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## REVIEW OF DOCTORAL DISSERTATION

**Jiayu Ru**

*„Problems of aquatic products export from Shandong province to Belt and Road Initiative countries”*

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This review contains the following content:

1. Selection of research issues and dissertation topic
2. Objectives of the dissertation and research hypotheses
3. Research methods
4. Layout and content of the dissertation
5. The formal side of the dissertation
6. Conclusion

### **1. Selection of research issues and dissertation topic**

This dissertation deals with trade flows within the Belt and Road Initiative (BRI), also known as the One Belt One Road Initiative. BRI is a strategic economic project and political initiative initiated by Xi Jinping in 2013. BRI aims to expand the infrastructure network connecting China and countries in Central Asia, the Middle East, Africa, and Europe. According to projections, BRI might contribute to world GDP growth by as much as 4.2 percent by 2040. As many as 56 member states of the Chinese initiative will gain a GDP increase of over USD 10 billion thanks to new investments and increased trade. Russia and Central Asia, with an 18% increase in GDP, and Central Europe, with a 6% increase in GDP, are also expected to benefit from the BRI.

Among BRI's main objectives, besides improving connectivity, political coordination, trade development, financial integration, and improvement of interpersonal connectivity are indicated. So far, 148 countries and territories have joined the Chinese initiative, including eleven EU countries. The BRI offers low-interest loans to develop transport infrastructure dedicated primarily to low- and middle-income countries. According to data from The Boston University Global Development Policy (GDP) Center, Chinese banks have provided loans

totaling USD 287 billion for development projects. China's overseas development investment funds have invested USD 155 billion in equity finance for development projects. According to Morgan Stanley analysts, the total expenditure on this initiative could reach USD 1.2-1.3 trillion in 2027.

However, BRI-backed projects aimed at reducing infrastructure bottlenecks, developing trade, and increasing prosperity face ever greater challenges, particularly financial, socio-environmental, governance, and corruption risks. There were allegations of embezzlement of loans, e.g., for the electrification of villages in Nigeria for the amount of USD 6.8 million or the development of infrastructure in the Democratic Republic of Congo for the amount of USD 19 million. Moreover, the problems and risks associated with Chinese loans led to the suspension of some BRI projects. For example, in June 2020, Kenya canceled a contract worth USD 3.2 billion due to a court decision on irregularities related to the tender. In 2021, Ghana terminated a contract worth USD 236 million, and the Democratic Republic of Congo is considering suspending a contract to extract natural resources worth USD 6 billion.

While in 2016, BRI China's two main institutional lenders - China Development Bank and the Export-Import Bank of China (China Exim) - spent USD 87 billion on projects, in 2021, it was only USD 3.7 billion. However, liabilities for bailing out of countries struggling with indebtedness resulting from BRI projects increased dramatically in the respective period. Bailout funds transferred to 22 countries, including Argentina, Pakistan, Sri Lanka, and Ukraine, amounted to USD 40 billion only by 2021. Shocks such as the Covid-19 pandemic, the war in Ukraine, the disruption of global supply chains, and the energy crisis have significantly increased the debt servicing costs of many borrowers under the BRI. China tries to assist them by offering rescue lending like the IMF (with the difference that the interest rate on Chinese loans is more than twice as high). On the other hand, it is acting in the interest of Chinese lenders threatened by the insolvency of debtors under BRI projects. Consequently, the global financial system, particularly the international lending system, seems to be losing its transparency and scope of institutionalization.

The Group of Seven (G7)-led Partnership for Global Infrastructure and Investment (PGII), announced in 2022 to address infrastructure gaps in low- and middle-income countries, is an alternative to BRI and proves the geostrategic dimension of the Chinese initiative.

In the context of the above comments, the choice of the subject matter of the doctoral dissertation does not raise any objections. The analysis of the determinants of trade flows within the countries involved in BRI from the perspective of a selected Chinese province, referred to

by the author as the "major province of aquatic products" (p. 11), contributes to the literature and fills the research gap in the field of province-level trade patterns and strategies.

In my opinion, the topic of the dissertation is characterized by high topicality and importance.

