, research impact, or alternative career pathways, is something that institutions are far better positioned to address than individual students are to navigate alone. A doctoral student facing an uncertain job market has limited capacity; a prestigious research institution does not. Universities carry a weight of reputation, industry connection, alumni networks, and structural resource that individual students simply cannot replicate for themselves. This points to a clear and pressing responsibility. Institutions should be doing significantly more to deploy that capacity on behalf of their doctoral students: providing structured, personalised career support for both academic and non-academic pathways; building active partnerships with industry, government, and the broader enterprise sector; offering students real visibility into career trajectories beyond the traditional postdoc pipeline; and helping students understand how their research, even in fields with uncertain near-term prospects, translates into transferable skills and value. The gap between what institutions could offer and what they currently provide is not a marginal one. Closing it would not require new resources so much as a deliberate reorientation of existing institutional capacity toward the students who are, ultimately, the reason that capacity exists.

Another critical driver identified in the DPG model is the “% Enforced Government Policy Ratio.” This variable captures the degree to which national governments enforce policies that influence doctoral education and researcher well-being, such as funding mechanisms,

scholarship structures, and career transition programs. Governmental interventions that address financial insecurity and career uncertainty can reduce psychological strain among doctoral students and foster a healthier, more sustainable research environment. Moreover, higher levels of mental well-being and productivity among doctoral candidates feed back into governmental capacity by strengthening national research performance, innovation potential, and global competitiveness.

In the survey, there are some open questions. When doctoral students talk about the pressures they face, their concerns are almost entirely framed at the institutional or personal level. They speak of their supervisor, their department's publication requirements, their university's support services, or their own ability to cope. Rarely do students trace these pressures upward to the policy environment that shapes them. Yet almost every concern they raise: publication thresholds, funding availability, mental health provision, career pathway support, are not simply an institutional choice. It is a reflection of a broader governance architecture that institutions themselves are operating within, and responding to. Publication requirements, for instance, are not invented by individual universities in isolation. They are shaped, directly or indirectly, by national research evaluation frameworks, funding allocation mechanisms, and government-driven performance metrics that cascade downward through the system. When a student feels crushed by the pressure to publish, they are experiencing the downstream effect of policy decisions made far above the level of their department. Addressing the symptom at the institutional level, without reforming the conditions that produce it, will only ever be partial. This is why government intervention is not merely helpful, but necessary. Institutions can improve their career support, strengthen their mental health services, and reform their supervisor training. But the capacity of any single institution is bounded by the policy environment it operates within. Genuine and lasting improvement in doctoral students' wellbeing and outcomes requires coordinated action at the government level: reform of research evaluation frameworks that drive unhealthy publication pressures, sustained investment in mental health infrastructure across the higher education sector, and active policy support for diversified doctoral career pathways beyond academia.

While individual stakeholders (governments, institutions, supervisors, and students) each contribute to the system through their own capacities and intentions, their actions in isolation often have limited systemic impact. The DPG approach emphasizes the "outside-in" governance perspective, highlighting that sustainable improvement in doctoral mental health requires cross-boundary collaboration. Through the performance drivers "% Enforced Collaborative Policy Interventions" and "% of Impacted PhD Students and Stakeholders," DPG illustrates how joint initiatives can be designed and implemented across stakeholder groups.

Such collaborative policy interventions might include multi-stakeholder doctoral well-being programs, national networks for supervisor training, cross-institutional mental health support platforms, and joint career development schemes. These initiatives leverage the collective strengths of government agencies, higher education institutions, research councils, and civil society to co-create value and resilience in the doctoral education system.

Ultimately, the DPG framework provides a systemic lens through which to understand and manage the interdependencies shaping doctoral students' mental health globally. By promoting collaborative governance rather than isolated interventions, stakeholders can enhance the sustainability, inclusiveness, and productivity of the research ecosystem while fostering better well-being among doctoral researchers.

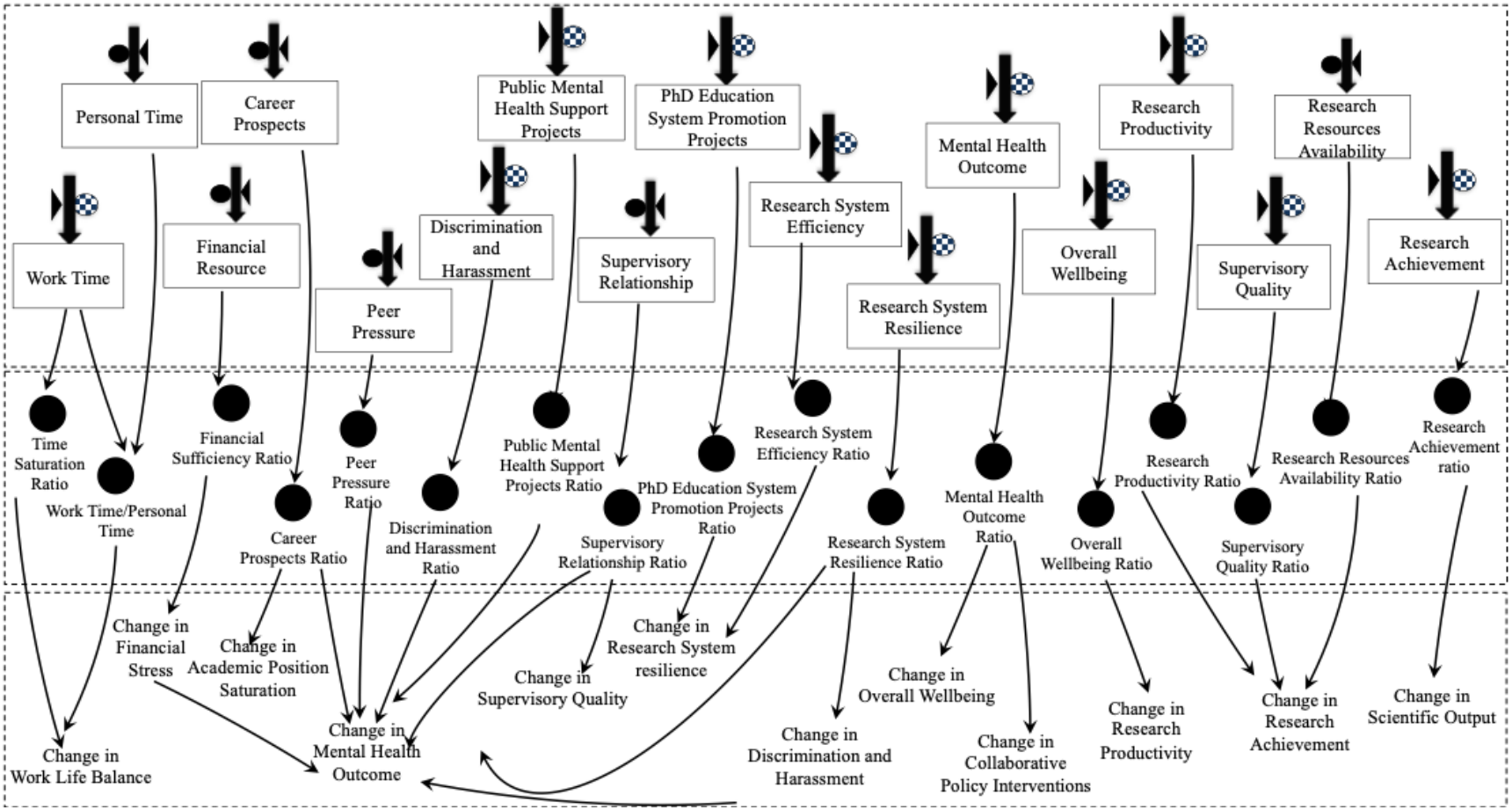

Figure 8 (part a): DPM chart of global context

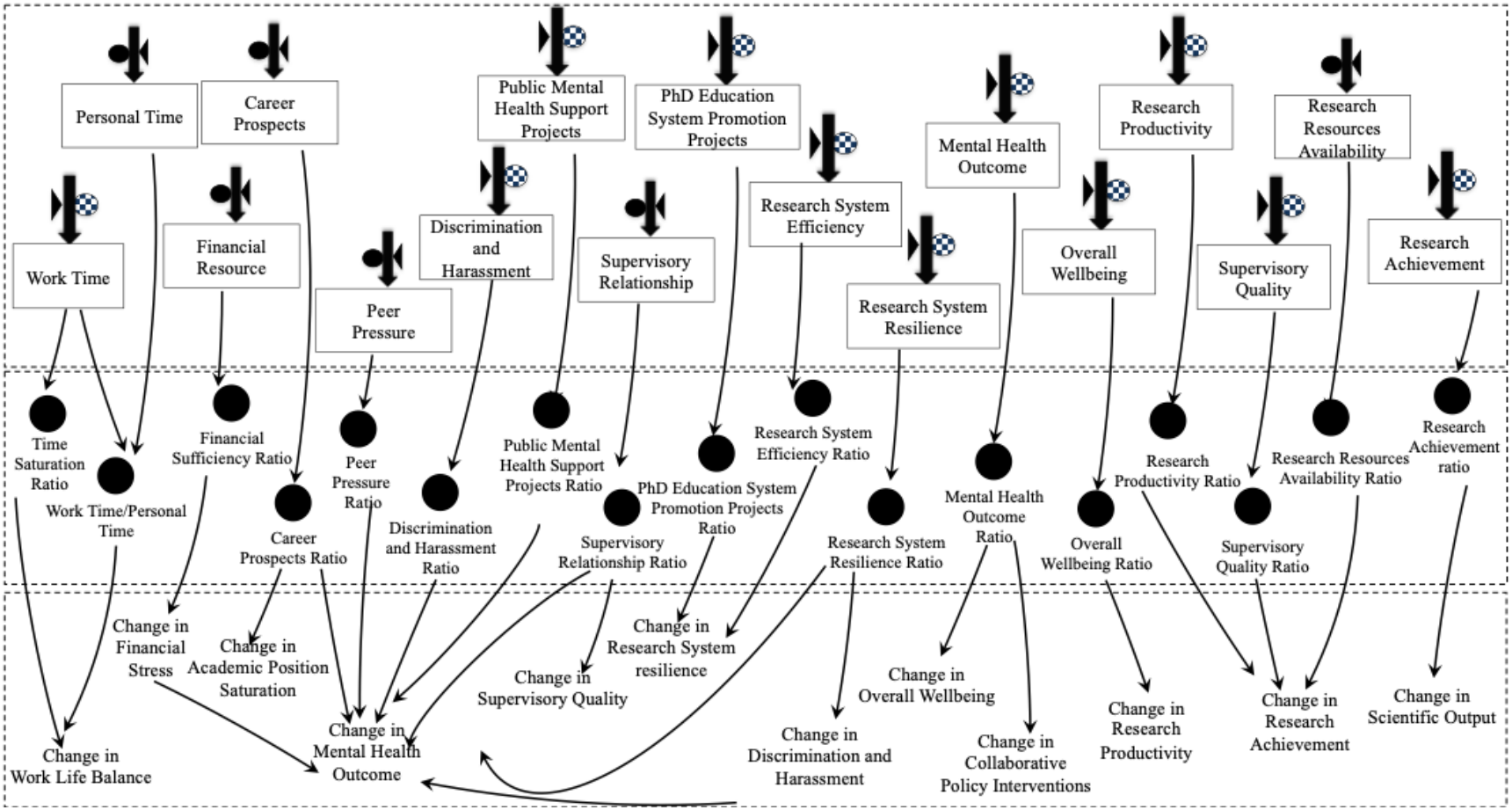

Figure 8 (part b): DPM chart of global context

4.3 Mapping causal relationships in doctoral students' mental health through a Causal Loop Diagram

4.3.1 Introduction

The Dynamic Performance Governance (DPG) framework offers a systems-based approach to analyzing how collaborative governance mechanisms influence doctoral students' mental health outcomes. The causal loop diagram (CLD) developed in this study identifies 13 reinforcing feedback loops (R1–R13) that collectively describe the dynamic interactions between governance capacity, institutional policies, individual well-being, and research performance. Each loop captures a distinct yet interconnected mechanism contributing to the overall dynamics of doctoral education performance and mental health outcomes.

Alongside these reinforcing dynamics, six balancing feedback loops are identified, depicting the corrective mechanisms that exist within the system, the points at which institutional intervention, peer support, or individual resilience can interrupt a downward spiral and restore equilibrium. These balancing loops are where policy levers are most actionable: they represent the places in the system where targeted reform, in mental health provision, career guidance, or supervisor accountability, can produce genuine and lasting change.

Together, the 13 reinforcing and 6 balancing loops form a dynamic map of doctoral education governance — one grounded not in abstraction, but in the lived experiences of global PhD students captured across the *Nature* survey data and in literature.

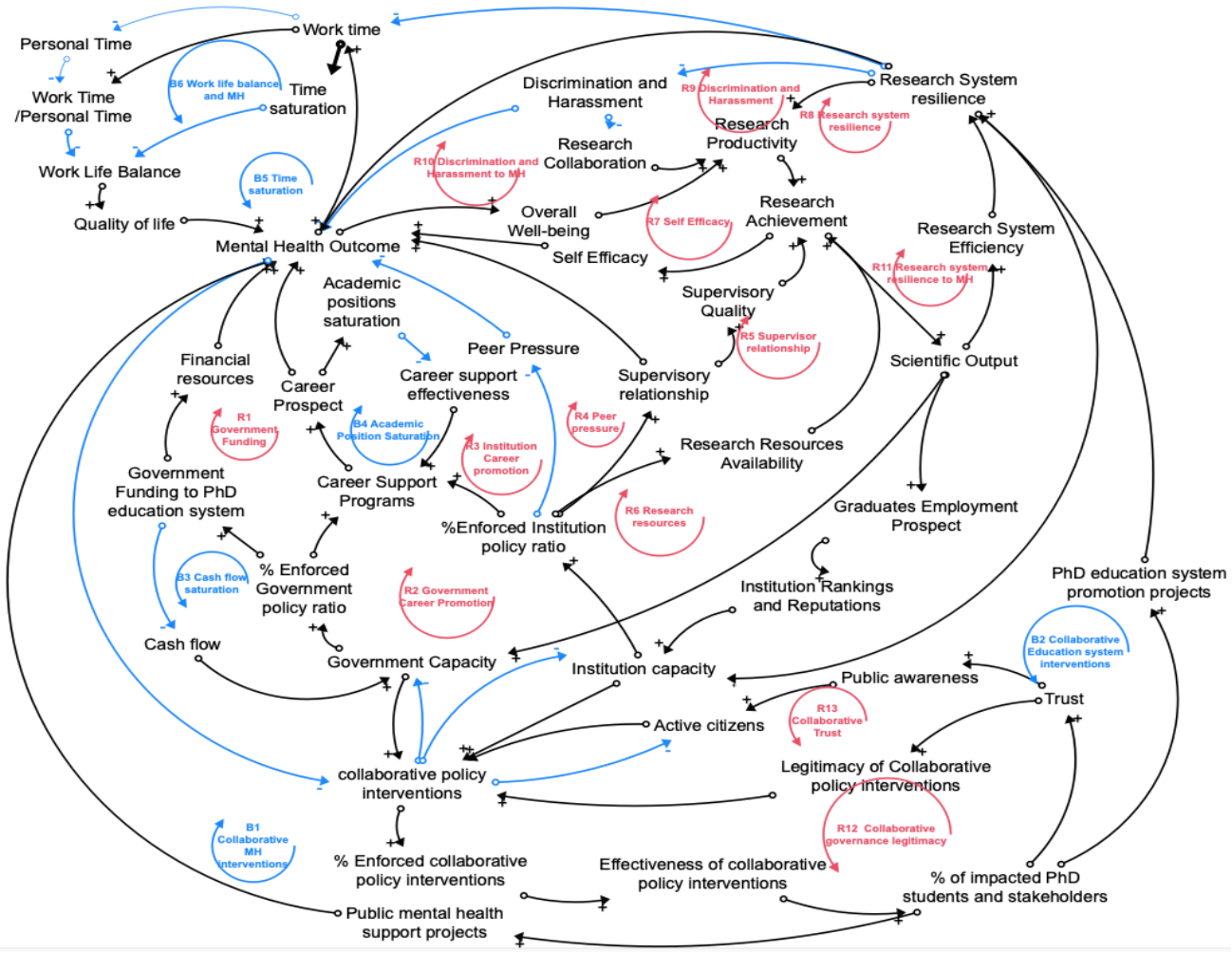

Figure 9: A causal loop diagram depicting the causal relationships of Doctoral students' mental health outcome in the global context (Source: model constructed by the author through Stella Architect).

4.3.2 Reinforcing loops that analyze positive feedback in the PhD system

R1. Government Funding Loop

The Government Funding Loop illustrates how increased government capacity enhances the enforcement of policy frameworks that allocate greater funding to the doctoral education system. Enhanced financial resources improve doctoral students' well-being and mental health, which in turn leads to higher research productivity and scientific output. Much research has discovered a positive impact of research funding on the scientific outputs of universities (Beaudry & Allaoui, 2012; Gush et al., 2018). Countries like Sweden, where government funding predominates and students are formally employed by universities, report higher levels of work-life balance and financial stability compared to the U.S., where varied funding sources (e.g., fellowships and assistantships) create a more competitive and stressful environment (Keloharju et al., 2024).

Low levels of well-being are linked to diminished research productivity, increased errors, and a reduction in the quality and quantity of scientific output (González-Betancor & Dorta-González, 2020; Kusurkar et al., 2020). Improved national research performance reinforces governmental legitimacy and capacity, completing a virtuous cycle. Research indicates that high levels of subjective wellbeing among the citizenry, often a byproduct of successful national systems, lead to "greater societal trust and more confidence in parliament" (Diener & Tov, 2007; Tov & Diener, 2009). Happy people are generally more confident in their government and more democratic in their views (Keyes, 2013b; Tov & Diener, 2009). This loop underscores the critical role of government investment in sustaining both academic excellence and doctoral mental health. Governments are described as the "ultimate stewards" of national wellbeing (Sayers, 2001). Their capacity is evidenced by their ability to link problem analysis (such as the mental health of researchers) to effective resource allocation and policy implementation to maintain research productivity (Aristeidou & Aristidou, 2023).

R2. Government Career Promotion Loop

In the Government Career Promotion Loop, government capacity supports the enforcement of career development policies that expand career support programs and improve PhD students' career prospects. Governments reinforce their capacity by implementing policies,

such as those involving health, human capital, and labor markets, that create "virtuous cycles of wealth creation". For example, investment in high-quality higher education and science subjects (like IT) can lead to job creation, increased foreign direct investment (FDI), and national development (*World Population Prospects : The 2000 Revision | AUC Library*, n.d.). Better career opportunities positively affect mental health and research performance, further strengthening scientific outcomes. Research identifies satisfaction with career perspectives as an important predictor of lower levels of anxiety and burnout. In contrast, a negative view of career opportunities in academia is a significant predictor of mental health problems (*STI 2018 Conference Proceedings | Scholarly Publications*, n.d.). Across several countries, satisfaction with career guidance and future prospects is linked to overall PhD satisfaction, which is a foundational requirement for maintaining mental well-being (Naumann et al., 2022). When student well-being is high, often supported by confidence in future employment, research output increases in both quality and quantity (Larivière, 2012; Pearson et al., 2008; Scott & Takarangi, 2019). As research success grows, it enhances government credibility and capacity to continue supporting career-based initiatives. This loop highlights the importance of policy-driven career support in promoting both research excellence and psychological well-being.

R3. Institutional Career Promotion Loop

The Institutional Career Promotion Loop operates at the organizational level, where strong institutional capacity allows the enforcement of career-oriented policies. These policies promote career support programs and strengthen students' employability. Literature advocates that universities should provide tailored career advice and transferable skills training to decrease anxiety regarding job perspectives (Naumann et al., 2022; Scott & Takarangi, 2019). Enhanced employability contributes to improved mental health and research productivity, which elevates institutional rankings and reputation. Institutions that offer a "strong value proposition," including clear milestones and support for non-academic career paths, tend to have students who can better cope with program demands (Keloharju et al., 2024; Naumann et al., 2022). PhD students are viewed as the "promise for the future" and a core component of the knowledge economy (*STI 2018 Conference Proceedings | Scholarly Publications*, n.d.). Their work directly affects institutional standing through total

quantity and quality of university's scientific output and innovation (González-Betancor & Dorta-González, 2020) and creation of new knowledge (Aristeidou & Aristidou, 2023). As reputation grows, institutional capacity expands, creating a reinforcing cycle of organizational growth and student well-being. University reputation is a primary engine for institutional expansion and competitive advantage. Maintaining an "international reputation for providing a world-class research qualification" is essential for UK institutions, many of which have "ambitious growth targets" (Metcalfe, J., Wilson, S., & Levecque, K., 2018). This loop emphasizes the leverage potential of institutions in enhancing doctoral sustainability.

R4. Peer Pressure Loop

The Peer Pressure Loop captures the dual effect of academic competitiveness. Strong institutional capacity and effective policy enforcement can increase performance pressure among doctoral students, potentially undermining mental health. Research highlights "peer comparison" as a main influencing factor for PhD students' anxiety(Ma et al., 2024). Students frequently compare their progress, such as publication counts, their cohorts, which often results in feelings of incompetence and the belief that they are "behind the curve" (Gin et al., 2021; Ma et al., 2024). However, supportive academic environments can transform competitive pressure into a source of motivation, ultimately improving productivity and research outcomes. Mentoring groups that create a "non-competitive space" allow students to share experiences and career planning advice, enhancing overall well-being and productivity(Ma et al., 2024). Formally structured peer groups for collaborative learning, such as writing groups, can foster a sense of belonging and academic identity, which ultimately supports better academic outcomes and persistence (Cahusac De Caux et al., 2017; Pretorius, 2022). Improved performance strengthens institutional reputation, which further reinforces capacity. This loop reflects a balancing reinforcement process, acknowledging that while pressure can enhance performance, unmanaged stress can impair well-being.

R5. Supervisory Relationship Loop

The Supervisory Relationship Loop highlights the role of high-quality supervision in promoting mental health and academic success. Strong institutional capacity enables better

supervisory practices, leading to improved mentorship and guidance. Strong, supportive, and positive mentoring relationships correlate significantly with lower levels of anxiety and depression. Conversely, a "laissez-faire" or passive leadership style is associated with elevated risks of psychological distress (Keloharju et al., 2024). Enhanced supervision supports doctoral students' research performance and well-being, reinforcing institutional reputation and capacity. Supportive relationships at the advisor level are linked to higher research productivity, better career commitment, and increased research self-efficacy (Keloharju et al., 2024). This loop demonstrates that supportive supervision is both a driver of research achievement and a protective factor for mental health.