## **2. Objectives of the dissertation and research hypotheses**

The main objective of this dissertation, formulated in the Introduction, is „to provide a description of the trade of aquatic products between Shandong province and the countries along the Belt and Road routes, and to demonstrate whether the export of aquatic products in Shandong province is affected by the trade efficiency and technical efficiency of the countries along the Belt and Road routes” (p. 12). The purpose of the doctoral dissertation is formulated correctly, but it seems too detailed.

The author also designs two sets of hypotheses to identify determinants of aquatic products' export from Shandong province, as well as trade inefficiency (pp. 12-13):

H1<sub>1</sub>: The per capita GDP of importing countries is positively correlated with aquatic products export of Shandong province.

H1<sub>2</sub>: The per capita GDP of exporting countries is positively correlated with aquatic products export of Shandong province.

H1<sub>3</sub>: The total population of importing is positively correlated with aquatic products export of Shandong province.

H1<sub>4</sub>: The total population of exporting is positively correlated with aquatic products export of Shandong province.

H1<sub>5</sub>: Distance is negatively correlated with aquatic products export of Shandong province.

H2<sub>1</sub>: Tariff's share of national tax is positively correlated with trade inefficiency.

H2<sub>2</sub>: Country's membership in the WTO is negatively correlated with trade inefficiency.

H2<sub>3</sub>: Degree of currency freedom is positively correlated with trade inefficiency.

H2<sub>4</sub>: Liner Shipping Connectivity Index is negatively correlated with trade inefficiency.

H2<sub>5</sub>: The degree of financial freedom is negatively correlated with trade inefficiency.

The author formulates as many as ten detailed hypotheses, each relating to the correlation of selected variables with exports and trade efficiency. Two issues raised my doubts. First of all, the purpose of the work mentions the impact of trade efficiency and technical efficiency on exports, while none of the hypotheses refers to technical efficiency. Secondly, none of the

hypotheses refers to BRI, which raises the question of whether the choice of countries involved in this initiative is purely accidental or whether the author uses the reference to BRI to indicate certain implications of ongoing/planned infrastructural projects to improve physical connectivity with the other countries and regions of the world. However, since the author selects the BRI countries for analysis, it would be worth justifying this accordingly. For example, by formulating a hypothesis regarding the potential (I assume positive) impact of BRI projects on the development of trade in aquatic products between Shandong province and selected BRI countries, reducing its costs and increasing efficiency and competitiveness.

I also wonder about the usefulness of the "exporting country" hypotheses since the author examines the trade in aquatic products from the perspective of a selected Chinese province. Thus, while the trading strategy towards other BRI countries, depending on physical distance, GDP per capita, or population, may vary, the study of the impact on exports of Shandong province of the size of its GDP or population does not seem to contribute much.

### **3. Research methods**

A careful reading of the reviewed doctoral dissertation allows us to conclude that the author used several appropriate research methods.

In the Introduction, the author briefly describes the research methodology, justifying the selection of the stochastic gravity model for the purpose of studying the export potential of Shandong province's aquatic products, then the data envelope analysis model for the trade efficiency evaluation (p. 12). Detailed justification for the choice of methodology and references to relevant literature can be found in Chapters 4 and 5, respectively.

The stochastic gravity model is embedded in the original papers by Tinbergen (1962) and Linnemann (1966), which should be considered correct. It is a widely used model for analyzing bilateral trade flows and assessing their potential. Subsequently, the empirical applications of the model in the works of other authors, as well as the shortcomings of the gravity model in the context of the possibility of using the random frontier method, are indicated (pp. 94-99). Subchapter 4.4 indicates the data sources obtained, including provincial statistical yearbooks, the World Bank database, and the Global Heritage Foundation. I wonder, however, to what extent it is reasonable to include the so-called virtual variable in the set of variables, i.e., WTO membership. As the author explains, when China and the importing country joined the WTO "at the same time," the value was "1"; otherwise, "0" (p. 101). Taking into account the MFN clause, the accompanying rules of differentiated treatment of less developed countries,

and the fact that the next variable in the model is TAF, the introduction of such a solution is not justified. The empirical analysis of stochastic frontier gravitation, embedded in the approaches of Armstrong (2007) and Bergstrand (1989), excluded boundary variables from the model while pointing to the use of the time-invariant model (pp. 102-104).