R6. Research Resources Availability Loop

In the Research Resources Availability Loop, institutional capacity determines the availability of research resources, including funding, equipment, and technical support. Material resources are speculated to help students cope with the high demands of PhD programs; competitive programs often secure more resources to provide superior instruction and material support(Johnson & Hall, 1988; R. Karasek & Theorell, 2009). Adequate resources facilitate higher research productivity and achievement, which boosts institutional reputation and capacity. The accumulation of resources, both material and symbolic, is crucial for researchers to establish their academic careers (Oleksiyenko & Sá, 2010). Over time, the expansion of resources reduces uncertainty and psychological stress, indirectly improving mental health. The provision of sufficient facilities and resources for research is a core component of "organizational well-being" (Mahsood et al., 2025). This loop illustrates how material and environmental conditions underpin academic and psychological outcomes.

R7. Self-Efficacy Loop

The Self-Efficacy Loop centers on the individual-level psychological mechanism linking mental health and performance. Low research self-efficacy is consistently linked to elevated levels of depression, anxiety, and burnout(Gin et al., 2021). In particular, students who doubt their intellectual ability may experience the "imposter phenomenon," which further exacerbates psychological suffering(Mahsood et al., 2025). Improved mental health enhances overall well-being and self-efficacy, enabling students to perform more

effectively in their research. Higher performance reinforces confidence and further improves mental health, forming a self-reinforcing virtuous cycle. This loop highlights the interplay between internal motivation, psychological resilience, and academic success.

R8. Research System Resilience Loop

The Research System Resilience Loop depicts how a resilient research environment sustains long-term performance. A resilient system requires a "whole-university approach" where mental health is embedded in policies, processes, and structures rather than being treated as a "bolt-on" initiative (Gakhal, 2024). This includes coordinated, humane administration, and clear milestones to reduce uncertainty (Bergvall et al., 2025). System resilience supports research productivity and achievement, which improves system efficiency and adaptability. A more efficient system is better equipped to handle challenges, thus reinforcing resilience. This loop emphasizes that systemic stability and adaptability are critical to maintaining doctoral mental health and institutional effectiveness.

R9. Discrimination and Harassment Loop

The Discrimination and Harassment Loop illustrates a negative reinforcing cycle. Discriminatory practices and harassment erode collaboration, reducing research productivity and scientific output. In competitive environments, harassment and bullying from supervisors or peers can create "cliquey" labs where certain individuals are systematically excluded. Such environments force students, particularly women of color, to compartmentalize or hide salient parts of their identities to fit into science culture, further hindering authentic collaboration (Salusky et al., 2025). Diminished system efficiency weakens institutional resilience, which allows discriminatory behaviors to persist. A major obstacle to reform is that only 28% of those who experience bullying or discrimination feel able to speak out without fear of personal retribution, often because the perpetrators are supervisors or senior staff (Nordling, 2025). This destructive loop demonstrates the urgent need for anti-discrimination interventions to protect both performance and psychological safety in academic environments.

R10. Discrimination and Harassment to Mental Health Loop

Extending the previous loop, the Discrimination and Harassment to Mental Health Loop directly connects discriminatory practices to mental health deterioration. Discrimination creates a sense of "othering" and invisibility, leading to social isolation and the belief that the student "doesn't belong" in academia (Nordling, 2025). Harassment and exclusion reduce students' well-being and self-efficacy, leading to lower productivity and research quality. Stigma associated with these experiences leads to alienation and social withdrawal, which further decreases the chance of a "normal life" or recovery, reinforcing the initial distress (Sayers, 2001). As performance declines, institutional capacity to address these issues weakens, perpetuating the cycle. This loop reinforces the importance of inclusivity policies as a foundation for both institutional health and individual resilience.

R11. Research System Resilience to Mental Health Loop

The Research System Resilience to Mental Health Loop integrates system-level stability with individual well-being. A resilient research system enhances mental health and well-being by providing predictability, support, and adequate resources. Resilience is enhanced by "sharpening the functioning and capacity of systems" to be health-enhancing, such as streamlining "clunky" administration that adds unnecessary stress (Gakhal, 2024). Improved mental health contributes to higher productivity and system efficiency, which further strengthens resilience. This loop demonstrates how a supportive system environment can protect against mental strain and sustain doctoral performance.

R12. Collaborative Governance Legitimacy Loop

The Collaborative Governance Legitimacy Loop explains how the perceived legitimacy of collaborative policies drives their effectiveness. Legitimate and transparent governance builds stakeholder trust, leading to stronger participation and policy compliance. Legitimate and transparent governance is a foundational requirement for building trust among stakeholders in doctoral education, particularly between students, academic institutions, and government bodies (Gakhal, 2024; Sayers, 2001). Within the university setting, a lack of transparency regarding administrative processes, including "clunky" management systems, conflicting information, and delays in communication, is a primary source of student stress and erodes organizational trust (Gakhal, 2024). To establish legitimacy, institutions must move toward humanized and coordinated support structures that prioritize

the diverse needs of researchers over rigid bureaucratic policies (Beasy et al., 2021). At the policy level, governments maintain legitimacy by acting as the "ultimate stewards of mental health," assuming responsibility for developing integrated policies that link problem analysis to fair resource allocation (Sayers, 2001). As more doctoral students experience positive outcomes, legitimacy and trust are further reinforced. This loop underscores the importance of accountability, inclusiveness, and credibility in maintaining effective governance networks.

R13. Collaborative Trust Loop

Finally, the Collaborative Trust Loop captures the dynamic relationship between trust, public awareness, and participatory engagement. Trust is defined as a foundational element for collective action and a functional "therapeutic alliance" between service providers and consumers (Herrman et al., 2005). Raising public awareness is the primary strategy for dismantling the most significant barrier to mental health support: stigma and discrimination(Sayers, 2001). Increased public awareness fosters active citizenship and greater participation in collaborative interventions. Communities, families, and consumers (students) should be active participants in the development and decision-making of policies and services. This ensures that interventions are tailored to specific cultural, social, and academic needs. Effective policy implementation enhances outcomes for doctoral students, strengthening public trust, and reinforcing awareness (Sayers, 2001). This loop highlights how collective trust and civic engagement sustain collaboration over time and amplify governance impact.

Overall, the thirteen reinforcing loops illustrate a complex, interdependent system where government capacity, institutional performance, and individual well-being interact dynamically. Positive feedback mechanisms (R1–R3, R5–R8, R11–R13) create virtuous cycles that promote both academic excellence and mental health. In contrast, the negative reinforcing mechanisms (R4, R9, R10) reveal potential systemic vulnerabilities that may undermine performance if not effectively governed. The integrated DPG model thus provides a holistic framework for understanding how collaborative governance can serve as a strategic mechanism to promote doctoral mental health and enhance the long-term sustainability of research systems.

4.3.3 Balancing loops analyzing negative feedback in the PhD system

While reinforcing loops capture the self-reinforcing growth dynamics of the doctoral education system, balancing loops (B1–B6) describe its stabilizing forces. These loops help to maintain system equilibrium by counteracting excessive growth or decline in key variables such as funding, workload, and collaborative interventions. These feedback mechanisms reflect the system's capacity to self-correct and sustain long-term performance without leading to burnout, overextension, or inefficiency.

B1. Collaborative Mental Health Interventions Loop

The Collaborative Mental Health Interventions Loop (B1) illustrates how collaborative policies can moderate mental health outcomes through feedback control. When collaborative policy interventions increase, they enhance the proportion of enforced interventions and improve their overall effectiveness. As a result, a greater number of PhD students and stakeholders are positively impacted, particularly through public mental health support projects. Participatory engagement empowers marginalized groups to influence health-related matters that affect them, transforming them from passive recipients into active agents of social change(Herrman et al., 2005). Improved mental health outcomes, however, reduce the perceived urgency for additional interventions, leading to a gradual decline in policy enforcement intensity. This balancing loop stabilizes the system by preventing the oversaturation of interventions while maintaining a sustainable level of mental health support.

B2. Collaborative Education System Interventions Loop

The Collaborative Education System Interventions Loop (B2) extends the logic of B1 by linking collaborative governance efforts to the resilience of the research system. Effective mental health promotion requires partnerships between the health and education sectors. For example, coordination between academics, public service providers, and community representatives has led to culturally relevant programs for specific groups, such as women suffering from depression (Herrman et al., 2005). In 2018, the Office for Students (OfS) and Research England awarded funding to 17 university projects specifically targeted at PGR mental health (Metcalfe, Day, de Pury & Dicks, 2020). These projects focused on community-building, peer-led workshops, and mental health literacy training for both

students and supervisors (Gakhal, 2024). Initiatives like Scholar Minds in Germany and the #ichbinHanna movement have raised public awareness of the precarious working conditions and mental health challenges facing early career researchers (Naumann et al., 2022). Effective collaborative interventions enhance doctoral education promotion projects and system resilience, which together improve mental health outcomes. As the situation stabilizes and doctoral well-being improves, the demand for further intervention diminishes, reducing collaborative policy pressure. This feedback mechanism ensures that resources are allocated efficiently and that collaborative initiatives are introduced only when systemic instability or stress becomes evident. It reflects the system's ability to self-balance educational reforms and mental health programs.

B3. Cash Flow Saturation Loop

The Cash Flow Saturation Loop (B3) demonstrates how financial mechanisms stabilize the availability of government funding. Increased government capacity and the enforcement of related policies initially raise funding allocations to doctoral education. However, as cash flow increases, marginal gains in performance and well-being begin to decline, leading to a reduction in further funding expansion. This saturation effect maintains fiscal discipline and prevents overfunding beyond what the system can effectively absorb. In this way, B3 balances the financial flow between government input and educational system capacity.

B4. Academic Position Saturation Loop

The Academic Position Saturation Loop (B4) addresses the limitations of career advancement opportunities within the doctoral system. As career support programs improve, they enhance students' career prospects and motivation. However, the number of available academic positions is finite. As these positions become saturated, the effectiveness of further career support diminishes. This leads institutions to recalibrate or diversify career support efforts, thereby restoring equilibrium between career aspirations and realistic employment opportunities. The loop highlights a self-correcting mechanism that prevents systemic frustration and reduces the psychological pressure associated with unmet academic career expectations.

B5. Time Saturation Loop

The Time Saturation Loop (B5) represents the balance between work time and personal time, and it is a key determinant of doctoral mental health. When work time increases, time saturation (or overload) rises, reducing work-life balance and quality of life. As mental health outcomes deteriorate, students and institutions are likely to implement corrective behaviors or interventions that reduce excessive workload and restore balance. This loop captures the natural corrective process through which individuals and organizations respond to overwork and burnout risks, thus maintaining sustainable productivity and well-being.

B6. Work-Life Balance and Mental Health Loop

The Work-Life Balance and Mental Health Loop (B6) closely interact with B5 but focuses on the reciprocal relationship between mental health and time management. An increase in work time relative to personal time weakens work-life balance and reduces quality of life, which negatively affects mental health outcomes. As mental health deteriorates, productivity and engagement may decline, prompting a natural or institutional correction in workload to restore balance. This loop functions as a behavioral stabilizer, ensuring that work intensity remains compatible with human well-being. Together, B5 and B6 represent psychosocial balancing mechanisms embedded within the doctoral system.

Collectively, the six balancing loops (B1–B6) reflect the system's inherent regulatory capacity. They counteract the potentially destabilizing effects of the reinforcing loops identified earlier, such as resource overexpansion, intervention overload, or excessive workload. These loops ensure that the doctoral education system remains sustainable by continuously adjusting the levels of intervention, funding, and work intensity. In particular, the balancing loops associated with collaborative policy (B1–B2) maintain equilibrium at the governance level, while those linked to time and career dynamics (B4–B6) regulate individual and institutional performance pressures. Together, these feedback structures illustrate a system that is both dynamic and adaptive, which is capable of growth through reinforcement but also stability through balance.

For those who wish to look beyond the causal loop diagram, the stock-and-flow model offers a more granular view of the same underlying dynamics. Where the CLD maps the relationships and directions of influence between variables, the stock-and-flow model illustrates how those influences accumulate and change over time — showing not just that

mental health burden grows when support is absent, but how fast, and under what conditions it might be reversed.

It is important to note that this model remains structural rather than operational. The majority of variables in this study, for example supervisor relationship quality, institutional trust, mental health burden, career confidence, are inherently intangible and do not lend themselves to precise numerical measurement. As a result, no empirical data has been entered into the model, and no simulation output has been generated. What the stock-and-flow structure offers instead is a conceptual precision that the CLD alone cannot provide: a clearer articulation of what accumulates, what flows, and where the system's critical pressure points lie.

The model is fully consistent with the CLD developed in this study, reflecting the same 13 reinforcing and 6 balancing feedback loops, and should be read as a companion tool rather than a standalone framework. Its value lies not in producing numbers, but in making the logic of the system visible, and in laying the groundwork for future research that, with appropriate measurement instruments, could bring this model to life with real data.

Readers primarily interested in stakeholder analysis may move directly to chapter 4.4. Those with an interest in system dynamics are encouraged to engage with the stock-and-flow structure in detail, as it offers a more precise account of the governance mechanisms through which doctoral education policy translates into student outcomes.

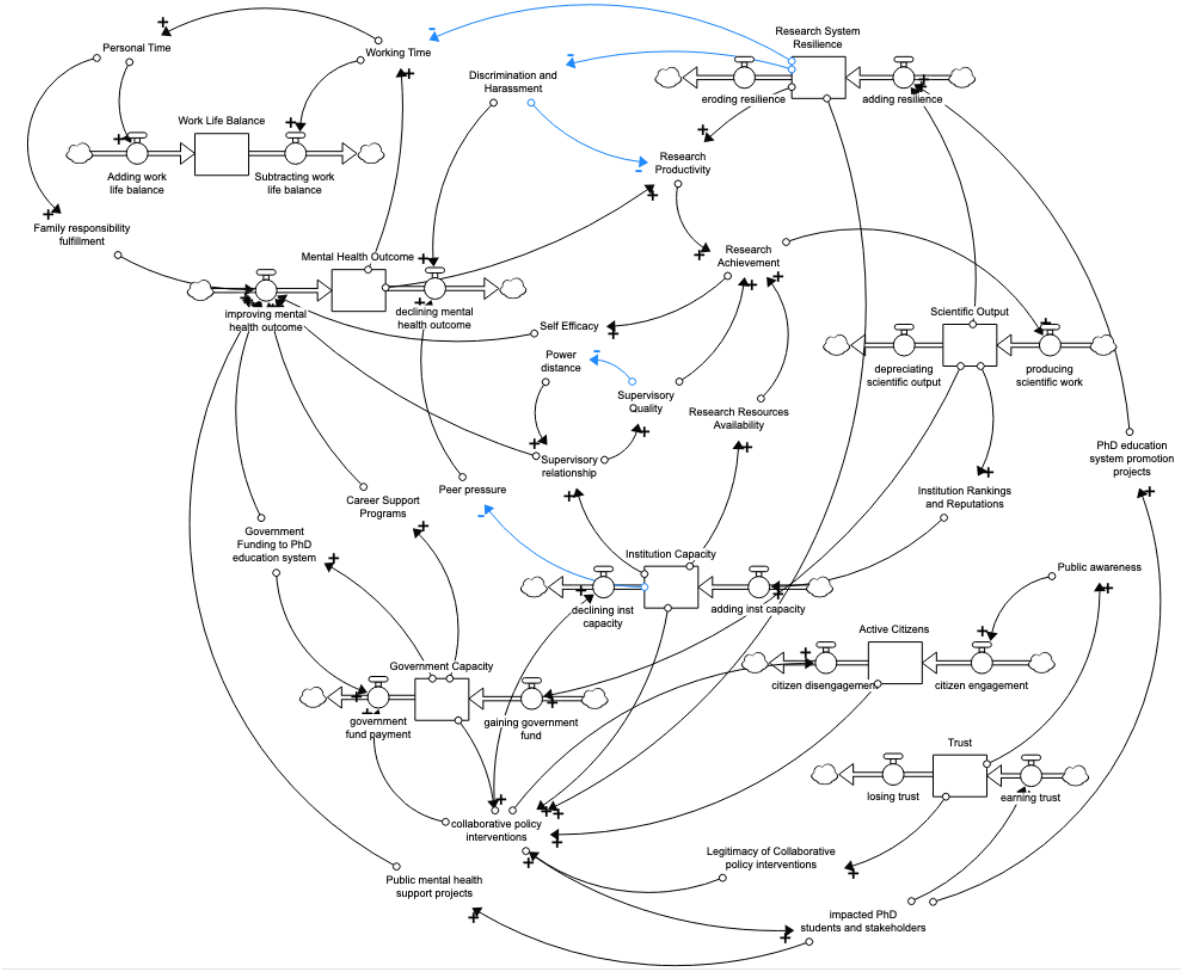

Figure 10: a stock-and-flow model that shows the dynamic of the global context

4.4 Stakeholder analysis

In this model, four main stakeholder groups are central to improving doctoral students' mental well-being: governments, institutions, active citizens, and PhD students themselves. Each group plays a distinct yet interconnected role in the governance structure, contributing to the feedback loops that shape mental health, performance, and system resilience.

In practice, this means each stakeholder operating at the level of their capacity, in coordination with the others.

4.4.1 Government role and reinforcing policy loops

Governments play a crucial role in the DPG model through funding mechanisms and policy design. By increasing government capacity and enforcing higher ratios of policy implementation, public authorities can provide more funding to the PhD education system, strengthening research infrastructure and career development programs. These interventions enhance financial resources for doctoral students and expand career support programs, directly addressing two of the top concerns identified in the Nature (2019) PhD mental health survey, which are financial insecurity and uncertain career prospects (Nature, 2019).

Improved financial stability and career opportunities positively affect mental health outcomes by reducing anxiety and promoting a sense of security. As mental health improves, so does overall well-being, leading to greater research productivity, achievement, and scientific output. In turn, enhanced scientific output justifies further government investment, reinforcing a positive feedback loop of funding, performance, and well-being (R1: Government Funding Loop). This dynamic captures how effective public governance can indirectly sustain both research excellence and human well-being in academia (Bianchi & Rivenbark, 2014).

Governments possess a capacity that no single institution can match, the ability to coordinate across stakeholders, set system-wide standards, direct funding strategically, and create the conditions under which institutional reform becomes not just possible but expected. In the context of doctoral education, this means the government has both the responsibility and the leverage to act: to use its policy instruments to protect student

wellbeing, to build bridges between universities and the enterprise sector, and to ensure that the enormous investment students make in doctoral study is met with an equally serious institutional and governmental commitment to their success.

Doctoral students should not have to navigate a system that was not designed with their wellbeing in mind. Redesigning that system requires more than goodwill at the departmental level. It requires governance.

At the government level, this means reforming the national research evaluation frameworks that drive unhealthy publication pressures, investing directly in mental health infrastructure across the doctoral sector, and creating formal policy mandates that require institutions to provide structured career support for both academic and non-academic pathways. Government capacity is uniquely suited to setting the conditions — through funding, regulation, and cross-sector coordination — within which everything else becomes possible.

4.4.2 Institutional role in supervisory and career Support

Universities and research institutions represent another central actor within the DPG system. Institutional capacity directly affects PhD students' experiences through supervisory relationships, peer environments, and support programs. When institutions implement structured mentoring systems, professional development programs, and mental health services, they strengthen supervisory quality and improve research achievement. Positive supervision and mentorship have been shown to buffer stress and prevent burnout among doctoral candidates (Pyhältö et al., 2021; Levecque et al., 2017).

Moreover, institutions can address peer pressure by fostering a more collaborative and less competitive academic culture. Reducing peer comparison and promoting community-based research environments can improve the psychosocial atmosphere of doctoral education. This, in turn, enhances institutional reputation and capacity over time by supporting student success and research excellence. Institutions can also build partnerships with industry and other universities to create career support programs that ease job uncertainty, which was reported by 79% of PhD respondents as their top concern (Nature, 2019).

At the institutional level, collaborative intervention means translating government policy into practice: building active partnerships with industry and the enterprise sector, embedding career guidance as a core component of doctoral training rather than an optional add-on, restructuring supervisor accountability frameworks, and designing mental health services that are genuinely tailored to the specific pressures of doctoral study. Prestigious institutions in particular carry a reputational and relational capital that, if deliberately deployed, can open doors for students that no individual effort could.

At the supervisor and departmental level, collaborative intervention means being an active participant in a broader support ecosystem rather than the sole point of contact for a student's academic and personal development. Supervisors who are connected to institutional career resources, who are trained in recognising mental health distress, and who are held to consistent standards of guidance and support become multipliers of institutional and governmental investment rather than isolated actors.

4.4.3 Active citizens and collaborative governance

NGOs, alumni, mental health advocates, and the general public can be considered active citizens, who play a key role in ensuring the legitimacy and sustainability of collaborative policies. When citizens are informed and engaged, they enhance the effectiveness and transparency of mental health interventions. Increased public trust and awareness strengthen the legitimacy of collaborative governance and promote a positive cycle of civic participation and institutional accountability (R13: Collaborative Trust Loop).

This active participation also helps normalize conversations about doctoral stress and mental well-being, building social support networks that complement institutional and governmental initiatives (Stubb et al., 2012). Over time, this results in a more resilient education system that integrates public values into policy design.

4.4.4 PhD Students as co-producers of well-being

Finally, PhD students themselves are not passive recipients but active contributors to collaborative governance. Their engagement in peer-support initiatives, advocacy groups, and institutional decision-making can improve the relevance and effectiveness of interventions. By providing feedback to institutions and policymakers, doctoral students help shape policies that more accurately reflect the lived realities of academic life. This co-

production approach embodies the principle of shared responsibility central to DPG (Bianchi, 2016).

And at the student level, the level at which all of these interventions ultimately land, collaborative policy means students are not passive recipients of support, but active participants in shaping it. Student feedback, as captured in surveys like those analyzed in this study, is itself a governance input: data that should be feeding directly into institutional policy review and government decision-making on a regular, structured basis.

The DPG model highlights that improving doctoral students' mental health requires a systemic and collaborative approach rather than isolated interventions. Government funding, institutional practices, civic engagement, and student participation all form part of a dynamic governance system that regulates well-being, performance, and resilience. Strengthening these interactions through coordinated policy design and shared accountability can foster a healthier, more sustainable doctoral education system globally.

Chapter 5 Designing Dynamic Performance Governance in the doctoral students' mental health sector in Chinese context

5.1 Quantitative analysis: PhD satisfaction and mental health among Chinese doctoral students

5.1.1 Introduction

While doctoral students around the world face similar academic and psychological challenges, Chinese PhD candidates encounter additional, context-specific stressors shaped by the country's unique social, cultural, and institutional characteristics. Building on the global analysis of doctoral mental health, this chapter develops an additional Dynamic Performance Governance (DPG) model and a corresponding Causal Loop Diagram (CLD) tailored to the Chinese doctoral education system.

The purpose of this section is to explore in depth how China's centralized governance structure, rapid expansion of higher education, and performance-driven academic culture interact to influence the mental health of doctoral students. By examining these dynamics through a DPG perspective, the model aims to reveal the underlying feedback mechanisms that link government policy, institutional behavior, and student well-being.

The goal of this analysis is not only to understand the systemic causes of mental health challenges within Chinese doctoral education but also to provide insights and policy recommendations for decision-makers. These suggestions aim to promote a more sustainable and human-centered doctoral education system, one that balances research productivity with mental health, and institutional performance with student well-being.

5.1.2 By the numbers of 2019: What the survey data reveals

The author used raw data from the 2019 PhD Survey. Of the 6,320 valid responses, 765 doctoral students were studying in China in 2019. Among these, 680 were Chinese students studying in China, and this subgroup was used to analyze the mental health issues of Chinese doctoral students.

Among the 680 students, 78% were between the ages of 25 and 34, which is consistent with the fact that many Chinese students pursue doctoral education immediately after completing their previous studies or after only a few years of work experience. In terms of gender distribution, 63% of the respondents were male and 37% were female, indicating a noticeable gender imbalance among doctoral students. Another notable characteristic is that the prevalence of LGBTQ-identifying students in the Chinese sample was considerably lower compared with the broader survey population.

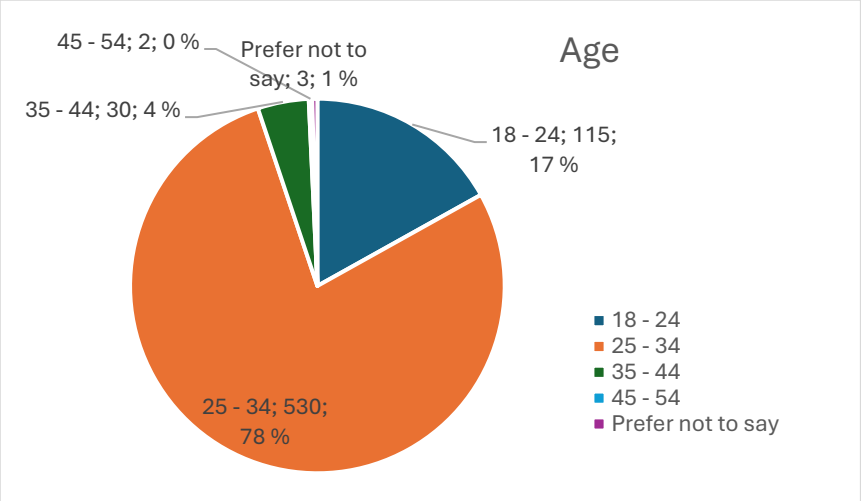

Figure 11: Age allocation of Chinese doctoral students (Made by the author from the 2019 *Nature* survey data)

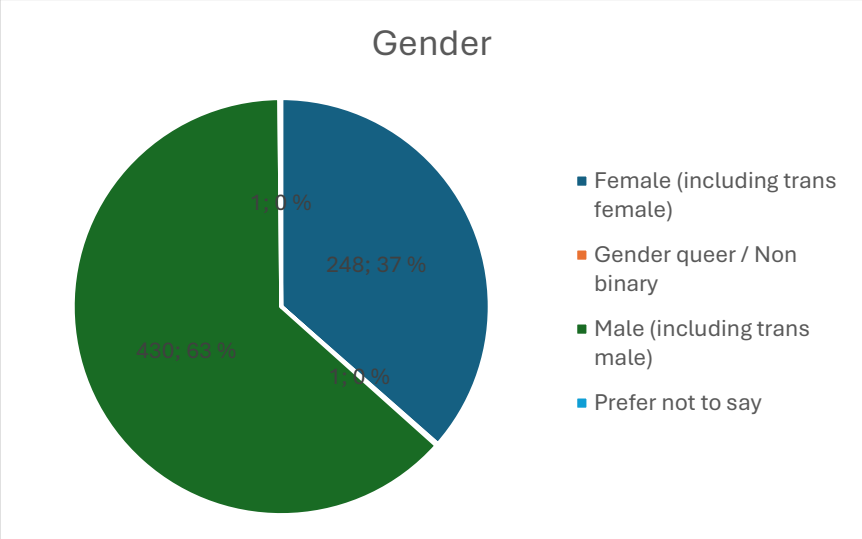

Figure 12: Gender difference of Chinese doctoral students (Made by the author from the 2019 *Nature* survey data)

The 680 respondents are asked about how satisfied they are with their PhD experience in general. Score 1 means not at all satisfied; score 4 means neutral and score 7 indicates extremely satisfied. Please see the score distributions in the figure below.

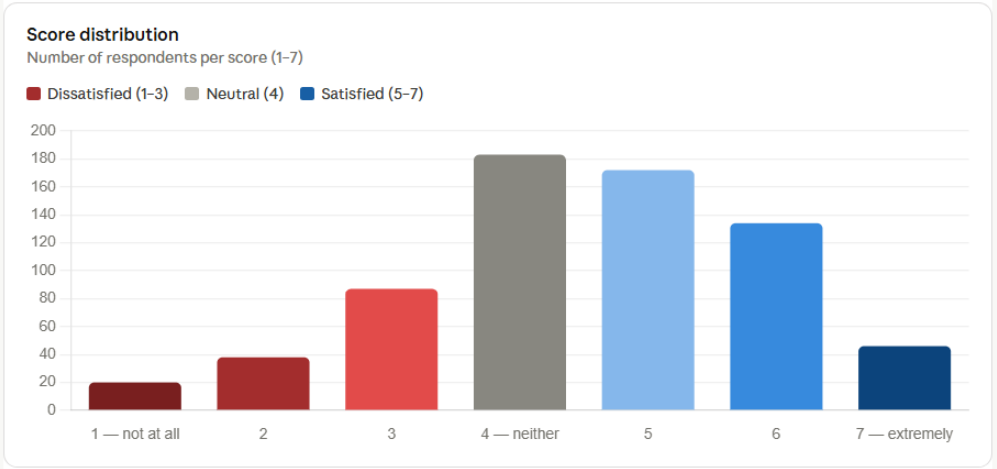

Figure 13: How satisfied are you with your PhD experience? (Made by the author from the 2019 *Nature* survey data)

Score 5 is the clear mode (172 respondents, 25%), and the curve falls away sharply toward both extremes. Very few students are at the extremes: only 3% gave a 1, and only 7% gave a 7. This suggests most students have a moderate, nuanced view of their experience rather than strong feelings either way. Over a quarter of respondents chose the exact midpoint (score 4). In satisfaction research, a large neutral block often signals passive dissatisfaction — students who are not engaged or fulfilled but haven't fully processed it as dissatisfaction yet. Combined with the 21% who are clearly dissatisfied (scores 1–3), nearly half the cohort is not positively satisfied. The Mean score of 4.6 sits only modestly above the neutral midpoint, reinforcing that satisfaction is thin rather than strong. The overall picture is most students are getting through, but few are thriving.

Rank distribution heatmap — all 14 concerns × all 7 rank positions

Darker red = more students ranked this concern at that position · sorted by weighted priority score

Concern	1st	2nd	3rd	4th	5th	6th	7th	Total
1 Inability to finish on time	290	82	45	26	13	10	7	**473**
2 Uncertainty about career/job	85	105	101	50	36	27	6	**410**
3 Financial worries after PhD	72	78	86	77	47	35	18	**413**
4 Work/life balance	36	69	75	69	48	23	17	**337**
5 Uncertainty about PhD value	44	75	51	46	31	27	10	**284**
6 Mental health concern	13	37	52	52	47	22	27	**250**
7 Parenting/care responsibilities	16	26	47	41	42	35	25	**232**
8 Number of faculty jobs	18	39	38	37	22	18	28	**200**
9 Funding / grant difficulty	32	31	31	22	27	17	11	**171**
10 Supervisor/PI relationship	19	45	29	25	19	14	10	**161**
11 Multiple postdocs culture	10	21	20	20	20	27	24	**142**
12 Political landscape	1	5	5	12	4	7	11	**45**
13 Student debt during PhD	1	4	5	7	5	6	5	**33**
14 Impostor syndrome	4	7	2	2	3	3	—	**21**

Fewer — More

Row totals — total mentions per concern

Confirms breadth of each concern across all rank positions

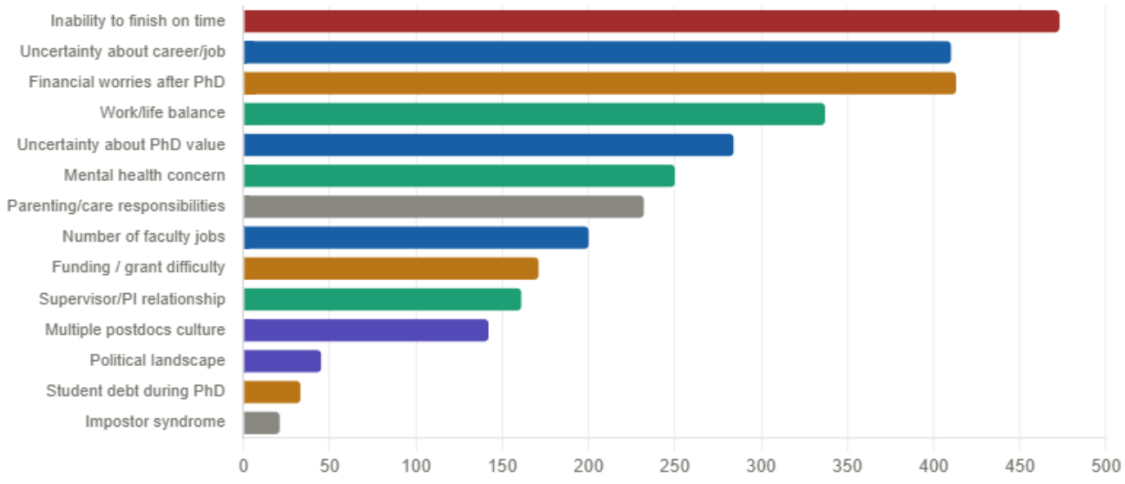

Figure 14: What concerns you the most since you started your PhD? (Made by the author from the 2019 *Nature* survey data)

The data tells a richly layered story across four dimensions:

1. Completion anxiety dominates urgently. "Inability to finish on time" is in a category of its own: ranked first by 290 respondents (45% of all first-place votes) and accumulating the highest total mentions (473) and highest weighted score. This is not just a widespread concern; it is the most acute, immediate pressure students carry. It sits at the intersection of time pressure, supervisor dynamics, funding limits, and self-worth, which makes it a symptom of multiple system failures at once.
2. Career and financial concerns are broad but distributed. "Uncertainty about job/career prospects" and "financial worries after PhD" each accumulate over 400 total mentions, but their first-rank votes are far lower (85 and 72 respectively). The chart also reveals this clearly: they are widespread worries that students rank consistently across all positions, rather than a single burning priority. This suggests chronic background anxiety rather than acute crisis.
3. Mental health is significantly under-ranked as a first concern. Despite 250 total mentions, mental health was ranked first by only 13 respondents. Its rankings cluster heavily in the 3rd–5th positions. This is an important finding: students are experiencing mental health distress but not framing it as their primary concern. It is being masked by more tangible, visible pressures like completion and money, even though those pressures are almost certainly driving the mental health burden.
4. Career and future concerns form the largest cluster overall (1,036 combined mentions across job prospects, PhD value, postdoc culture, and faculty jobs), confirming that structural uncertainty about life after the PhD is the single most pervasive theme running through doctoral student anxiety.

Impostor syndrome, with only 21 total mentions, is almost certainly the most under-reported concern in the entire dataset. Its low ranking is unlikely to reflect low prevalence, as research consistently shows impostor syndrome is widespread in doctoral education, particularly among high-achieving students navigating the pressures of original research and academic performance. The more probable explanation is one of framing and self-recognition: students who experience chronic self-doubt, a persistent sense of not

belonging, or fear of being exposed as inadequate may simply not identify with the clinical label "impostor syndrome," and therefore do not select it. The experience is there; the language to name it may not be. This is an important methodological limitation when interpreting its apparent absence from the data.

Student debt during the PhD ranks similarly low, but for reasons that are more straightforwardly contextual rather than methodological. In the Chinese higher education system, doctoral study is typically accompanied by a stipend that, while modest, is sufficient to cover basic living costs. Tuition fees for doctoral programmes in China are also considerably lower than in Western contexts, meaning the debt burden many Western PhD students carry simply does not apply in the same way. Any existing debt from undergraduate study is generally manageable by the time students reach doctoral level, given that PhD stipends provide a stable, if limited, income stream. In this sense, the low ranking of student debt is not a data anomaly, but an accurate reflection of the structural financial reality for Chinese doctoral students.

The political landscape also ranks very low across the dataset, and again, context explains this more than indifference. China's political environment is, by comparative standards, stable and consistent. For Chinese doctoral students studying within China, political uncertainty, of the kind that might concern students in countries experiencing electoral volatility, policy reversals, or social unrest, is not a salient daily pressure. The low ranking reflects that stability rather than a lack of political awareness.

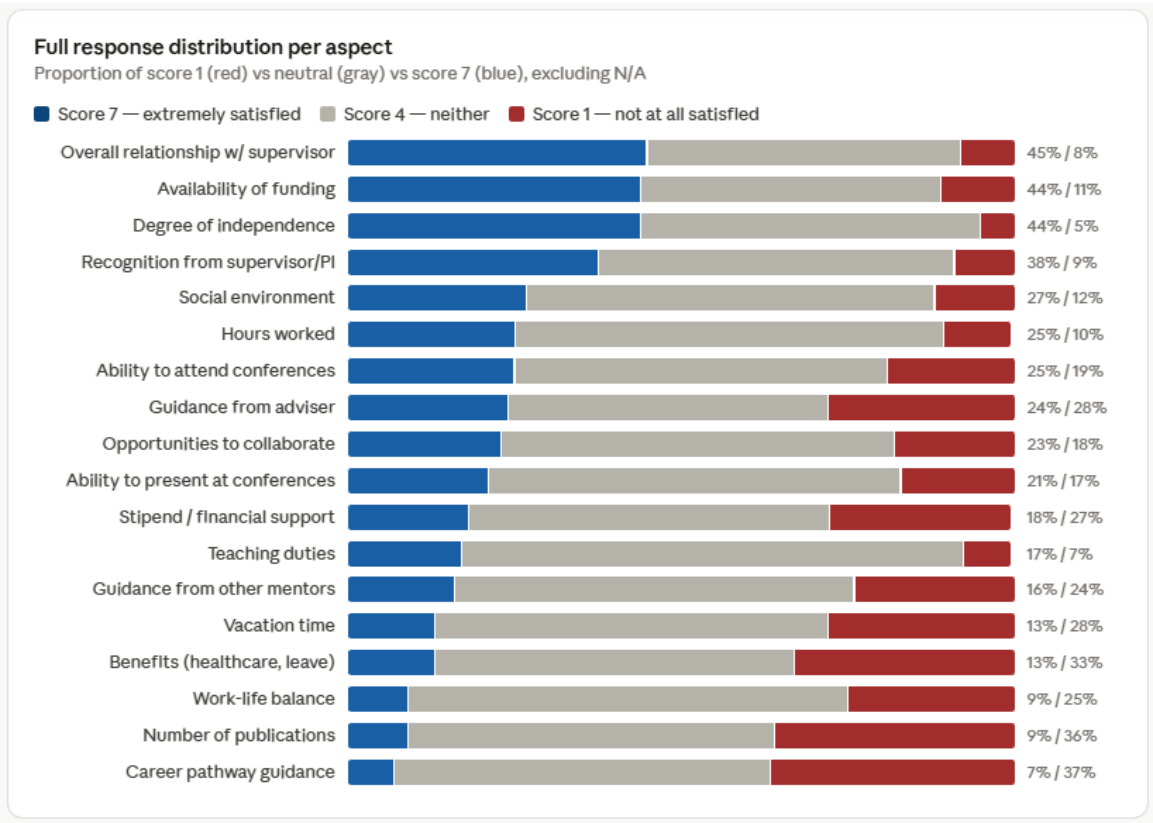

Figure 15: How Satisfied are you with each of the following attributes or aspects of your PhD? (Made by the author from the 2019 *Nature* survey data)

Three aspects stand out with strong satisfaction — degree of independence (+39%), overall supervisor relationship (+37%), and availability of funding (+33%). Recognition from supervisor/PI is also reasonably positive. These are the aspects of PhD life students feel best about.

Five aspects have significantly more dissatisfied than satisfied respondents. Career pathway guidance and number of publications are the worst (-30% and -27%), followed by benefits (-20%), vacation time (-15%), and work-life balance (-16%). Career guidance being the lowest-rated aspect is particularly striking — it echoes the global *Nature* survey finding about the gap between openness to non-academic careers and actual advice given.

Teaching duties (75% neutral), hours worked (64% neutral), and ability to present at conferences (56% neutral) have extraordinarily high score-4 rates. This likely reflects students who have simply adapted to their conditions — not satisfied but not actively

protesting. Work-life balance, by contrast, has a low neutral rate with high dissatisfaction, suggesting students feel it acutely rather than passively accepting it.

Among the 680 students, 41% reported having sought help for anxiety or depression related to their PhD studies, while approximately half indicated that they had not sought such support. For the half of students who did not seek help, it is unclear whether they were generally coping well or whether they experienced anxiety or depression but chose not to take any action or seek support, due to various reasons. In addition, around 8.8% of respondents preferred not to disclose this information. This group may also deserve particular attention, as students who choose to remain silent about their mental health challenges may be the ones experiencing significant difficulties.

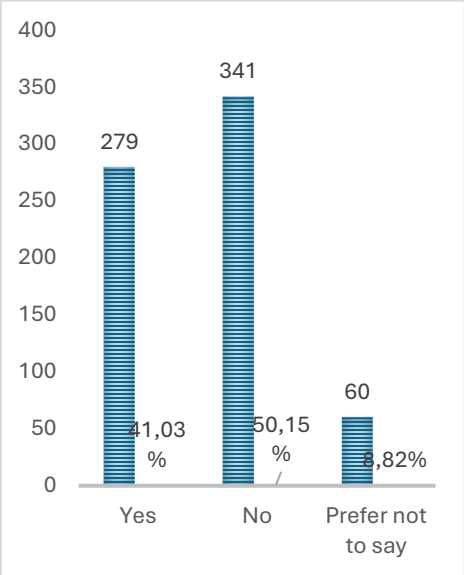

Figure 16: Have you ever sought help for anxiety or depression caused by PhD study? (Made by the author from the 2019 *Nature* survey data)

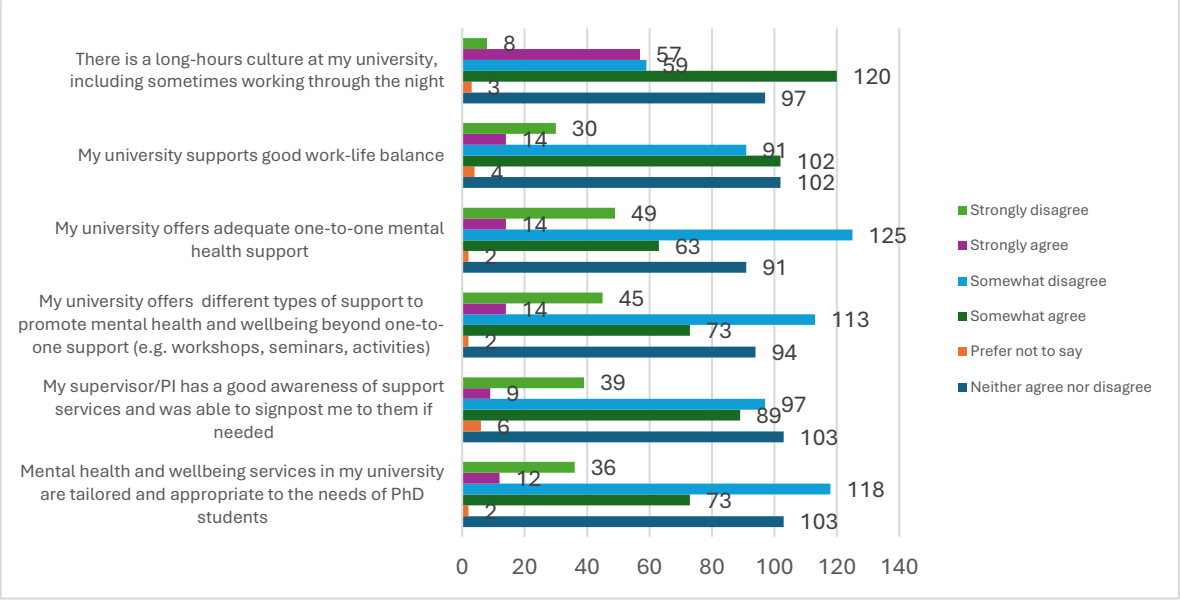

Figure 17: To what extent do you agree or disagree with the following statements? (Made by the author from the 2019 *Nature* survey data)

Among the 344 students who responded to the statement shown in the figure above, most expressed an unclear or uncertain attitude toward the support methods provided by their institutions. The majority selected either "somewhat disagree" or "somewhat agree."