The data envelopment analysis model is explained concerning research by Charnes et al. (1978) - to be precise, however, Farrell's (1957) research is considered pioneering in the context of efficiency measurement. The DEA methodology has several advantages, including its flexibility and the possibility of using it when the relationship between variables does not have a known mathematical function and individual input and output variables are expressed in different units. Equally important, it is possible to use DEA to identify sources of inefficiency for analyzed units. On the other hand, the problem of DEA is the negative correlation between the number of variables (DMUs) and efficiency, as well as the overestimation of efficiency (among others: Alirezaee et al., 1998, Zhang and Bartels, 1998).

The author uses the output-oriented DEA model based on research by Banker, Charnes, and Cooper, which is more complex and includes variable return on a scale (VRS). Trade efficiency is expressed as comprehensive efficiency composed of the following components: pure technical efficiency and scale efficiency (pp. 125-126). In this context, the wording of the main objective of the dissertation, where the author announces the study of the impact on the export of aquatic products in Shandong province on the part of trade efficiency and technical efficiency, should be considered a bit misleading. A person unfamiliar with DEA modeling may feel a little confused about whether technical efficiency is equated with trade efficiency or separate, autonomous categories (p. 12 vs. 126). The methodological part is supplemented by subchapter 5.4, which explains the two-way dependence of exports and technological progress based on the new growth theory. Subchapter 5.5 introduces the DEA-Tobit and DEA-CLAD index methods (pp. 143-150). In the latter case, trade efficiency values from DEA modeling are used as dependent variables.

It is worth emphasizing that in the first three chapters, the author uses analytical, descriptive, and comparative methods, such as systematic cluster analysis for segmenting export markets of water products and critical literature review.

***To sum up, the author's methodological workshop used in the research should be considered sophisticated and advanced, the selection of methods as appropriate, and the embedding in the literature - highly satisfactory.***

#### **4. Layout and content of the dissertation**

The dissertation has 176 pages, six chapters, an Introduction, a Bibliography, and a List of Tables, Figures, and Pictures. A short introduction covering the purpose of the considerations in each substantive chapter would be useful, improve the clarity of the considerations and help the reader follow the author's thinking. There is no smooth transition between the chapters - while the paragraph summarizing the first chapter introduces the context of the second chapter, such a solution is not used in the subsequent parts of the dissertation. In the case of three strictly empirical chapters, i.e., 3-5, the last subchapter contains conclusions from the conducted research. It is a pity that the author lacks consistency in applying this solution in all chapters of the dissertation because it undoubtedly increases the clarity of the argument, speaks for the maturity of the author's scientific workshop, the ability to conduct a reliable analysis, which is an essential feature of a researcher.

The structure of the dissertation would be clearer if the "Conclusion" were introduced instead of Chapter 6.

Considering the relatively high number of abbreviations used in the dissertation, it would be useful to include a list of abbreviations, making it easier to read individual chapters and understand the content. For instance, only in the Introduction (slightly more than four pages) are there 12 abbreviations already.

To sum up, the work layout is correct, the order and subject matter of the chapters do not raise any serious objections, and their logical sequence and substantive relationships are readable.

#### **Chapter 1. Theoretical framework of the Belt and Road Initiative**

Chapter 1 describes the genesis and the essence of the Belt and Road Initiative. Shandong province has been included in the BRI context, indicating the most important projects and initiatives implemented in provincial cities led by Jinan and Qingdao (pp. 32-35). The author tries to prove that the Shandong province can play a "constructive role" in the Belt and Road Initiative implementation processes, constituting - as I believe - a kind of benchmark for other regions of China while promoting balanced and coordinated development of those areas (p. 27). Starting from Subchapter 1.3, the author conducts an empirical analysis of projects implemented under Shandong province's Belt and Road Initiative. This part *de facto* closes the scope of studies on the theoretical framework of discussion around issues that seem to resonate from the title of the dissertation, i.e., international trade, trade policy, export strategy, location advantages, regional/local development, or determinants of competitiveness.

Apart from reservations about the structure of the chapter itself, I see the considerations contained in it as a solid basis for subsequent chapters.