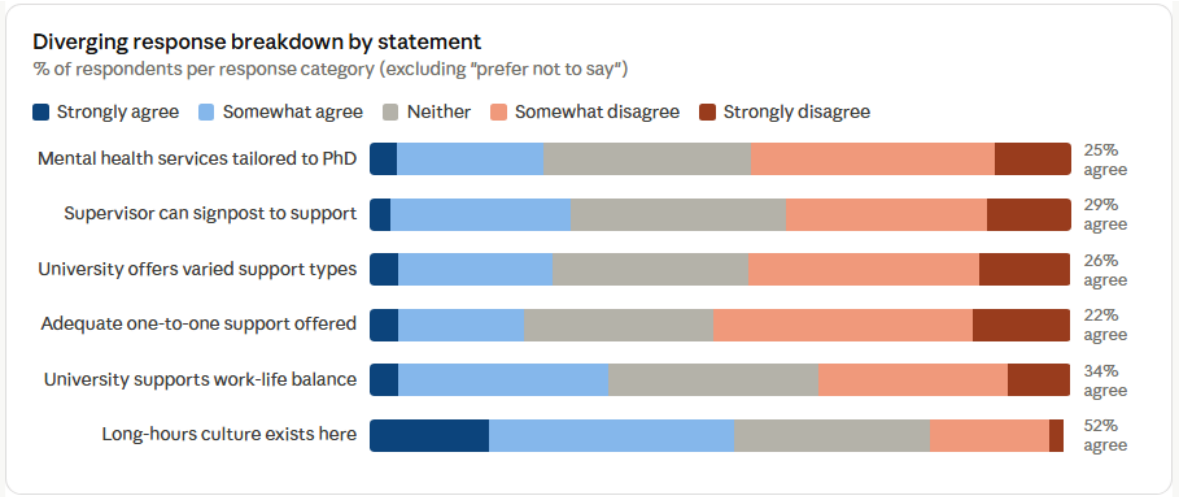

Figure 18: To what extent do you agree or disagree with the following statements? (Made by the author from the 2019 *Nature* survey data)

The data shows support services are widely seen as inadequate. All four statements about university mental health provision have negative net scores, which means more respondents disagreed than agreed. The weakest performer is one-to-one support adequacy, where 51% disagreed (somewhat or strongly) versus just 22% who agreed. Tailored PhD-specific services and varied support types also show majority dissatisfaction. Supervisor signposting is a real gap. 40% disagreed that their supervisor was able to point them to support services, and only 29% agreed. This is particularly important since supervisors are often the first point of contact when PhD students struggle. Long-hours culture is clearly felt. This is the only statement with a strongly positive net score (+33%), with 52% agreeing a long-hours culture exists — including 17% who strongly agree. This contrasts sharply with the work-life balance statement, which is much more mixed (36% agree vs 34% disagree). High "neither" rates across the board. Every statement sits at 27–31% neutral, which is consistently high. This could reflect genuine ambivalence, but given the context of services, it likely reflects students who simply haven't accessed or noticed the support on offer.

The overall sentiment across all responses is as follows: 31% agree, 40% disagree, 29% neutral, which shows a net negative picture of how PhD students perceive their university's mental health and wellbeing provision.

5.1.3 Six years on: How things have and haven't changed

In May and June 2025, *Nature*'s careers team again surveyed 3,785 PhD candidates from around the globe, exploring everything from supervision practices to workplace concerns. Some of the countries have very few responses, the data represented mainly from Eight countries that had more than 100 participants, which makes comparisons between them robust: Australia (101 respondents), Brazil (113), China (312), Germany (247), India (430), Italy (111).

PhD candidates in Brazil, Australia and Italy are the most satisfied in their programs in overall, while those in China were the least satisfied. The global average is 75%, while China is -15 of that percentage, which is 60%, ranked the lowest among those countries.

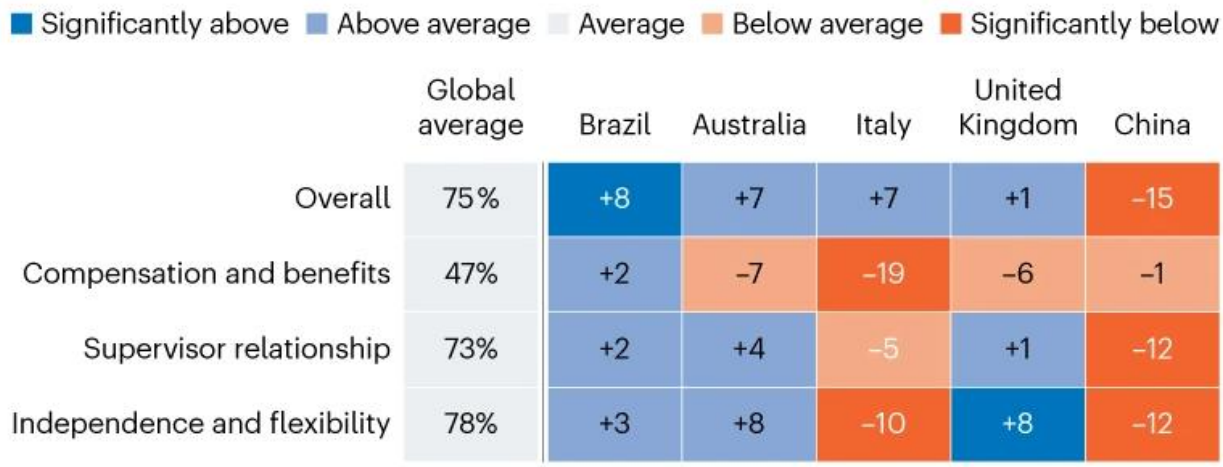

Figure 19: How satisfied are students? (Source: Linda Nordling, 2025)

The below figure shows how supervision, mental health and overwork concern stack up, among which China has significantly higher level of workload.

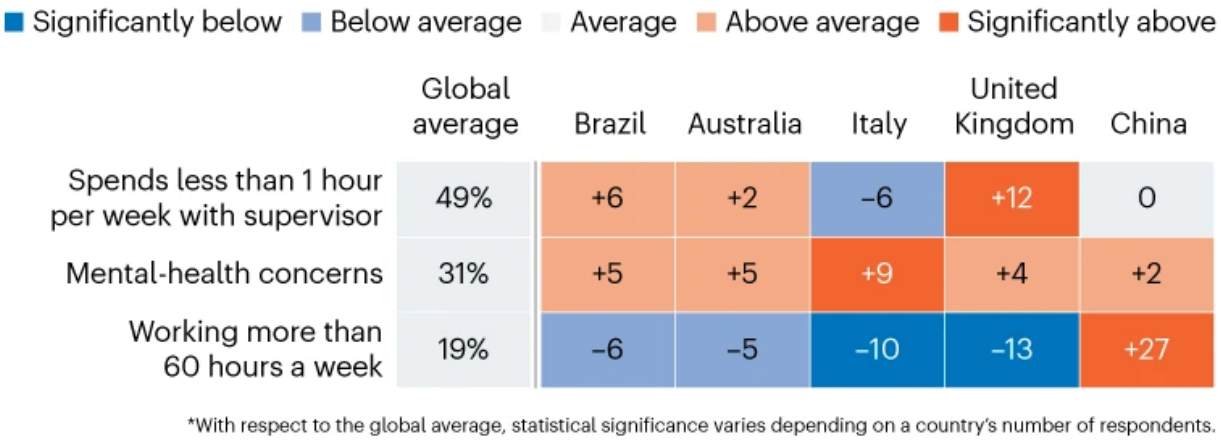

Figure 20: How supervision, mental health and overwork concern stack up (Source: Linda Nordling, 2025)

Based on this new survey, it is apparent it is urgent to investigate how Chinese doctoral students' mental health is faring. The author extracted the data of Chinese students studying in China, which is 260 students out of all 3785 global samples. Below figure shows the comparison of Chinese doctoral students' satisfaction towards their PhD experience.

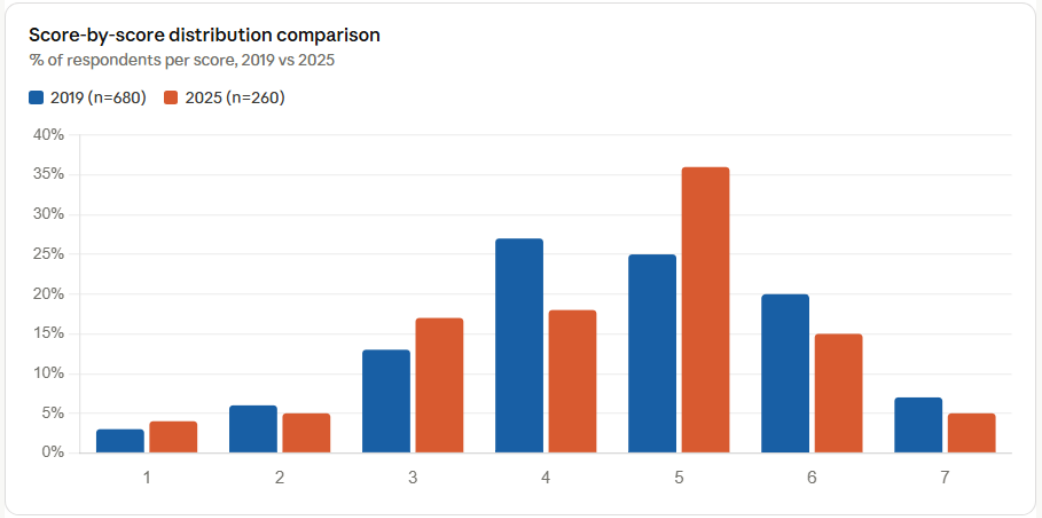

Figure 21: How satisfied are you with your PhD experience in 2019 and 2025? (Made by the author from the 2019 and 2025 *Nature* survey data)

The comparison shows it is more nuanced than a simple better or worse situation of the students' satisfaction, but the 2025 data show a polarization trend rather than a uniform shift.

Satisfaction rate is marginally up, but so is dissatisfaction. The share of satisfied students (scores 5–7) rose slightly from 52% to 56%. However, dissatisfied students (scores 1–3) also rose from 21% to 26%. Both ends of the scale grew, which means this isn't straightforwardly an improvement. The most striking shift is the drop in score-4 responses from 27% down to 18%. Students are forming stronger opinions. This polarization suggests that by 2025, Chinese PhD students have less ambivalence, that they have clearer views, both positive and negative about their experience. The 2025 peak is strongly at score 5 (36%), compared to 2019's flatter spread across 4, 5 and 6. This means more students in 2025 are "somewhat satisfied" but not strongly so — a cautious positivity rather than enthusiasm. Meanwhile, scores 6 and 7 combined fell (27% → 20%), suggesting genuine enthusiasm hasn't grown. The proportion giving score 3 jumped from 13% to 17%, meaning more students are clearly dissatisfied but not at crisis point. Combined with the drop in score-4 neutrals, many students who were previously undecided may have shifted into mild dissatisfaction.

The mean score dropped slightly from 4.6 to 4.3, confirming that despite the headline satisfaction rate ticking up, the center of gravity shifted modestly downward. Both cohorts sit well below the Nature global average of 75%. The 2025 Chinese cohort (56%) is now close to the Nature-reported China average (60%), which may originate from the nuanced sample choice difference, suggesting this sample is broadly representative. The persistent gap with the global average points to structural issues: career guidance, mental health support, work-life balance, that haven't meaningfully improved in six years.

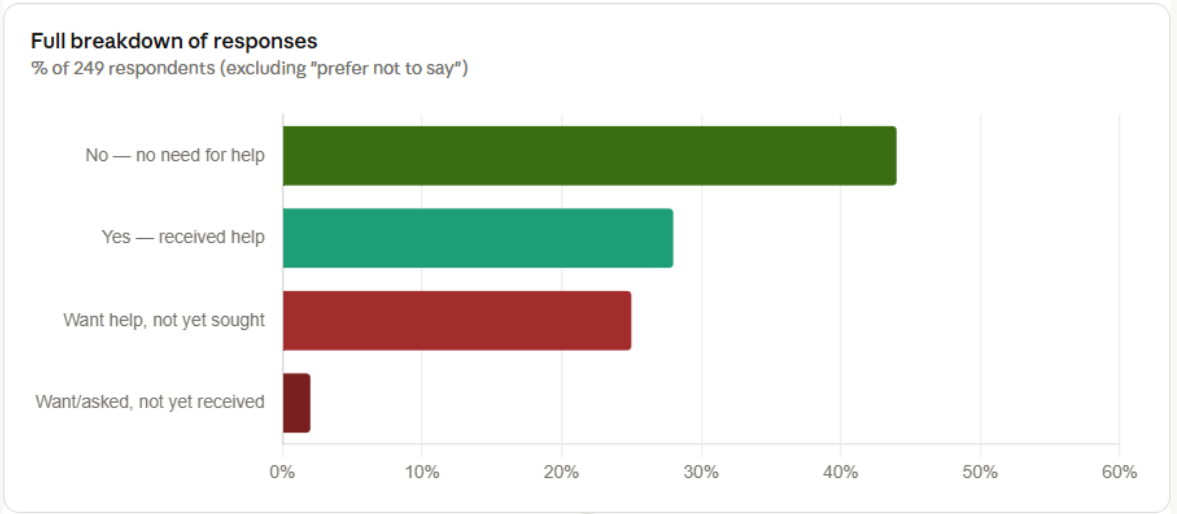

Figure 22: Have you ever received help for anxiety or depression connected to your studies? (Source: Made by the author from the 2019 and 2025 *Nature* survey data)

Here are the key findings from the 2025 mental health data: the unmet need is the most alarming finding. 56% of respondents report some form of mental health need (want help or have received it). But of that group, only half have successfully received help. The other half with 69 students, or 28% of the entire cohort, are currently living with unmet mental health needs connected to their studies. That's a substantial proportion. The "want help but haven't sought it" group (25%) is a critical signal. This is a category that rarely appears clearly in global surveys, and it points directly to barriers beyond just access: stigma, uncertainty about where to go, fear of academic consequences, or distrust of services. In Chinese academic culture, seeking help for mental health can carry stigma, which likely inflates this group relative to Western cohorts. The 2% who asked for help but haven't

received it yet, though small (6 students), represent a system failure: students who overcame barriers to seek help and still got nothing.

In the broader picture, cross-referencing with the satisfaction data: students in the 2025 cohort who are dissatisfied with their PhD experience are almost certainly concentrated in the "want help, haven't received it" group. The polarization we saw in the satisfaction scores, more people at extremes, fewer neutral, likely maps closely onto this mental health divide.

By comparing the survey questions and data from 2019 and 2025, the author sees the below findings, even though the questions are not directly comparable. The 2019 question asked, "have you ever sought help", a behavioral act. The 2025 question is more nuanced, capturing both those who received help and those who wanted it but didn't get it. This means the apparent drop from 41% to 28% is partly an artefact of question design, not a real improvement. Adding the 2025 "received help" (28%) and "want but haven't received" (25%) groups give a total mental health burden of 53%, which is significantly higher than the 2019 figure of 41%. The 2019 survey almost certainly missed a large hidden demand group because it never asked the question. The 2019 figure was already an undercount. Students who wanted help but never sought it would have answered "No" in 2019, quietly inflating the "no need" group. The real 2019 burden, had the same question been asked, was likely 50%+ as well.

What has genuinely worsened is the access gap. In 2025, for every student who successfully received help, there is almost exactly one student who needed it and didn't get it. That 1:1 ratio of helped to unhelped is a serious structural failure in university mental health provision and connects directly back to the earlier finding that students rated mental health services as poorly tailored and inadequate.

5.1.4 Conclusion: What the data tells us

The comparison between the 2019 and 2025 survey data paints a picture that is neither straightforwardly better nor worse. However, it is more polarized, more urgent, and harder to ignore.

Six years on, Chinese doctoral students remain significantly less satisfied with their PhD experience than the global average, and the structural issues that drove that gap in 2019: poor career guidance, inadequate mental health provision, and a pervasive long-hours culture, have not been meaningfully addressed. If anything, the 2025 data suggest the situation has become more acute. Satisfaction scores have polarized, with more students at both extremes and fewer sitting in the middle. Dissatisfaction has grown. And critically, the mental health burden, when properly accounted for, appears to have worsened rather than improved, with 56% of 2025 respondents reporting some level of mental health need, and half of those receiving no support at all.

The data points clearly to three areas where action is not optional but overdue.

First, mental health services must be redesigned around PhD students specifically. Generic university counselling is not working. The 2025 data shows that students know help exists but aren't seeking it or are seeking it and not receiving it. This points to barriers of stigma, accessibility, and relevance. Universities need dedicated PhD-focused mental health pathways, faster response times, and culturally sensitive provision that normalize help-seeking rather than quietly discouraging it.

Second, career guidance must become a core part of doctoral training, not an afterthought. Across both years, career pathway guidance ranked as one of the lowest-satisfaction aspects of the PhD experience. In a climate where academic job markets are shrinking and PhD graduates increasingly move into industry and other sectors, leaving students without structured career support is a failure of institutional responsibility. Departments need to move beyond passive openness to non-academic careers and actively invest in concrete, personalized guidance.

Third, the long-hours culture must be confronted directly. The 2025 data confirm it remains embedded: felt, accepted, and rarely challenged. Work-life balance was among the most dissatisfying aspects of PhD life, yet the culture that drives it is rarely addressed at institutional level. Supervisors, departments, and universities all have a role in modeling and enforcing healthier norms around working hours, rest, and boundaries.

Taken together, the 2019 and 2025 data is not a story of stagnation. It is a story of a student population becoming more vocal about what is wrong, more aware of their unmet needs, and less willing to sit in neutral. The question is whether government and institutions are willing to listen and act.

5.2 Qualitative analysis: A semi structured interview of Chinese doctoral students' mental health

To complement the quantitative findings from the 2019 and 2025 *Nature* survey data, the author conducted a series of in-person semi-structured interviews with Chinese doctoral students. This qualitative phase of the research aimed to move beyond the numbers and capture the lived experiences, personal narratives, and contextual nuances that survey data alone cannot fully convey, which offers a richer and more complete picture of the challenges and realities facing this cohort.

5.2.1 Sampling and data collection

Purposive sampling was used to recruit Chinese doctoral students with diverse backgrounds, including variation in academic disciplines, stage of study, and study location (different provinces). Snowball sampling was also used to recruit additional participants.

A total of 10 participants were interviewed. Data collection continued until thematic saturation was reached, which occurred after approximately 10 interviews.

Data was collected through semi-structured interviews lasting approximately 45 minutes. The interview guide was informed by key stressors identified in the literature (e.g., institutional requirements, cultural expectations, supervisory relationships, and mental health support), while remaining open-ended to allow new themes to emerge.

All interviews were audio-recorded with consent and transcribed in the original language (Chinese). For the purposes of analysis and presentation, the transcripts were translated into English by the researcher.

5.2.2 Data analysis and ethical considerations

The data were analyzed using an inductive thematic analysis approach. First, transcripts were read multiple times for familiarization. Second, initial codes were generated from

meaningful segments of text. Third, codes were grouped into broader categories. Finally, themes were developed to capture patterns across the data.

All participants provided informed consent. Data was anonymized, and pseudonyms were used. Due to privacy considerations and some sensitive topics, full interview transcripts are not included.

A coding framework was developed to systematically analyze the interview data. Initial codes were generated inductively from the data, while also being informed by key themes identified in the literature. For example, statements related to publication pressure and graduation requirements were coded under "academic requirements," while references to family expectations and cultural norms were coded under "cultural and familial factors." These codes were then grouped into broader categories, which informed the development of overarching themes.

Due to the large volume of qualitative data generated, the full set of initial codes is not presented in the main text. Instead, an illustrative example of the coding process is provided to demonstrate how raw data were systematically transformed into codes, categories, and themes. This approach is common in thematic analysis studies, where the emphasis is placed on the analytic process and resulting themes rather than exhaustive listing of all codes. However, the complete coding framework was maintained and used throughout the analysis to ensure rigor and transparency. An example of the coding process is shown below:

Raw Data	Code	Category	Theme
"I must publish papers to graduate."	Publication pressure	Academic requirements	Institutional pressure
"I don't want to disappoint my parents."	Family expectations	Family influence	Cultural expectations
"I feel like my supervisor gives me too many unrelated tasks."	Excessive supervisory workload	Supervisor overloading / role mismatch	Power Dynamics in Supervisory Relationships
"I don't think I am good enough to be a PhD or a lecturer in the future."	Imposter syndrome	Academic self-efficacy concerns	Institutional and Academic Pressure

Raw Data	Code	Category	Theme
"As a man and PhD, I don't have money to start a family now."	Financial pressure / gender role expectation	Socioeconomic and gender expectations	Socio-cultural and Familial Expectations
"My supervisor doesn't allow me to graduate."	Supervisory control over graduation	Gatekeeping power of supervisor	Power Dynamics in Supervisory Relationships
"I have to help my supervisor with administrative tasks."	Non-academic workload burden	Role confusion / exploitation of labor	Power Dynamics in Supervisory Relationships
"Our relationship got horrible when I refused to cheat on data."	Research ethics conflict	Ethical pressure under supervision	Power Dynamics in Supervisory Relationships
"My supervisor finally allowed me to graduate because I am pregnant."	Conditional graduation based on pregnancy	Supervisory gatekeeping / conditional approval	Power Dynamics in Supervisory Relationships
"My supervisor finally allowed me to graduate because I am pregnant."	Pregnancy-triggered academic decision / gendered treatment	Gendered discrimination in academic progression	Gendered and Structural Inequality in Academia
"I cannot get married now because I don't know where I can find a job."	Career uncertainty affecting life decisions	Job insecurity and life postponement	Career Uncertainty and Future Anxiety
"The market is so bad, I either got positions I don't like, or one with too little money."	Poor job market conditions	Employment insecurity	Career Uncertainty and Future Anxiety

Figure 23: Semi structure interview data coding example

5.2.3 Findings

This study explored the mental health and wellbeing of Chinese doctoral students through semi-structured interviews. Five interrelated themes were identified: (1) Institutional and academic pressure, (2) Supervisory power and academic hierarchy, (3) Socio-cultural and familial expectations, (4) Career uncertainty and life course anxiety, and (5) Barriers to Mental Health Support.

Overall, the findings suggest that doctoral students' mental health is shaped by an interaction between institutional structures, interpersonal power relations, cultural norms, and broader socio-economic conditions.

Theme 1: Institutional and Academic Pressure

A dominant theme emerging from the data was the strong pressure associated with institutional requirements and academic expectations. The findings confirm existing literature that highlights the strong academic demands placed on doctoral students, particularly in relation to publication requirements and graduation criteria. However, this study extends previous research by showing that these institutional demands are not only structural but also deeply psychological, contributing to sustained anxiety and self-doubt. Participants frequently mentioned publication requirements, heavy workloads, and uncertainty surrounding graduation criteria.

For example, one participant A stated: “I feel constant pressure because publishing papers is necessary for graduation.” This pressure was particularly evident among students in research-intensive disciplines, where academic performance is closely tied to measurable outputs. These findings align with existing literature but also highlight the emotional impact of institutional demands.

Theme 2: Cultural and Familial Expectations

The findings further demonstrate that Chinese doctoral students experience significant pressure from family and society. This supports existing literature on collectivist cultural contexts, where academic achievement is closely tied to family honor and social success. Cultural and familial expectations were identified as significant contributors to psychological stress. Participants described strong expectations from family members and society regarding success and future career outcomes. One participant B explained: “My family expects me to succeed because I am doing a PhD. They didn’t have much of a good education due to generational limits, and think good education secures a good future. However, the time has changed, they cannot imagine how competitive this new world is”

In addition, cultural norms emphasizing endurance and emotional restraint influenced how participants managed stress, often leading to internalization of difficulties. For example: “I realize that I am not made for academia, but it’s also too difficult for me to just give up, after 2 years of commitment. I am too cowardly to just give up, not only because of family and supervisor expectations, but also internally.

Theme 3: Supervisory Power and Academic Hierarchy

One of the most significant contributions of this study is the role of supervisory power in shaping doctoral students' wellbeing. While previous research has acknowledged the importance of supervisor-student relationships, the present findings highlight the extent of hierarchical control in academic progression.

The supervisory relationship played a crucial role in shaping participants' experiences. Many participants described hierarchical dynamics that limited open communication and autonomy. As participant C noted: "I don't feel comfortable expressing disagreement with my supervisor." Additionally: "I have been struggling to graduate, even I have fulfilled the graduation requirement, my supervisor doesn't allow me to finish." "My supervisor finally allowed me to graduate because I am pregnant, now I am ready to go, but the past stress makes me not want to revisit that memory again." Participants reported limited autonomy, difficulty challenging supervisors, and in some cases, conditional control over graduation outcomes. This reflects Confucian-influenced power distance, where authority is rarely questioned.

The findings reveal that such power asymmetry is not only academic but also emotional, contributing to fear, dependency, and ethical tension. It also suggests that power distance within supervisory relationships contributes to stress and reduced wellbeing.

Theme 4: Career Uncertainty and Life Course Anxiety

Career uncertainty emerged as a key source of psychological distress. Participants expressed concerns about unstable job markets, limited opportunities, and low-income positions. As one participant D said, "I cannot get married now because I don't know where I can find a job." "The market is so bad, I either got positions I don't like, or one with too little money."

This uncertainty also influenced major life decisions, such as delaying marriage or family planning. This finding extends existing literature by linking academic uncertainty to broader life-course disruptions, suggesting that doctoral education affects not only professional identity but also personal life trajectories.

Theme 5: Barriers to Mental Health Support

Participants reported several barriers to accessing mental health support, including limited availability, perceived ineffectiveness, and stigma. One participant E stated: "Seeking help

is not very common in our culture, and you have to keep it a secret if you did so. You will be discriminated against if others find out that you are sick, and most importantly, you don't want to leave that in your medical record, as it will influence your future job seeking. Employers don't want to hire people that are or were mentally sick" As a result, many participants relied on informal coping strategies rather than professional support services.

5.2.4 Conclusion

Taken together, the findings demonstrate that Chinese doctoral students' mental health is shaped by a multi-layered system of pressures:

- Institutional structures (academic requirements)
- Interpersonal power (supervisors)
- Cultural expectations (family and society)
- System barriers (support system)

These dimensions interact with each other rather than operating independently, producing cumulative psychological strain.

However, this semi structure interview study is also limited by its small sample size and qualitative nature, which does not aim for generalizability. However, it provides in-depth insights into lived experiences that may inform future larger-scale research.

5.3 Special stressor of Chinese Doctoral students' mental health

This research has previously discussed these elements briefly and from a general perspective in the literature review section. However, to build a more comprehensive understanding of the dynamics influencing doctoral students' mental health, particularly within the Chinese context, the following section will explore these stressors in greater depth. All those stressors are extracted from literature review or survey and interview data. Each stressor represented in the Dynamic Performance Governance (DPG) framework, and the causal loop diagram (CLD) will be examined to explain its role, interconnections, and implications for mental health and overall system performance. By analyzing these factors in detail, the study aims to clarify how structural, cultural, and institutional characteristics interact to shape the lived experience of doctoral students and to provide a foundation for

evidence-based recommendations for policy and governance improvements in the Chinese doctoral education system.

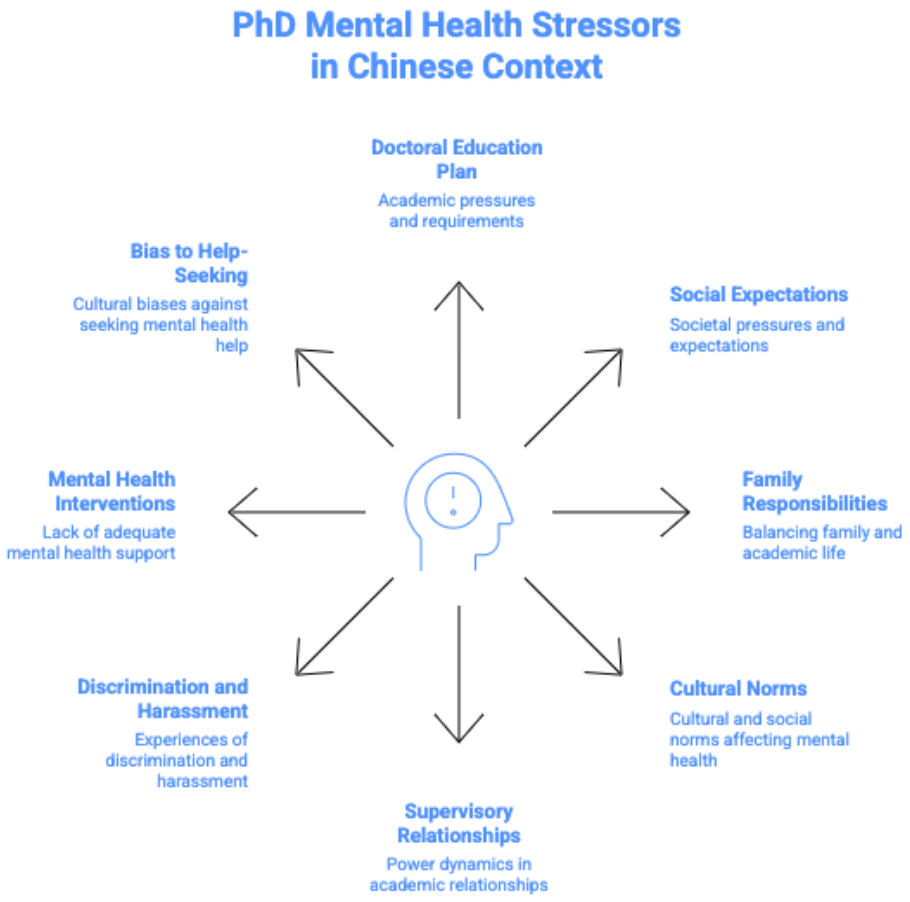

Figure 24: Additional stressors to PhDs mental health outcome in China (Source: Sketched by author)

5.3.1 Doctoral education plan and requirements

In China, the doctoral education system operates under a centralized governance model, where both national policy and institutional regulations strongly influence program design, completion criteria, and evaluation standards. Students are often required to publish several papers in internationally indexed journals (e.g., SCI or SSCI) before graduation, regardless of the research field (Zhang & Shen, 2021).

This rigid structure places enormous pressure on doctoral candidates, particularly those in the humanities and social sciences, where international publications may be less accessible. The standardized and quantitative nature of these requirements often leaves little room for individualized pacing or flexibility, amplifying academic stress, and undermining students' sense of autonomy and intrinsic motivation.

The current structure of PhD programs in China can often place excessive demands on students, both in terms of their research workload and the administrative hurdles they must clear. A particularly difficult aspect of this system is the significant power granted to a PhD supervisor. In many cases, a supervisor holds the ultimate administrative authority to approve or deny a student's graduation.

This power dynamic can lead to severe personal and professional consequences. For instance, there is one case from the author's interview of a student who had met all the formal requirements for his degree: he had completed his research and published the required number of papers. He had even secured a highly coveted job offer from Huawei, a top-tier company known for its competitive "talent program."

Despite having fulfilled his obligations to the university and having this exceptional career opportunity, his supervisor refused to grant final approval for graduation. As a result, the student was unable to receive his doctorate in time to start the job and was forced to decline the offer. This situation, where a single individual's discretion can override a student's completed work and derail their career prospects, understandably causes immense distress and feelings of powerlessness.

5.3.2 Social expectations toward PhDs

In Chinese society, earning a PhD is traditionally viewed as a symbol of prestige, success, and family honor. Many doctoral students face implicit expectations from parents, peers, and communities to achieve not only academic excellence but also high social mobility. However, the overproduction of PhD graduates and the limited availability of academic or high-status positions have weakened the economic and symbolic value of a PhD degree (Wang et al., 2022).

This mismatch between expectations and reality produces psychological tension; students may feel guilt or shame if they fail to meet societal standards. This stressor connects to self-efficacy, unrealistic social expectations can lower confidence, diminish well-being, and indirectly reduce research productivity.

One illustrative case from the author's interviews with Chinese doctoral students highlights this phenomenon. A PhD student reported that the nature of her current research work was quite different from what she had initially anticipated, and over time she realized that she did not enjoy the topic or approach. However, despite her dissatisfaction, she felt unable to withdraw or change direction due to a strong sense of obligation toward her family and supervisors, as well as the perceived sunk cost of the time and effort already invested in the program. This sense of entrapment created profound emotional strain, leaving her mentally exhausted and demotivated.

Such experiences are not uncommon among Chinese doctoral students. Many continue to persevere in research areas or institutional environments they find unfulfilling, primarily out of fear of disappointing others or being perceived as weak or ungrateful. The strong emphasis on perseverance or enduring hardship, and meeting collective expectations reinforces this behavior, even when it comes at the expense of students' personal well-being. As a result, students often internalize stress, suppress dissatisfaction, and maintain a façade of commitment, which can contribute to long-term mental fatigue and burnout.

5.3.3 Family responsibilities

In China's collectivist culture, family obligations hold deep moral importance. Many doctoral students, especially those in their late twenties or thirties, must balance academic responsibilities with caring for children, elderly parents, or financial contributions to the household.

The one-child policy has also created a "sandwich generation," where a single adult is often expected to support both older and younger family members. This dual burden, academic and familial, creates role conflict, reducing available time and energy for research, and leading to time saturation and burnout. Women are disproportionately affected, as traditional gender norms assign them greater caregiving responsibilities.

Another case from the author's interviews illustrates the heavy burden of family responsibilities and financial pressure faced by some Chinese doctoral students. One interviewee, who began his doctoral studies after years of professional work and starting a family, described a deep sense of guilt toward his wife and parents, who were supporting him financially during his studies. He felt conflicted that he was not contributing economically, as his limited funding only covered his personal expenses. Moreover, being physically distant from his family and missing important moments in his child's early life intensified his feelings of inadequacy and emotional strain. In his attempt to minimize the financial burden on his family, he restricted his own spending and endured considerable psychological stress, illustrating how financial constraints and family obligations can become major sources of mental distress for mature doctoral students.

Balancing family life and academic demands is particularly challenging in China, where traditional family expectations remain deeply influential. Even for unmarried students, family-related pressures can be substantial. Many face constant reminders from parents and relatives about the need to marry and have children, especially as they approach their thirties. This social expectation is even more pronounced for women. Female doctoral candidates often face the stigma of being labeled as "sheng nü" (leftover women) if they remain unmarried after the age of thirty. Such gendered cultural norms not only impose emotional stress but also reinforce feelings of inadequacy and social isolation. Together, these pressures, financial, familial, and cultural, contribute significantly to the overall decline in doctoral students' mental health and well-being.

5.3.4 Cultural and social norms

Chinese cultural norms prioritize collectivism, harmony, and conformity. These values influence students' attitudes toward performance, failure, and help-seeking. For instance, expressing stress or dissatisfaction may be viewed as a sign of weakness or lack of discipline, conflicting with the Confucian ideal of perseverance.

Such social norms encourage emotional suppression and discourage open discussions about mental health. Suppressed emotions lead to poorer mental health outcomes, which reduce productivity and self-efficacy, which in turn heightens stress and silence further help-seeking.

5.3.5 Power distance in supervisory relationships (Confucian culture)

Supervisory relationships in Chinese academia are deeply influenced by Confucian hierarchical values, emphasizing authority, respect, and obedience (Li & Zhu, 2020). Supervisors, often referred to as “academic parents” hold substantial control over students’ funding, research direction, and even future employment recommendations.

This widened power distance can foster mentorship but also enable neglect, exploitation, or even academic bullying if unchecked. Because students are culturally conditioned to avoid confrontation, they may endure harmful supervision without reporting it. In this case, poor supervisory quality may greatly reduce mental health outcomes and overall system resilience.

A further source of stress commonly observed in Chinese doctoral education arises from the unequal power dynamics between supervisors and students, which often lead to various forms of academic and personal labor exploitation. Unlike in many European systems such as Norway, where PhD candidates are typically treated as paid researchers, doctoral candidates in China are formally regarded as students rather than employees, but the practical relationship often resembles that of an employer and employee. Supervisors frequently hold significant control over students’ access to research funding, publication opportunities, and, most critically, their ability to graduate. This structural dependency creates an environment in which students feel compelled to comply with their supervisors’ requests, even when such tasks extend beyond their academic responsibilities.

In many cases, doctoral students are expected to contribute extensively to their supervisors’ research projects or administrative tasks, often receiving only modest or symbolic financial compensation that does not correspond to the volume or complexity of their work. Moreover, it is not uncommon for students to be asked to assist with personal errands or non-academic duties for their supervisors, and it is unfortunately a practice that is widely normalized and culturally accepted within Chinese academia, though it would be considered inappropriate or unethical in most Western academic contexts.

Such arrangements can have substantial consequences for students’ academic progress and mental health. The excessive workload and blurred boundaries between academic and personal obligations reduce the time and energy available for their own research, leading to

stress, fatigue, and a sense of powerlessness. While many supervisors in China are highly supportive and foster nurturing mentor–mentee relationships, instances of supervisory overreach and exploitation remain prevalent. Given the hierarchical nature of the system, students often have limited channels to voice concerns or resist unfair treatment, as supervisors retain decisive authority over academic evaluations, recommendations, and the ultimate approval of thesis completion.

5.3.6 Discrimination and harassment

Although the number of female doctoral students in China has increased significantly, gender bias and inequality persist within academia. Women often encounter stereotypes suggesting they are less suited for rigorous research careers or that family responsibilities should take priority over professional advancement (Chen & Xu, 2022).

Moreover, female PhD candidates may face subtle discrimination in hiring or promotion, particularly in male-dominated disciplines. Such systemic inequality contributes to psychological distress, reduced confidence, and career uncertainty, reinforcing peer-pressure and self-efficacy. Addressing gender disparities is therefore essential for a sustainable doctoral system.

Another critical but often overlooked stressor within the Chinese doctoral education system is sexual harassment, which remains significantly underreported and frequently concealed. When such incidents occur, affected students often choose to remain silent due to uncertainty about available reporting mechanisms, fear of reputational harm, or anxiety over potential retaliation. This is particularly severe when the perpetrator holds a position of authority like a supervisor or senior academic, as the hierarchical nature of the academic system creates a power imbalance that discourages victims from speaking out. In cases involving peers, victims may remain quiet out of concern for damaging the offender's academic future or provoking interpersonal conflict and retaliation.

Female doctoral students are disproportionately affected, and they face additional cultural and social barriers to disclosure. The persistence of victim-blaming attitudes, sometimes referred to as the "guilty victim" phenomenon, fosters a sense of shame and self-blame among those who experience harassment. As a result, many victims internalize their trauma

and suffer in silence, leading to long-term psychological distress and deterioration in overall well-being.

In recent years, the growing influence of digital platforms has allowed some victims to share their experiences publicly, occasionally under their real names, as a means of seeking justice and raising awareness. These online disclosures can bring temporary social attention and public support, yet they also expose victims to significant personal risk, including online harassment, institutional pressure, or legal repercussions. Despite increasing awareness, most cases of sexual harassment in academia remain unreported or unresolved, reflecting both systemic shortcomings in institutional response and deep-rooted cultural norms surrounding gender, authority, and silence.

5.3.7 Inadequacy of mental health interventions

While mental health has gained more public attention in China, institutional-level interventions within universities remain limited. Many universities lack professional counseling services, or existing services are underfunded and stigmatized.

Mental health programs tend to focus on crisis management rather than prevention and are seldom integrated into doctoral training or supervision frameworks. Typically, significant attention to mental health issues is only triggered by serious incidents or tragedies, rather than through ongoing, proactive support. Even when such crises occur, many institutions tend to manage them internally, often avoiding public acknowledgment or open discussion. This tendency reflects a broader cultural pattern in which the dissemination of negative information is believed to have potentially harmful social consequences; one of them is about influencing other students' emotions or behaviors in undesirable ways. Consequently, institutions may prioritize maintaining a positive image and social stability over transparency and collective learning.

However, this practice can inadvertently perpetuate stigma, hinder open dialogue, and weaken opportunities for systemic improvement in mental health support. Preventive measures remain underdeveloped, and post-crisis interventions often lack depth, coordination, and follow-up. While it is important to note that not all universities operate in this manner, this tendency is sufficiently common to be recognized as a systemic challenge within the Chinese higher education context.

5.3.8 Bias toward mental help-seeking

Cultural stigma surrounding mental illness remains a major barrier in Chinese higher education. Many students fear that seeking psychological help could harm their reputation or academic evaluation. Mental health issues are often perceived as personal failures rather than systemic challenges.

This bias against help-seeking suppresses the potential impact of even well-designed support interventions, diminishing the effectiveness of any kind of support. Consequently, mental distress accumulates silently, worsening both individual well-being and institutional resilience.

In contrast to many Western contexts, such as Europe, where mental health services are widely accessible and commonly utilized, the cultural perception of psychiatric support in China remains deeply stigmatized. In European countries, it is relatively normal for individuals to consult a psychiatrist or use online mental health services as part of routine well-being maintenance. However, in China, seeking psychiatric or psychological assistance is often associated with severe mental illness or emotional instability, rather than being viewed as a proactive or preventive health behavior. This perception discourages many doctoral students and the general population from seeking professional help when experiencing stress, anxiety, or depression.

Moreover, the availability and normalization of online mental health services in China lag behind those in many Western nations. While some universities and institutions nominally provide psychological counseling services, these are often underutilized, under-resourced, or treated as symbolic gestures rather than functional support mechanisms. Many of these programs lack professional staff, confidentiality guarantees, or sufficient integration with academic structures, leading students to perceive them as ineffective or merely performative. Consequently, Chinese doctoral students frequently choose to internalize or self-manage their psychological distress, rather than seeking formal help, which may exacerbate mental health challenges over time.

5.3.9 Summary of stressors in Chinese context

These stressors reveal that doctoral mental health in China is not solely a matter of individual resilience but is systemically embedded within policy, culture, and institutional design. Each stressor interacts dynamically within the DPG framework:

- Cultural and hierarchical norms amplify stress.
- Rigid requirements and limited interventions create structural pressure.
- Social and family expectations shape emotional and behavioral responses.

To achieve sustainable improvement, interventions must therefore go beyond counseling and address governance-level dynamics, but enhancing supervisory training, reducing performance-based pressure, and fostering cultural acceptance of mental health support.

5.4 A dynamic governance analysis of doctoral students' mental health outcomes in Chinese context

This DPG chart maintains a structure similar to the framework applied in the global context but integrates several elements that are specific to the Chinese environment. To ensure clarity and avoid unnecessary repetition, the following section will focus primarily on explaining the components that are unique to the Chinese context.

Within the Dynamic Performance Management (DPM) and Dynamic Performance Governance (DPG) framework, several strategic resources play critical roles in shaping doctoral students' mental health outcomes in the Chinese context. One essential strategic resource is personal time, which refers to the amount of discretionary time students have outside of academic and research work. Personal time functions as a foundational capacity that enables students to maintain balance between professional obligations and private life. Limited personal time reduces the intermediate outcome of family responsibility fulfillment, which reflects how effectively students can meet family expectations and obligations. This reduction, in turn, negatively influences perceived family responsibility fulfillment, which is a subjective evaluation of one's success in maintaining familial harmony and happiness, and ultimately contributes to poorer mental health outcomes.

Another significant strategic resource is the broader system of social and cultural norms, which governs how society views both academic pursuit and mental health. In China,

traditional values emphasizing diligence, endurance, and respect for hierarchy shape collective social opinions toward PhD students and influence social bias against mental health problems. These cultural patterns often stigmatize the open acknowledgment of stress or psychological difficulty, thereby discouraging students from engaging in mental health help-seeking behaviors. A reduction in help-seeking, combined with strong social expectations toward academic excellence, intensifies social pressure on PhD students. This pressure operates through the performance driver of social norms ratio, reflecting the alignment (or misalignment) between cultural expectations and students lived realities. Elevated social pressure, together with unmet family expectations, affects the overall social and family ratio, thereby worsening mental health outcomes.

In the surveys among Chinese doctoral students and the semi structure interview, Chinese doctoral students frequently spoke of the pressure that accompanies their academic journey not only as a personal ambition, but also as a familial and societal one. A PhD in the Chinese context carries significant symbolic value, it represents not only individual achievement but the fulfilment of family hopes, the repayment of parental sacrifice, and a visible marker of social standing. When the reality of doctoral study, with its uncertainty, its slowness, its frequent setbacks, collides with these expectations, the gap between what students feel they should be achieving and what they are actually experiencing becomes a profound and often silent source of distress. This cultural dimension also helps explain one of the most significant findings in the 2025 data: that a substantial proportion of students who wanted mental health support had not sought it. Stigma is not simply a personal reluctance, but is socially constructed and culturally specific. In a context where seeking psychological help can be interpreted as weakness, as a loss of face, or as evidence that one is not coping with something one is expected to handle with quiet resilience, the barrier to help-seeking is not merely logistical. It is deeply embedded in social norms.

The contrast with certain Northern European contexts is instructive here. In countries like Denmark, Sweden, or Norway, doctoral study is often pursued later in life, and by individuals who have already built careers and families, who are returning to academia out of genuine intellectual curiosity rather than social obligation. For these students, a PhD is an act of personal freedom rather than social duty. The absence of familial expectation,

combined with broader cultural norms around mental health openness and work-life balance, creates a fundamentally different psychological environment, one where help-seeking carries far less stigma and where the purpose of doctoral study is less easily destabilised by slow progress or uncertainty. This comparison is not offered to suggest that one cultural context is simply superior to another, but to make a more strategic point: social and cultural norms are not fixed. They are shaped over time by education, by public discourse, by institutional messaging, and by the stories a society chooses to tell about what success looks like and what struggle means. The same cultural infrastructure that currently amplifies pressure and suppresses help-seeking among Chinese doctoral students is, if engaged thoughtfully, a resource that can be redirected.

Governments, institutions, and academic communities have the capacity to actively shift social narratives around mental health in doctoral education — normalising help-seeking, reframing struggle as a legitimate and expected part of the research process, and decoupling doctoral achievement from its burden of social obligation. Public campaigns, institutional cultures that model openness, peer support networks that destigmatise distress, and supervisors who speak openly about the difficulties of research can all contribute to a gradual but meaningful shift in what is considered normal and acceptable to feel, and to say, during a PhD. Cultural norms have historically been one of the greatest barriers to mental health support in Chinese doctoral education. With deliberate and coordinated effort across stakeholders, they can become one of its most powerful enablers.

A further critical resource embedded in the system is power distance, a structural characteristic of supervisor–student relationships within the Chinese academic environment. High power distance limits open communication and reduce students' perceived autonomy, making supervisory relationships an essential intermediate outcome that mediates the effect of governance structures on well-being. When the power distance is high, supervisory dynamics tend to become more hierarchical and less supportive, indirectly deteriorating students' mental health, which constitutes the final outcome of this dynamic system.

The relationship between a doctoral student and their supervisor in China is not simply a professional or academic arrangement. It is imbued with deep cultural meaning, drawing on

Confucian traditions that place the teacher-student relationship among the most significant and sacred bonds a person can hold. Classical Chinese sayings speak of the teacher as one who transmits knowledge, imparts professional skills, and resolves confusion. It is a role that in the doctoral context extends naturally into life guidance, mentorship, and moral stewardship. When this relationship works well, it is genuinely powerful: a good supervisor in the Chinese academic tradition can offer not only intellectual direction but a form of paternal or maternal care that supports the whole person through the difficulty of doctoral study. The survey data reflects this. Overall satisfaction with the supervisor relationship was among the higher-rated aspects of the PhD experience, and students who reported strong supervisory relationships consistently showed better overall wellbeing and satisfaction scores. In the Chinese context, the cultural framing of this relationship actively amplifies its positive potential — students who feel supported by their supervisor may feel a deeper and more holistic sense of being cared for than is typical in more transactional Western academic cultures. But the same cultural architecture that makes a good supervisory relationship so valuable makes a bad one extraordinarily difficult to escape. This is where the concept of power distance becomes critical. Power distance, the degree to which less powerful members of a society accept and expect unequal distributions of power, is notably high in Chinese academic culture. The hierarchical structure between supervisor and student is not merely organisational; it is culturally legitimised and socially enforced. A supervisor holds authority not just over a student's research, but over their publications, their funding, their academic reputation, and ultimately their career trajectory. In a high power distance context, challenging or reporting a supervisor who is abusive, exploitative, or neglectful is not simply difficult, but can feel culturally transgressive, socially risky, and professionally devastating.

This is a structural problem, and it requires structural solutions. But it is also a cultural one, and cultural resources, as argued elsewhere in this study, can be shifted and redirected rather than simply dismantled.

The deep respect for the teacher-student relationship in Chinese culture is not the problem; it is the absence of reciprocal accountability within that relationship that causes harm. Reform efforts should seek to preserve and honour the cultural value of mentorship while

building the institutional mechanisms that ensure it cannot be weaponised. This means establishing clear, confidential, and genuinely safe reporting channels for supervisory misconduct — channels that students can access without fear of academic retaliation. It means introducing regular, structured, and anonymous feedback mechanisms through which students can evaluate their supervisory experience, with results that carry real institutional weight. It means mandatory supervisor training that addresses not only research mentorship but power dynamics, mental health awareness, and the responsibilities that accompany the significant authority supervisors hold.

From a DPG perspective, these interconnected dynamics illustrate how cultural, institutional, and interpersonal governance factors collectively shape performance over time. Enhancing doctoral students' mental health requires coordinated interventions that expand personal time, reduce social bias, and balance hierarchical relationships, thereby improving the alignment between individual well-being and institutional performance objectives.

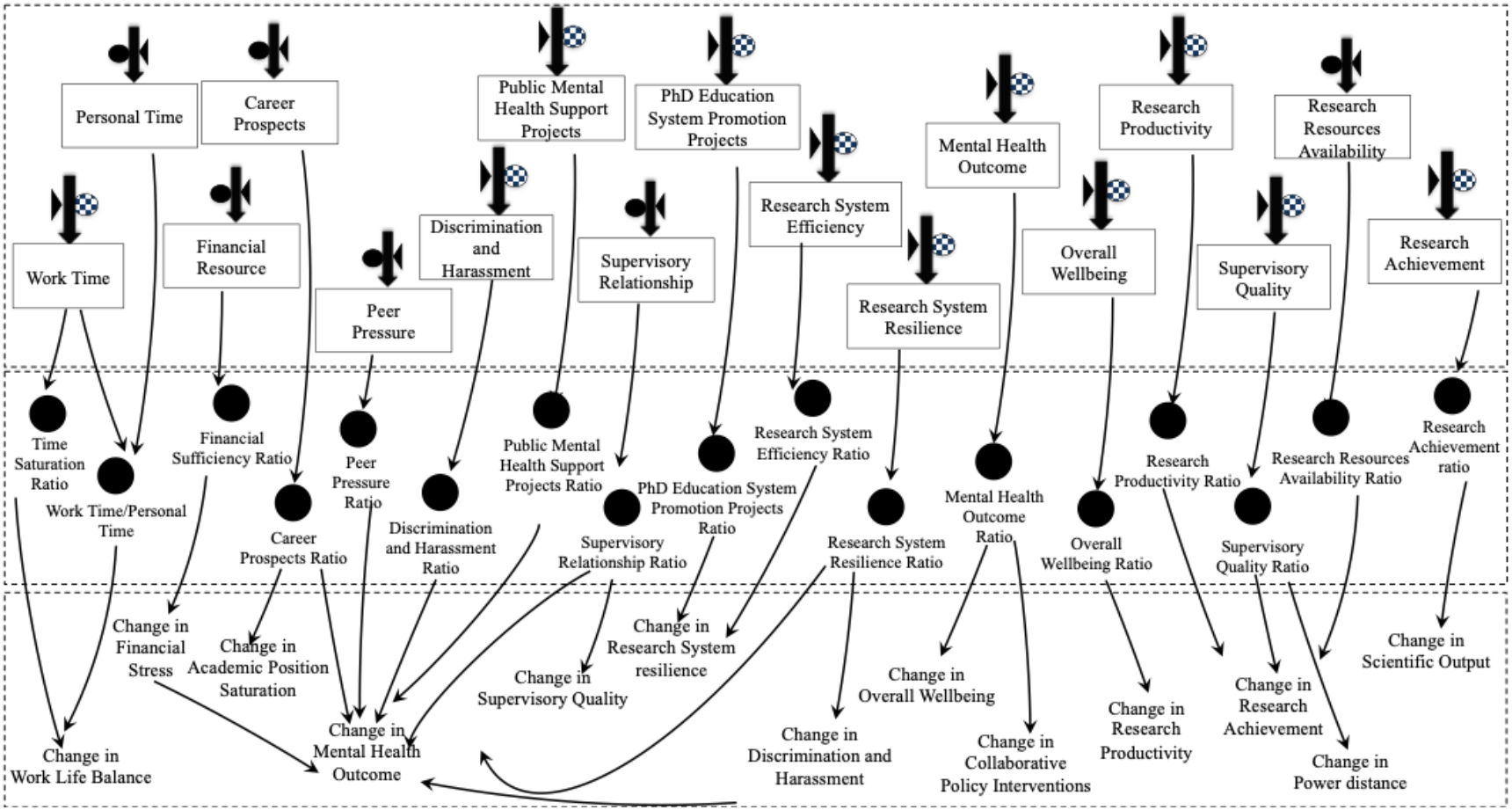

Figure 25 (part a): DPM chart of Chinese context

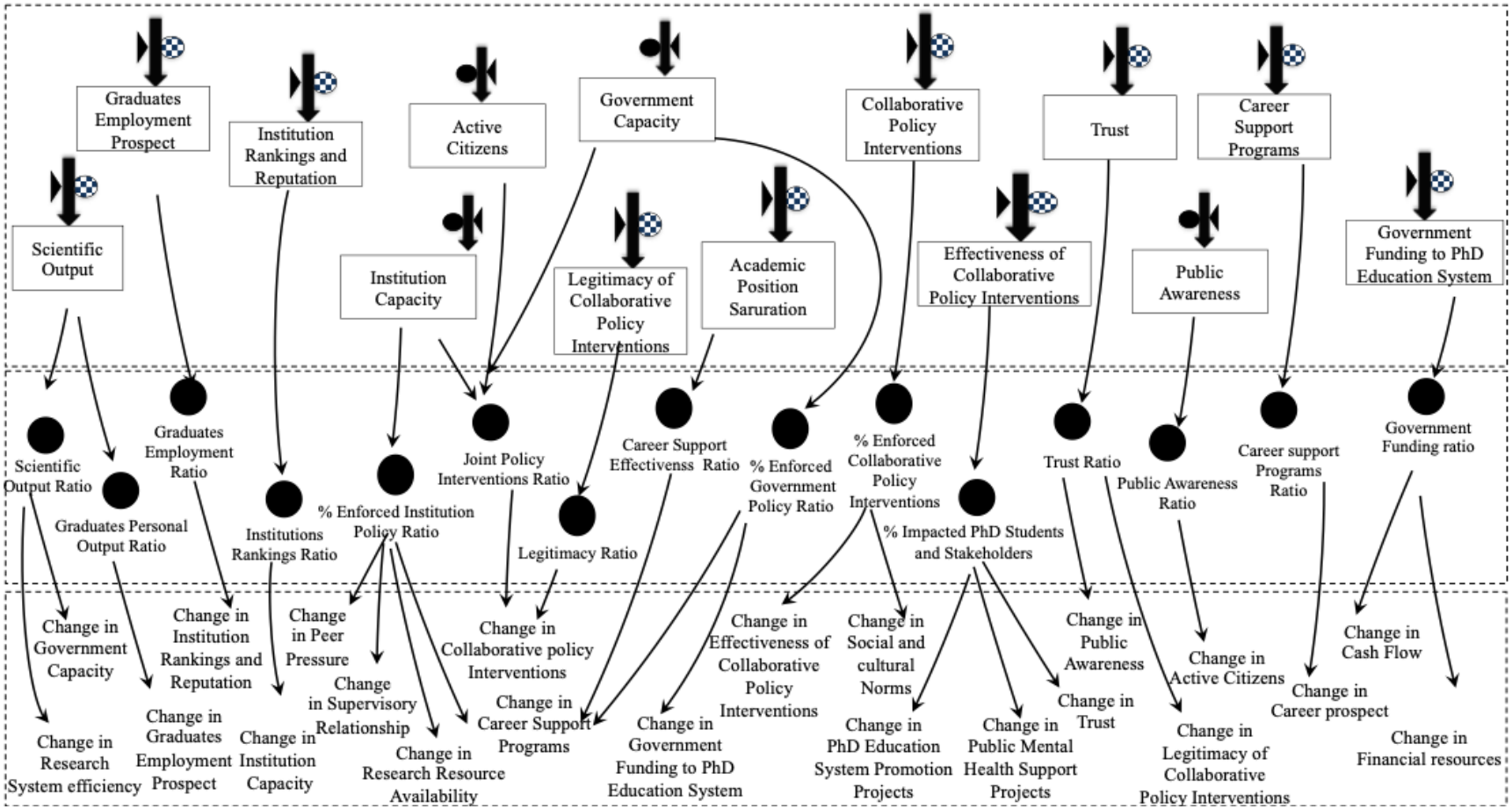

Figure 26 (part b): DPM chart of Chinese context

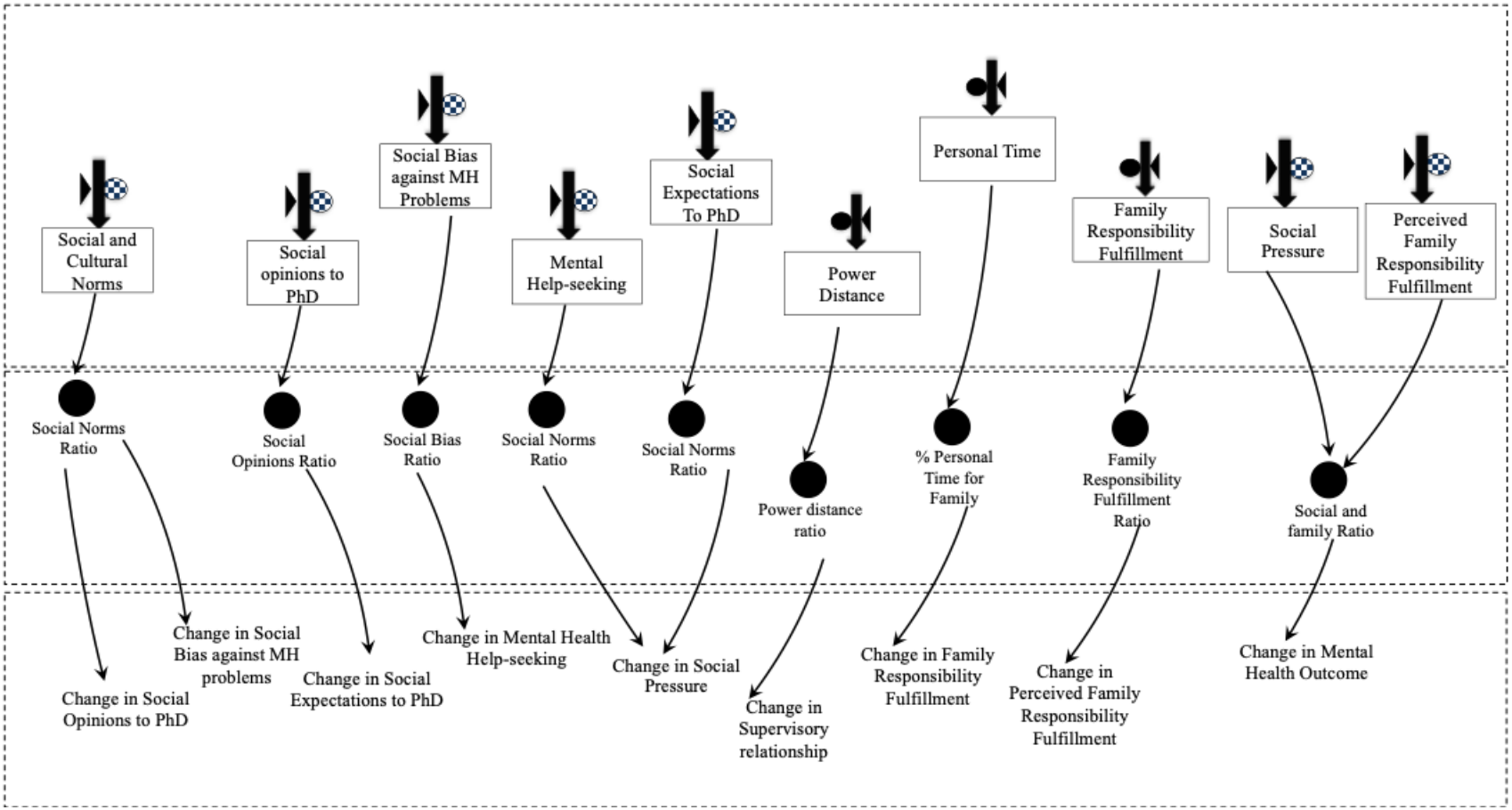

Figure 27 (part c): DPM chart of Chinese context

5.5 Mapping causal relationships in doctoral students' mental health in China through a Causal Loop Diagram

The Causal Loop Diagram (CLD) for the Chinese context shares a broadly similar structural foundation to that of the global model; however, it incorporates additional balancing loops that reflect the unique sociocultural and institutional dynamics of China's doctoral education system. These additional loops capture the tension and self-regulation mechanisms within a system characterized by strong hierarchical relationships, collective social expectations, and limited mental health awareness.

While the global CLD primarily focuses on the interplay between academic workload, supervisory quality, and mental health, the Chinese version extends this framework by integrating governance capacity, social norms, and family responsibility as crucial systemic factors. In particular, the inclusion of loops such as Government Capacity (B7), Institutional Capacity (B8), and Active Citizens (B9) reflects the multi-level governance structure of China, where policy effectiveness depends heavily on both top-down administrative enforcement and bottom-up participation. These loops illustrate how policy interventions can reach a point of diminishing returns, creating balancing effects that prevent the system from overextension or inefficiency.

Furthermore, the loops related to social expectations (B10) and social bias against mental health problems (B11) highlight deeply rooted cultural influences that are less dominant in Western contexts. In China, social stigma surrounding mental health and the cultural emphasis on perseverance and social conformity often discourage PhD students from seeking psychological help. These loops represent self-regulating cultural feedback: as social pressure and bias intensify, mental health outcomes decline, prompting gradual shifts in institutional and policy responses.

The inclusion of family responsibility (B12) and power distance (B13) further contextualizes the model within China's sociocultural fabric. The strong family-oriented value system adds another dimension of role conflict, as PhD students strive to meet both academic and familial obligations. At the same time, high power distance strengthens the hierarchical relationship between supervisors and students, which can increase

psychological stress. However, institutions and students often try to adapt to these challenges through better communication and informal coping strategies.

In summary, the Chinese CLD not only mirrors the structural composition of the global framework but also deepens it by embedding culturally specific balancing mechanisms. These loops demonstrate how the Chinese doctoral system attempts to maintain equilibrium between policy ambition and practical capacity, cultural norms and individual well-being, and authority and collaboration. Through the lens of Dynamic Performance Governance (DPG), these balancing loops embody the adaptive processes that enable the Chinese doctoral ecosystem to evolve despite systemic pressures.

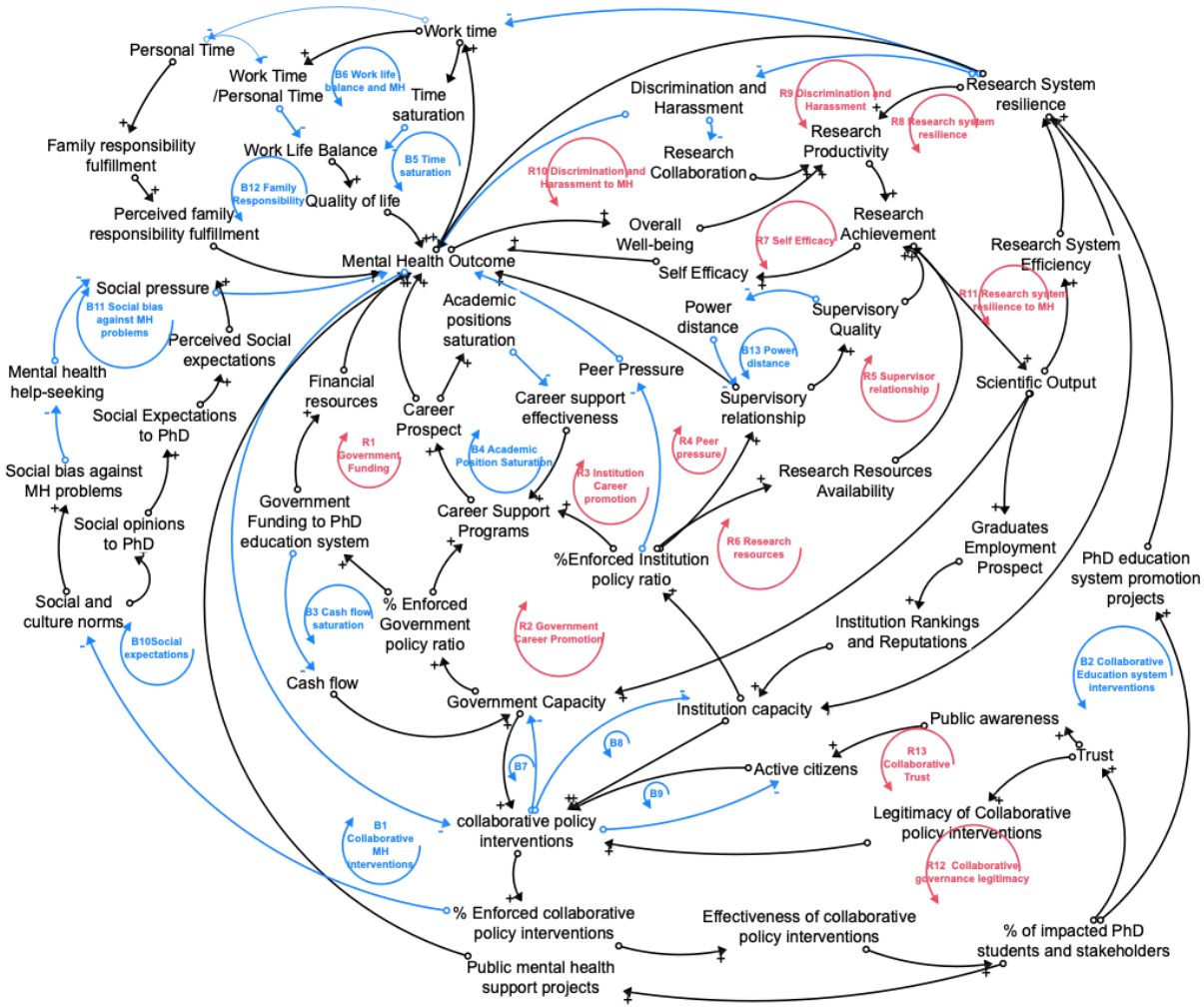

Figure 28: A causal loop diagram depicting the causal relationships of Doctoral students' mental health outcome in Chinese context (Source: model constructed by the author through Stella Architect)

B7 – Government Capacity Balancing Loop

This loop captures how government capacity stabilizes through the implementation of collaborative policy interventions. When government capacity increases, it enables more collaborative initiatives aimed at improving the PhD education system and mental health support. However, as collaborative efforts expand, they require more administrative and financial resources from the government, which can temporarily reduce its capacity to sustain further interventions. This feedback maintains equilibrium by balancing governmental effort and available resources.

B8 – Institutional Capacity Balancing Loop

Similar to the governmental loop, this mechanism reflects how institutional capacity regulates itself through collaborative policy engagement. When institutions engage more actively in collaborative interventions (e.g., mental health programs, research training), their capacity initially strengthens. Yet, the increased demand for coordination and resources may strain institutional systems, leading to a natural stabilizing effect that prevents overextension.

B9 – Active Citizens Balancing Loop

This loop emphasizes the role of civic participation in sustaining collaborative governance. A rise in active citizen engagement enhances the legitimacy and effectiveness of collaborative policies. However, as public involvement grows, maintaining participation quality and coherence becomes challenging. Excessive expectations or fatigue among stakeholders can lower engagement, creating a balancing dynamic that stabilizes participation at a sustainable level.

B10 – Social Expectations Balancing Loop

This loop represents the social and cultural pressures faced by PhD students in the Chinese context. Social expectations are shaped by cultural norms and public opinions, which often increase the perceived need for academic achievement and social conformity. When expectations intensify, they heighten social pressure, negatively affecting students' mental health. Collaborative policy interventions and evolving cultural norms act as counterbalances, mitigating harmful expectations, and promoting more supportive social environments.

B11 – Social Bias Against Mental Health Problems Balancing Loop

This loop captures how stigma toward mental health challenges influences help-seeking behavior among PhD students. High social bias discourages individuals from seeking psychological support, worsening mental health outcomes. However, effective collaborative interventions and evolving social norms can reduce bias and promote awareness, thus balancing the system. The loop demonstrates how cultural change and mental health advocacy can gradually normalize help-seeking behavior and restore psychological well-being.

B12 – Family Responsibility Balancing Loop

This loop focuses on the tension between work and personal life. Excessive work time and academic pressure reduce personal time and fulfillment of family responsibilities, which in turn lowers mental health outcomes. When mental health declines, individuals may attempt to restore balance by adjusting their work–life boundaries, thereby creating a self-correcting mechanism. This loop highlights how personal time functions as a strategic resource that supports both family well-being and academic performance sustainability.

B13 – Power Distance Balancing Loop

This loop reflects the hierarchical nature of supervisor–student relationships, particularly pronounced in the Chinese academic culture. A high level of power distance can strain supervisory relationships and reduce communication quality, negatively affecting both supervisory outcomes and mental health. Over time, awareness and policy interventions (e.g., mentorship training, feedback mechanisms) can reduce excessive hierarchy, promoting a more balanced and supportive supervisory environment. Thus, the loop balances authority with empathy and guidance.

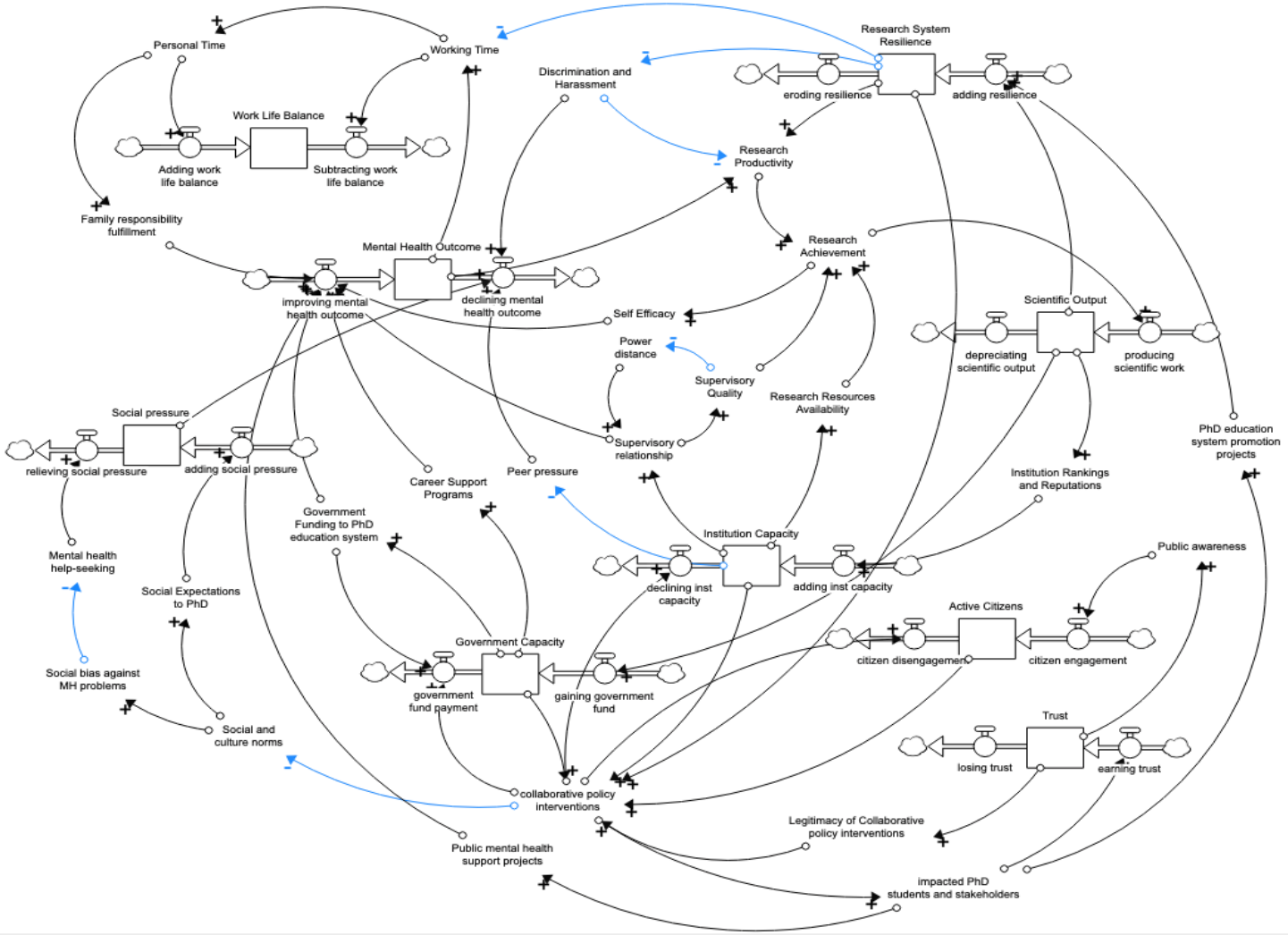

Figure 29: a stock-and-flow model that shows the dynamic of the Chinese context

5.6 Stakeholder analysis

In the Chinese context, doctoral mental health is shaped by an interconnected network of state policies, institutional practices, social norms, and individual agency.

- The government provides direction and funding (strategic resources).
- Institutions act as mediators that translate and implement policy (performance drivers)
- Citizens and cultural norms provide social legitimacy and expectations (contextual drivers).
- Students embody the outcomes, feeding back into the system through their well-being, productivity, and social participation.

For sustainable improvement, a Dynamic Performance Governance approach is necessary, which strengthens cross-level collaboration, enhances transparency, and aligns mental health goals with academic performance and social well-being.

5.6.1 Government

The government and funding agencies play a central and dominant role in China's higher education and research governance system (Liu et al., 2020; Xia et al., 2023). They act as the "ultimate stewards of mental health" through policy and financial control (Sayers, 2001).

As the main policymaker and financial sponsor, it serves as both a strategic resource provider and a key regulatory actor. The government influences doctoral students' mental health indirectly through funding allocations, research policies, performance indicators, and institutional evaluation systems. Primary funding for Chinese universities has shifted from a single channel relying solely on the state to a multi-channel system, though government support remains the dominant source. The four primary pillars of this system are government appropriations, student tuition and fees, institutional entrepreneurial activities, and social donations (Liu et al., 2020). While both central and local governments provide support, local governments have assumed a greater share of fiscal responsibility as the system has decentralized. By 2016, local governments contributed 66.4% of the education budget compared to 33.6% from the central government (Liu et al., 2020).

The government shapes research policies by aligning academic activity with centrally defined "national needs" (Xia et al., 2023). Essential decisions regarding university governance, course content, and research agendas are made exclusively by the Ministry of Education with some input from the academic community (Garda, 2008). The government uses competitive grant programs like the "863 Plan" (high-tech domains) and the "973 Plan" (basic research) as a policy tool, to steer researchers toward specific domains like biotechnology and information technology (Wang et al., 2020). However, China is seen as in transition from state control to a supervisory role, and from a hierarchical mode to a procedural mode (Mei Li & Rui Yang, 2014). In the decentralizing process, provincial governments and universities has gained more autonomy, but central government retains the main control role, including the appointments of presidents and party secretaries, political ideological education, evaluation, regulations and funding (Hong, 2018; Mei Li & Rui Yang, 2014).

Evaluation standards in the Chinese context are heavily weighted toward quantitative metrics, which is the main performance indicator and often leads to a prioritization of research volume over innovative quality (Fu, 2023; Wang et al., 2020). The number of articles indexed in international databases like the Web of Science (WoS) or domestic ones like CNKI/CSSCI serves as a primary indicator for faculty promotion, income, and institutional status (Wang et al., 2020; N. Yu et al., 2022). There is a system to grant ministerial and provincial awards and academic titles to researchers to incentivize them. However, this can create resentment among scholars whose niche areas are less "popular" with government officials (Xia et al., 2023). Institutional evaluation is defined by a tiered system that enforces a pyramid structure of prestige and resource allocation (Wang et al., 2020). The evaluation systems are built around national revitalization plans such as Project 211, Project 985, and the more recent "Double First-Class" initiative. Universities in these categories receive the lion's share of public funding (over 70% for Project 211) and enjoy higher policy priority (J. Yu et al., 2021). The systems reinforce the "Matthew effect," where initial advantages in reputation and funding lead to cumulative advantages in attracting senior scientists and laboratory equipment (Dong et al., 2025). Universities are evaluated on their ability to meet government-set objectives even if those goals conflict with institutional values (Cheng, 2005; Normile, 2018).

The government defines national goals for doctoral education, such as scientific output, innovation, and global ranking performance. These priorities often cascade down into pressure on universities and supervisors to produce measurable results. While these objectives enhance productivity, they can also contribute to excessive academic workloads and elevated performance stress for PhD students.

The state has begun acknowledging student mental health as part of its “Healthy China 2030” initiative, yet mental health remains under-prioritized compared to academic excellence. The effectiveness of government interventions depends on policy enforcement capacity and inter-agency collaboration, both of which vary across regions and institutions.

A key issue lies in the balancing loop between policy enforcement and institutional capacity; excessive top-down control may limit flexibility and innovation at the university level, while weak enforcement reduces policy impact. The government must, therefore, evolve from a command-and-control model to a collaborative governance approach, fostering cross-sector partnerships with mental health services, NGOs, and academia.

5.6.2 Academic institutions

Universities and research institutions function as the primary operational stakeholders directly responsible for PhD training and support. They translate national policy goals into concrete academic environments, thereby shaping the lived experiences of doctoral students.

Institutions manage supervisory relationships, provide academic resources, and create the immediate work and social environment of doctoral students. They act as intermediaries between government objectives and individual scholars. Governments provide "block funding" to institutions based on their size and rank. The university management then uses these funds to support staff salaries, campus buildings, and laboratory equipment, effectively creating the physical and social infrastructure in which doctoral students work (Dong et al., 2025; Geuna, 2001). Unlike specific project grants, institutional block funding allows universities the flexibility to make strategic investments in faculty recruitment and infrastructure improvement, which indirectly but significantly determines the quality of the research environment (Abramo et al., 2016; Dong et al., 2025; Owen-Smith, 2003).

Institutional culture and leadership play decisive roles in determining whether stressors are mitigated or amplified. Issues such as supervisory power distance, limited psychological counseling services, and performance-oriented assessment systems often lead to burnout and emotional exhaustion among students. Institutional evaluation standards often focus heavily on publication numbers rather than the depth or innovation of the research. Researchers in prestigious universities usually could satisfy the lowest academic standards due to good academic foundation, while researchers in less prestigious universities tend to publish more to meet the standards, while compromise in research quality (Abigail & Aloysius, 2003; N. Yu et al., 2022). This pressures students to conduct "safer, less creative, and more mediocre" research to meet strict graduation and funding requirements. Moreover, in many Chinese universities, mental health offices exist symbolically rather than being actively utilized or normalized.

Institutions often lack autonomous governance space to prioritize well-being initiatives, as their reputational and funding incentives are tied to publication and ranking outcomes. A more dynamic and participatory governance framework, where supervisors, students, and administrators share feedback loops, could enhance both academic quality and well-being outcomes.

5.6.3 Citizens and society

The citizen group represents the broader public, including families, social networks, and cultural systems that define social expectations toward PhD education. In China, where education is deeply tied to family honor and social mobility, public attitudes act as powerful performance drivers affecting doctoral students' mental states.

Social norms, collective opinions, and family expectations shape how doctoral study is perceived. A PhD is often viewed as both a prestigious social achievement and a moral responsibility to the family.

These social and cultural norms can create intense social pressure, especially when students struggle or experience setbacks. The stigma around mental illness and the common belief that seeking help indicates weakness hinder help-seeking behavior. Families often prioritize

endurance (“chiku”, 吃苦 means to endure hardship) over emotional well-being, reinforcing the reluctance to seek professional support.

Social norms evolve slowly. Collaborative interventions must therefore include public awareness campaigns and community-level education that normalize mental health. Citizens can become active participants in governance by engaging in discussions, supporting student well-being initiatives, and reshaping the social narrative surrounding doctoral education.

5.6.4 Doctoral students themselves

Doctoral students are both the main beneficiaries and active agents within this governance system. Their behaviors, perceptions, and coping strategies feed back into the system, shaping the outcomes of mental health policies and institutional practices.

Students manage personal resources such as time, motivation, and self-efficacy, which determine their resilience and productivity. They are also important feedback nodes, as how they respond to workload, supervision, and social expectations provides crucial information for systemic adjustment.

Many Chinese PhD students face dual burdens: academic stress and social or familial obligations. Some feel trapped in a sunk cost mentality, persisting in research they dislike due to fear of disappointing supervisors or family. Others suffer from isolation, limited work-life balance, and low autonomy under hierarchical supervision.

Empowering students requires more than individual counseling but demands structural reform that enhances their voice in decision-making. Collaborative platforms such as student councils, feedback systems, and peer networks could serve as dynamic nodes in the DPG framework, creating continuous loops of information and adaptation.

Chapter 6 Conclusions and future directions

6.1 Conclusions and policy implementations

This study concludes that doctoral students worldwide experience considerable psychological distress, largely arising from structural, institutional, and interpersonal pressures embedded in the doctoral education system. Across global contexts, factors such as excessive workload, career uncertainty, supervisory relationships, and financial constraints constitute the major stressors affecting doctoral students' mental health. However, in China, these challenges are amplified by the unique characteristics of the national higher education system, namely its centralized governance structure, performance-driven institutional culture, and deeply rooted social expectations regarding academic success and family responsibility.

Through the lens of Dynamic Performance Management (DPM) and Dynamic Performance Governance (DPG), this study conceptualized doctoral mental health as a dynamic, systemic issue rather than an isolated psychological condition. The Causal Loop Diagram (CLD) developed for the Chinese context reveals complex interdependencies among individual, institutional, and societal factors, emphasizing the importance of systemic balancing mechanisms. The inclusion of additional balancing loops (B7–B13) in the Chinese model, such as government capacity, institutional governance, social expectations, family responsibility, and power distance, reflects the multidimensional nature of doctoral mental health regulation in China. These loops highlight how mental health outcomes are dynamically influenced by feedback among governance capacity, social norms, and personal coping mechanisms.

A key finding is that no single actor can effectively address the mental health crisis among PhD students alone. The analysis of stakeholder roles, government, institutions, citizens, and students themselves demonstrates that collaborative governance is essential. The DPG framework suggests that effective mental health interventions must transcend institutional boundaries and be co-designed, implemented, and monitored through shared accountability mechanisms.

6.1.1 Government-level policy implications: Coordinated intervention at scale

The findings of this study carry clear and urgent implications for government policy, and it is not as abstract recommendations, but as evidence-based imperatives grounded in six years of survey data, qualitative interview insights, and a systems-level analysis of the feedback dynamics that sustain doctoral mental health challenges. Existing literature on doctoral education governance has consistently identified the gap between institutional intent and student outcomes, but policy responses have largely remained fragmented, reactive, and insufficiently coordinated across levels of the system. This study's multilevel DPG framework offers a structural basis for moving beyond that fragmentation.

The Chinese government, as the central coordinator of higher education policy and the top of the governance architecture within which all doctoral education operates, is uniquely positioned and uniquely responsible for initiating system-wide reform. The following policy directions are designed to address not isolated symptoms but the reinforcing dynamics that perpetuate them.

1. **Integrating mental health into national university performance evaluation frameworks.** Current evaluation systems for Chinese universities are heavily weighted toward research output, publication metrics, and funding acquisition. The data from this study demonstrates clearly that these metrics, when applied without counterbalancing indicators, contribute directly to the long-hours culture, publication pressure, and supervisory power dynamics that drive doctoral mental health deterioration. The government should reform national evaluation frameworks to include explicit, measurable indicators of doctoral student wellbeing, supervisory quality, career support provision, and mental health service accessibility.
2. **Establishing national guidelines for doctoral mental health management under the Ministry of Education.** The lack of national guidelines means that mental health support for doctoral students differs greatly between universities. The quality of support often depends on each university’s resources and willingness to invest in student wellbeing rather than on clear national requirements. The government should therefore create a national framework for doctoral student mental health that sets minimum standards for counselling services, requires PhD-specific support

separate from general student services, and asks universities to publicly report mental health outcomes and help-seeking rates. This is important because research consistently shows that doctoral students are a high-risk group whose needs are not adequately addressed by general university mental health services.

3. **Introducing targeted funding for psychological counselling and career development.** Policy mandates without dedicated funding produce compliance on paper and inaction in practice. The government should introduce targeted funding streams that are protected from reallocation into research infrastructure, but specifically to support psychological counselling services, career development programs, and supervisory training initiatives for doctoral education. This funding should be tied to outcome reporting, creating a direct feedback mechanism between resource allocation and measurable student wellbeing. This responds to a clear finding in both the 2019 and 2025 data: that the gap between students needing support and students receiving. It is not primarily one of awareness, but of accessible, adequately resourced provision.
4. **Encouraging inter-ministerial collaboration across education, health, and labor departments.** Doctoral student mental health sits at the intersection of educational policy, public health, and labor market governance, but policy responses have historically been isolated within education ministries alone. The government should establish formal inter-ministerial coordination mechanisms that bring together the Ministry of Education, the National Health Commission, and the Ministry of Human Resources and Social Security to design coherent, cross-sector policy responses. This is particularly important for career pathway reform: the transition of doctoral graduates into non-academic employment requires active labor market policy, industry partnership frameworks, and recognition of doctoral qualifications across sectors, none of which the Ministry of Education can deliver alone. The DPG framework's emphasis on collaborative governance across stakeholder groups provides the theoretical basis for this kind of inter-ministerial architecture and aligns with emerging international scholarship on whole-of-government approaches to higher education reform.

5. **Developing monitoring and accountability systems that go beyond research productivity.** Perhaps the most structurally significant policy implication of this study is the need for a national monitoring system that assesses doctoral education quality across a genuinely multidimensional set of indicators. The current research productivity measures such as publication counts, citation rates, and grant income are not sufficient measures of institutional performance; the evidence from this study suggests they are actively harmful when applied without counterbalancing accountability for student wellbeing. A national monitoring framework should track at minimum: doctoral completion rates disaggregated by demographic group; student satisfaction scores across key aspects of the doctoral experience; mental health help-seeking and service utilization rates; supervisory quality as rated by students; and career outcome data for doctoral graduates across academic and non-academic sectors. This data should be publicly reported, institutionally benchmarked, and directly linked to funding allocation decisions, which create the governance feedback loop that the DPG model identifies as essential for sustained systemic change.

6.1.2 Institutional-level Policy Implications: The Operational architecture of change

If government policy sets the conditions for reform, it is institutions that must translate those conditions into the daily lived experience of doctoral students. Universities and research institutions occupy the critical operational layer of the mental health governance system, who determines national policy mandates either become real support or remain bureaucratic formality. The findings of this study place particular weight on institutional action, because it is at this level that the reinforcing feedback loops identified in the DPG causal loop diagram are most directly triggered and most immediately felt by students.

The 2019 and 2025 survey data together reveal an institution-level structural misalignment: universities are largely measuring and rewarding the wrong things, providing support through the wrong channels, and organising doctoral training around research output rather than researcher development. The following institutional-level implications are intended to address those misalignments systemically rather than symptomatically.

1. **Implementing comprehensive institutional wellbeing frameworks with early intervention capacity and rapid access pathways.** The data from both survey years reveals a consistent and troubling pattern: students experiencing mental health distress are not reaching support services until the distress has become acute, if they reach them at all. In the 2025 cohort, 25% of students wanted help but had not yet sought it, which is a figure that points directly to the absence of proactive institutional outreach. Reactive counselling services cannot address a problem that students are not presenting. Institutions must therefore develop proactive wellbeing frameworks that include early warning systems: drawing on supervisor reports, academic progress monitoring, and anonymous self-reporting tools, that is capable of identifying students at risk before crisis point is reached. Integrated counselling services should be different from generic student mental health provision, but be genuinely PhD-specific, with practitioners who understand the particular pressures of doctoral study. The dedicated doctoral mental health pathways should offer rapid access, ideally within 48 to 72 hours after students seek help. These services should fully protect confidentiality and be designed in ways that make help-seeking feel normal rather than unusual or stigmatized.
2. **Revising workload expectations and institutional performance metrics to structurally reduce doctoral pressure.** Research and data show that the long-hours culture embedded in doctoral education is not only a personal choice but also an institutional expectation, which is also actively reinforced by the metrics through which doctoral success is measured. Publication counts, grant acquisition rates, and conference outputs are legitimate indicators of research productivity, but when applied without counterbalancing measures of student development and wellbeing, they create a pressure environment in which overwork is rational and rest is risky. Institutions must revise the implicit and explicit workload norms that govern doctoral study: establishing clear expectations around working hours, making it institutionally and culturally safe to take leave, and reforming the internal performance metrics used to evaluate both students and supervisors in ways that reward quality of mentorship and student development alongside research output. This connects directly to the DPG framework's balancing feedback loops, when

corrective mechanisms in the system are properly activated, they can interrupt the reinforcing dynamics of overwork, burnout, and declining productivity.

3. **Building peer support networks and community infrastructure as a structural provision.** Institutions should treat peer support as a structural component of their mental health governance framework: funding and formally recognizing peer mentoring programs, doctoral student associations, and interdisciplinary community spaces; integrating peer support training into doctoral induction; and creating physical and virtual environments that reduce isolation. This is especially important in the Chinese context, where social relationships and a sense of belonging strongly affect mental wellbeing. Well-designed peer networks can also provide culturally appropriate early mental health support.
4. **Embedding structured, personalized career guidance as a core component of doctoral training.** Career pathway guidance was among the lowest-rated aspects of doctoral satisfaction in both survey years, and the qualitative interviews make clear why: students are navigating acute uncertainty about their futures largely without institutional support. This is a governance failure, not a student failure. Institutions must embed structured career development into doctoral training as a mandatory and resourced component, not an optional service: providing personalized guidance for both academic and non-academic pathways from the first year of study; building active partnerships with industry, government, and the social sector that create real non-academic career opportunities and networks for doctoral graduates; and equipping students with the language and frameworks to articulate their transferable skills in contexts beyond academia.
5. **Establishing robust, transparent, and consequential supervisory quality assurance mechanisms.** The supervisor relationship is the single most powerful determinant of doctoral student wellbeing and satisfaction. Institutions must establish supervisory quality assurance mechanisms that are structured, regular, transparent, and genuinely consequential: mandatory annual training for supervisors on mental health awareness, power dynamics, and culturally sensitive mentorship; anonymous student feedback systems with results that inform supervisor development plans and, where necessary, supervisory appointments; and clear,

accessible, and confidential reporting pathways for supervisory misconduct that protect students from academic retaliation. Critically, these mechanisms must be designed with the specific power distance dynamics of Chinese academic culture in mind, which recognizes that formal reporting channels will remain unused unless students have genuine confidence that using them will not damage their academic futures.

6.1.3 Citizen and societal-level Policy Implications: Shifting the cultural architecture of doctoral wellbeing

The multilevel governance framework applied in this study recognises something that purely institutional or governmental analyses of doctoral mental health tend to overlook: that the most immediate and pervasive pressures many Chinese doctoral students experience do not originate in policy documents or university regulations, but in the social and cultural environment that surrounds and precedes their entry into academic life. The survey data and qualitative interviews consistently reveal a layer of distress that institutional support services cannot reach, and government mandates cannot directly address, which are the weight of family expectation, the fear of social judgment, the internalised belief that struggle must be hidden, and the cultural equation of academic achievement with personal worth and filial duty. These are not marginal to the mental health crisis in Chinese doctoral education. In many cases, they are its foundation.

This does not mean they are immovable. Social norms have often been one of the strongest drivers of long-term changes in behavior and attitudes, but they are also often overlooked in public health and education policy. The following societal-level implications are grounded in the understanding that cultural change, while slower and less legible than policy reform, is ultimately what determines whether institutional interventions are taken up, stigma is overcome, and help-seeking becomes normalised rather than exceptional.

1. **Launching sustained, evidence-based public awareness campaigns that can reframe mental health in academic contexts.** Public awareness campaigns should be carefully designed to fit the local cultural context, rather than using general mental health messages taken from Western countries. These campaigns should present help-seeking as a responsible and wise action rather than a sign of weakness

or failure. Campaigns should be targeted not only at doctoral students themselves but at their families, especially the parents and relatives whose expectations form so much of the invisible pressure students carry. Such initiatives can help shift cultural expectations of doctoral success away from speed and productivity and toward resilience, personal growth, and sustainable achievement.

2. **Engaging media, professional associations, and public intellectuals in normalizing open discourse about mental health in academia.** Cultural norm change does not happen through policy alone, but through the cumulative effect of public discourse, visible role models, and the gradual shift in what it is socially acceptable to say and feel. In the Chinese context, media platforms, including social media ecosystems such as WeChat, Weibo, and BiliBili, which carry enormous influence among young academics, represent a good method for normalizing mental health conversations within doctoral communities. Professional academic associations, university alumni networks, and prominent researchers all have the capacity to model openness about the psychological dimensions of academic life in ways that carry cultural authority precisely because they come from within the system. When senior professors openly share their experiences of doubt, anxiety, or burnout during their PhD and research careers, it can have a strong and reassuring effect on younger students who are facing similar feelings. This kind of openness can be more helpful than official leaflets or counselling adverts.
3. **Mobilizing family and community networks as active participants in doctoral student wellbeing.** Family in the Chinese cultural context can both be a source of pressure and support, belonging, and resilience. The same family relationships that can increase pressure and stress for doctoral students can also provide important emotional and practical support during difficult periods of the PhD journey. Therefore, societal-level interventions should include efforts to involve families as supportive participants in doctoral education. This can include providing families with accessible information about the nature of doctoral study, its timeline, common challenges faced by students, and how family communication can either increase or reduce stress. University open days, family information materials, and community

educational initiatives can help shift family expectations from focusing mainly on outcomes to supporting students throughout the process.

6.1.4 Doctoral Students' self-governance and empowerment

Doctoral students are not merely the end recipients of mental health policy. They are knowledge producers, institutional actors, community members, and when properly supported and empowered, agents of the very cultural and systemic change. This matters particularly in the Chinese doctoral context, where high power distance, hierarchical academic structures, and cultural norms around deference and collective harmony have historically positioned students as the least powerful actors in the doctoral governance system. Empowering doctoral students to exercise genuine agency over their own wellbeing, over institutional policy, and over the cultural narratives that surround them, is therefore not a supplementary concern but a governance imperative. The following individual and student-level implications are proposed to activate doctoral students as participants in, rather than subjects of, the multilevel governance architecture this study describes.

1. **Providing continuous, embedded mental health education and resilience development as a core component of doctoral training.** Universities should embed mental health education into doctoral induction and ongoing training programs: not as a single orientation session but runs through the entire doctoral journey, covering stress recognition and management, the psychological dynamics of doctoral study, sleep and workload self-regulation, and the practical skills of help-seeking and self-advocacy. Resilience training in this context should not be understood as teaching students to tolerate conditions that should be reformed, but as equipping students with genuine psychological tools that increase their capacity to navigate difficulty. The distinction matters: Empowerment-focused resilience development supports students' agency, while deficit-focused training shifts institutional problems onto individuals.
2. **Investing in personal and professional development programs that extend beyond research skills.** The satisfaction data from both survey years consistently identifies career guidance and personal development as among the most poorly

provided aspects of the doctoral experience. The qualitative interviews reinforce this: students feel underprepared not only for the job market but for the broader challenge of constructing a professional identity and life trajectory in conditions of genuine uncertainty. Doctoral training programs must be redesigned to include structured personal and professional development as a valued and formally recognized component. This should encompass academic skills development, industry exposure, entrepreneurship awareness, research communication, leadership and project management training, and the reflective practices that support self-awareness and adaptive decision-making under uncertainty.

3. **Empowering student unions and doctoral associations as genuine co-creators of wellbeing policy.** Student unions and doctoral associations should be given formal, structured roles in institutional governance processes related to doctoral wellbeing: seats on university mental health strategy committees, formal consultation rights in the development and review of supervisory quality frameworks, and direct communication channels to institutional leadership and, through representative bodies, to governmental policy processes.
4. **Developing student self-advocacy skills and formal channels for upward communication within the governance system.** This requires doctoral students to contribute to policy design at institutional and governmental levels. Self-advocacy is a skill that students need to learn and develop. Universities can support this by providing training in communication and feedback skills, offering mentoring from experienced academics, and creating safe channels where students can report problems related to supervision, institutional support, or university policies without risking their academic progress. When students are given these skills and institutions respond seriously to their concerns, the governance system becomes more effective and responsive. Student experiences can help improve university practices, universities can help shape government policies, and government policies can create better conditions for both students and institutions. In this way, the DPG model works as a collaborative system in which doctoral students are not only supported but also actively contributes to improving the system.

6.2 Contributions

6.2.1 Theoretical contributions

This study makes four interconnected theoretical contributions to the literature on doctoral education, mental health governance, and dynamic systems analysis.

First, this study applies the Dynamic Performance Governance (DPG) framework to doctoral mental health in a non-Western context. While DPG has been used in public administration and organizational governance, it has not been widely applied to doctoral education or student mental health. This research shows that the framework fits well with how doctoral mental health systems work, especially its focus on collaboration between different stakeholders. The feedback loops shown in the causal loop diagram and stock-and-flow model help explain how doctoral mental health outcomes are created and maintained. This goes beyond most existing research, which is mainly descriptive or focuses on correlations.

Second, this study develops a multilevel governance theory of doctoral mental health that includes culture and society as an official part of governance. Existing models, such as Levecque et al.'s organizational stress model (Levecque et al., 2017), Pyhältö et al.'s scholarly community model (Pyhältö et al., 2012), and Evans et al.'s framework on environmental and relational factors(Evans et al., 2018), have helped explain how institutions and relationships affect doctoral wellbeing. However, they treat culture and society only as background factors. This study argues that they should instead be seen as active governance factors. Social norms, family expectations, cultural attitudes toward mental health, and public ideas about academic success directly influence whether students seek help and whether institutional support systems work effectively. This broader view is especially important in non-Western contexts, where cultural influences have often been underestimated.

Third, this study contributes to the understanding of Chinese doctoral education by showing both long-term problems and new changes over time. The existing literature on doctoral education in China has grown substantially in recent years, but longitudinal comparative studies that track change over time in student wellbeing and satisfaction remain rare. By comparing the 2019 *Nature* survey data with the 2025 survey of Chinese PhD students

studying in China, this study provides empirical evidence of both the persistence of systemic challenges, including the gap with global satisfaction averages, the inadequacy of career guidance, the long-hours culture, and the emergence of new patterns that the existing literature has not yet fully theorised, most notably the polarisation of satisfaction scores and the significant growth of unmet mental health need as a distinct and measurable phenomenon. The identification of the unmet need group that students who want help but have not received it, as a specific population requiring targeted governance attention represents a conceptual refinement of how mental health burden is measured and understood in doctoral education research, with implications that extend well beyond the Chinese context.

Fourth, this study argues that doctoral student empowerment should be seen as part of governance itself, not just an additional support measure. Instead of viewing doctoral students as passive recipients of policies, this research positions them as active participants in how the system is governed. By including student self-governance and empowerment within the Dynamic Performance Governance (DPG) framework as a formal level with its own feedback effects, the study shows that student agency is a core part of how the system functions. When students are excluded from governance, feedback becomes weaker, institutions adapt less effectively, and unmet needs are more likely to persist. This supports the idea that involving students in governance is essential, not optional, and adds to growing research on participatory governance in higher education.

6.2.2 Practical contributions

Alongside these theoretical advances, this study generates four categories of practical contribution with direct implications for policy design and implementation.

First, this study provides an evidence base for multilevel policy reform in Chinese doctoral education. The combination of longitudinal survey data, qualitative interview findings, and dynamic systems modelling provides a richer and more actionable evidence base for policy reform than any single method could produce. At the government level, policymakers can see both the scale of doctoral mental health problems and the system dynamics that keep them in place. This allows policies to focus on root causes rather than just symptoms. The specific findings that 55% of 2025 respondents carry some form of mental health burden,

that career guidance satisfaction has not improved across six years, that the neutral satisfaction bloc has collapsed into polarised extremes, are concrete and specific enough to serve as baseline indicators for measuring the impact of future policy interventions.

Second, this study provides a diagnostic tool for institutional self-assessment. The causal loop diagram and stock-and-flow model can help universities understand how their doctoral mental health systems work. Universities can map their own policies, support systems, and cultural practices onto the feedback structures identified in this study to see where intervention would be most effective. This practical use of the Dynamic Performance Governance (DPG) model offers a useful tool for university leaders and policymakers to assess and improve doctoral education systems.

Third, this study provides a replicable mixed-methods research design for non-Western doctoral education contexts. The methodological combination employed in this study offers a replicable template for researchers studying doctoral education governance in other non-Western contexts where the literature remains thin. The specific adaptations made to account for Chinese cultural dynamics provide a methodological model that can be adapted for other high power distance, collectivist academic cultures across Asia, the Middle East, Africa, and Latin America, where doctoral education systems are growing rapidly but governance research remains scarce.

Fourth, this study provides concrete policy recommendations at each governance level based on systems evidence. Unlike recommendations from purely descriptive or correlational studies, these are based on a dynamic systems analysis that explains not only what should be done, but also why it should be done. The study identifies the feedback mechanisms through which each intervention is expected to create change. This makes the recommendations more reliable, easier to evaluate, and more useful for policymakers. It also helps them understand how and why interventions work, and what unintended effects may occur if policies are applied separately instead of as part of a coordinated, multilevel approach.

6.2.3 Conclusion

In conclusion, this study advances the current state of doctoral education research in ways that are both theoretically substantive and practically consequential. By applying the

Dynamic Performance Governance framework to doctoral mental health for the first time, and by extending its analytical architecture to incorporate cultural norms and student agency as formal governance variables, this study moves the field decisively beyond descriptive accounts of doctoral distress toward a dynamic systems explanation of how that distress is produced, sustained, and how it can be interrupted. The longitudinal empirical evidence presented here is among the most comprehensive yet assembled for Chinese doctoral students, and it demands a policy response that matches its systemic diagnosis: not fragmentary institutional adjustments but coordinated multilevel governance reform. The framework, the evidence, and the policy architecture are all present in this study. What it offers the field is not another documentation of a known problem, but a theoretically grounded, empirically validated, and practically actionable roadmap for solving it.

6.3 Research limitations

Although this research offers an innovative and systemic understanding of the mental health challenges faced by doctoral students in China through the application of Dynamic Performance Management (DPM) and Dynamic Performance Governance (DPG), several limitations should be acknowledged. These limitations concern the scope of the study, the methodological and data constraints, the conceptual assumptions embedded in the models, and the socio-political complexities of the Chinese context. Recognizing these limitations not only situates the findings within a realistic framework but also provides guidance for future research and model refinement.

6.3.1 Methodological and data constraints

The first limitation lies in the conceptual and methodological design of the study. The research relies heavily on conceptual modeling approaches, namely the DPM and DPG frameworks, to illustrate the systemic relationships among various stressors, institutional factors, and mental health outcomes. While these tools are powerful for visualizing causal mechanisms and feedback loops, they do not constitute empirical validation in themselves. The causal relationships and feedback dynamics represented in the Causal Loop Diagram (CLD) are based on theoretical reasoning and secondary data synthesis rather than on real-time system simulation or statistical modeling. This limitation means that while the study identifies plausible causal mechanisms, for example how supervisory relationships or social

expectations influence mental health, the magnitude and relative strength of these connections remain unverified. Future studies should therefore complement this conceptual work with quantitative system dynamics simulations or empirical testing, using longitudinal data to validate the proposed feedback relationships.

As a first-phase exploratory study, the research focuses on system mapping rather than precise measurement. Variables such as “social expectations,” “power distance,” or “mental health outcomes” are represented abstractly as nodes within the model. However, these constructions are complex and multidimensional in nature. For instance, “mental health outcome” may encompass emotional well-being, resilience, burnout, and psychological distress, all of which might have different determinants and temporal dynamics. The current model, by necessity, simplifies these phenomena, potentially overlooking nuances in how individual and institutional factors interact over time.

Data heterogeneity across Chinese higher education institutions introduces further complexity. China’s doctoral education system includes elite national universities, provincial institutions, and research academies with vastly different resources, governance structures, and academic cultures. This study treats “Chinese doctoral education” as a coherent system, which may obscure regional and institutional variation. Future empirical research could address this limitation by comparing different institutional types or regional education systems within China to identify divergent mental health dynamics and policy effectiveness.

6.3.2 Scope of the study and limitations of stakeholder representatives

Another constraint is the temporal scope of the study. The DPG and CLD models represent relationships as stable and continuous, but in reality, these dynamics evolve over time. For instance, the effectiveness of policy interventions or the level of social stigma toward mental health may change significantly across years due to cultural shifts, generational attitudes, or government reforms. The current model does not include time delays, adaptive feedback learning, or dynamic parameter changes, which limits its ability to forecast long-term outcomes or identify tipping points in the system.

Furthermore, mental health outcomes are influenced by nonlinear processes, for example, small stressors accumulating over time may suddenly trigger burnout or withdrawal.

Capturing these nonlinearities would require simulation-based approaches or longitudinal empirical data, which go beyond the current scope of this study. Future research can employ system dynamics simulation tools to test how interventions, such as increased funding or mental health awareness campaigns, would influence outcomes over multiple time horizons.

While this study identifies four main stakeholder groups: government, institutions, citizens, and doctoral students, it acknowledges that these groups are not homogeneous. Within each category there exist multiple sub-actors with different priorities and capacities. For example, “government” includes national ministries, provincial education bureaus, and local university authorities, each with distinct responsibilities and constraints. Similarly, “institutions” vary widely in research orientation, prestige, and policy autonomy. The “citizens” category may include families, online communities, and non-governmental organizations, whose involvement in higher education governance is still developing. This diversity makes stakeholder collaboration complex and often uneven in influence. The DPG model simplifies these variations to maintain conceptual clarity, but future research could incorporate stakeholder mapping or network analysis to reflect these nuances more accurately.

6.3.3 Cultural sensitivity, generalizability and reflexivity

Cultural norms and political sensitivities present another important limitation. Certain topics explored in this study are supervisory power distance, cultural norms of silence, and social bias against mental health help-seeking, which are deeply embedded in the Chinese sociocultural and institutional framework. Discussing these openly can be challenging, as they intersect with issues of authority, reputation, and hierarchy that remain highly sensitive in Chinese academia. As a result, the available academic and policy literature often approaches these subjects cautiously, emphasizing collective harmony and institutional achievement over critical examination. In addition, the Confucian cultural legacy of respect for authority and social harmony may have shaped the way respondents, interviewees, and even prior researchers frame these issues. This creates the potential for response and reporting bias, as students and institutions might understate conflicts, dissatisfaction, or mental distress to maintain social and institutional image.

Given its strong focus on China, the study's findings may not be directly generalizable to other national contexts without further adaptation. While many stressors faced by Chinese doctoral students are globally recognized, but their underlying drivers and cultural meanings differ across societies. The social expectation to achieve, the role of family responsibility, and the stigma toward mental illness are particularly pronounced in East Asian cultures influenced by Confucian values. Thus, while the DPG and CLD models developed here offer useful theoretical templates, they should be adjusted when applied to other cultural or institutional settings.

Finally, it is important to note the issue of researcher reflexivity. The author's cultural understanding, personal experiences, and interpretive stance may have shaped how problems were identified, categorized, and interpreted. Although every effort has been made to maintain objectivity, the complex socio-cultural nature of the topic inevitably invites interpretive bias.

6.3.4 Conclusion

The main limitations of this research arise from its conceptual nature, data constraints, cultural sensitivity, and the complexity of systemic interactions in China's doctoral education system. Despite these challenges, the study makes a significant contribution by constructing a systemic framework that integrates performance management, governance theory, and mental health studies. The DPG-based analysis not only highlights the need for collaborative interventions but also provides a starting point for future empirical validation and policy design. Addressing these limitations through interdisciplinary, data-driven, and participatory research will be essential for advancing a more sustainable and mentally healthy doctoral education system in China.

6.4 Future directions

The findings of this study highlight both the complexity and urgency of addressing mental health issues among doctoral students in China. Building on the conceptual frameworks of Dynamic Performance Governance (DPG) and Causal Loop Diagrams (CLDs), this research demonstrates that doctoral mental health is a systemic issue shaped by multiple interacting forces. However, given the evolving nature of doctoral education and the

distinct cultural and institutional context in China, future research can extend this work in several directions.

6.4.1 Expanding the dynamic framework: Longitudinal and quantitative validation

While the current study relies primarily on conceptual modeling and qualitative reasoning, future research should empirically validate the proposed DPG and CLD frameworks. A key direction would be to develop longitudinal studies that monitor doctoral students' well-being, performance, and resource dynamics over time. Such research could use system dynamics simulation or agent-based modeling to test the effects of different interventions (e.g., reducing power distance, increasing counseling access, or changing supervisory training).

6.4.2 Evaluating Collaborative Governance mechanisms

The current study proposes that collaborative governance among stakeholders is essential to address mental health sustainably. Future research could evaluate existing collaborative initiatives and test new models of governance. For example, studies could analyze the effectiveness of joint programs involving the Ministry of Education, university psychological centers, and student associations in promoting mental health literacy. Policy experiments or pilot programs could assess how shared responsibility frameworks improve communication and accountability across governance levels.

Another promising direction is to explore how digital governance tools can enhance collaborative policymaking, especially AI-based early warning systems for stress detection, or online mental health networks. Researchers should also assess potential risks, such as data privacy and overreliance on digital surveillance, to ensure ethical and sustainable implementation.

6.4.3 Investigating cultural and social norms as dynamic variables

A distinctive contribution of this study is the integration of social and cultural norms into the DPG model, to illustrate how stigma toward mental health problems, societal expectations for academic success, and family responsibility. Future research should further explore how these norms evolve and interact with changing social structures in China. For example, as mental health discourse becomes more public through social media and policy

advocacy, the social bias against mental health help-seeking may gradually decline. Longitudinal sociological or media studies could examine how this changing discourse reshapes perceptions of doctoral students' struggles. Similarly, the role of family expectations deserves more detailed exploration, particularly regarding gender norms, filial piety, and intergenerational responsibility.

Researchers might also examine regional and disciplinary differences to understand how specific academic cultures reinforce or mitigate mental health challenges, for instance comparing STEM fields with humanities and social sciences. Such differentiation would allow for targeted and culturally sensitive policy recommendations.

6.4.4 Building a sustainable doctoral ecosystem

Finally, future research should adopt a holistic sustainability perspective, treating doctoral education as a socio-technical system whose resilience depends on the balance between performance demands and human well-being. Building a sustainable doctoral ecosystem in China requires more than addressing mental health as an isolated problem, but requires rethinking academic culture, performance metrics, and value systems.

Future studies could explore how to redesign academic performance indicators to include well-being measures, how to promote a more inclusive definition of success beyond publication output, and how to support lifelong learning and alternative career pathways. Such efforts will not only improve individual mental health but also enhance the long-term productivity and innovation capacity of China's research system.

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