## **Chapter 2. Development and trade of aquatic products in Shandong province**

Chapter 2 provides an overview of the aquatic products sector in Shandong province, starting with the broader context of China's entire manufacturing sector, its export potential, export structure, and key target markets. Subsequently, the Shandong province is shown against this background, with an overview of the structure of local production and export of aquatic products, and finally, an indication of the most important problems related to the export of the assortment mentioned above to other countries of the world. And it is this last subchapter that raises some controversy, as its title corresponds directly to the title of the entire dissertation ("Problems in the export of aquatic products from Shandong province" vs. "Problems of aquatic products export from Shandong province to Belt and Road Initiative countries"). It is true that on pp. 71-73, the author mentions several times, e.g., the United States as an important export market for aquatic products from the Shandong province. However, most of the considerations in this subchapter are of a general nature and concern regulatory, environmental, and competitive issues that can be related to both trades with the countries of the Belt and Road Initiative and others, including the United States, Japan, and the United Kingdom.

I think it would be interesting to relate the author's conclusions and recommendations to the research results by Wang et al. (2016) or Zhou (2020). The first mentioned studied the competitiveness of exporting aquatic products in Shandong province based on the Porter diamond model. The second analyzed the development prospects of the aquatic product industry in Shandong province. Therefore, the added value of the author's research should be sought, among others, in Subchapter 6.2, where recommendations are formulated (pp. 159-161). It is indisputable, although there is no critical reference to the research results by other authors, including those mentioned above.

However, in general, this section of the dissertation is distinguished by a high content level and an expert source selection.

## **Chapter 3. Study of Shandong province's export potential of aquatic product to Belt and Road countries**

Chapter 3 characterizes the competitiveness and comparative advantages of the aquatic products trade in Shandong province. Subsequently, the profiles of key export markets within the Belt and Road Initiative are approximated using indicators such as GDP growth rate, GDP

per capita and population density, market access indicators, or ease of doing business. Section 3.4 uses a cluster analysis to segment export markets for aquatic products. As a result, the Belt and Road Initiative countries are divided into four categories. The first category includes export markets - mainly from Southeast Asia - characterized by "good economic development, high population density, a great potential for market sales of aquatic products, a good environment for aquatic products trade, and few barriers to access" (p. 91). The second category includes the countries of Central and Western Asia, as well as European countries (including EU countries), whose attribute is - in the author's opinion - "the signed free trade agreement with China and geographical proximity to China" (p. 91). While this is true for selected Asian countries, for second-class countries such as Poland, Bulgaria, and Slovakia, it is at least questionable (not only the EU but also, for example, the countries of the Persian Gulf have not yet signed the FTA with China). There is no justification for selecting these 37 Belt and Road Initiative countries for the analysis - there are 148 of them in total - p. 79 only informs about their selection (perhaps the basic issue is the availability of comparable data? or the size of trade volume?). On p. 87, there is a mistake – Pakistan is categorized as ASEAN Member State.

The chapter ends with a research summary - a good solution missing from the two preceding chapters. This chapter undoubtedly has cognitive values.

#### **Chapter 4. Trade potential measurement and stochastic frontier gravitational model (SFGM)**

In Chapter 4, the author uses the stochastic frontier gravitation model to measure the potential of aquatic product export. As research methods have been discussed above, I will focus on the modeling results.

- a. In the commentary on Figure 4.1, the author mentions 31 countries of the Belt and Road Initiative. In comparison, there are 36 countries in the list (indicators are calculated for eight years for so many countries that the figure is difficult to read). Among others, high trade efficiency is proven for Poland, Singapore, Malaysia, Lithuania, and Egypt. The author argues that Thailand had the highest trade efficiency index (over the entire 2012-2019 period, in the last year or the long-term average?), although it is difficult to read from Figure 4.2 (p. 106). I find no justification for selecting 2012-2019 for the analysis (data availability? Why eight years?). The author empirically confirms the decreasing export efficiency of aquatic products of Shandong province to 31 countries of the Belt and Road Initiative. In contrast, the mean efficiency remains almost the same (p. 107). Poland, Turkey, Russia, Malaysia, and Thailand are among the countries with the



greatest export potential for aquatic products of the Shandong province (they are subjected to further detailed analysis). On the other hand, export efficiency is so high that the potential for further development is negligible for countries such as Singapore and Sri Lanka. What may raise doubts is that, based on the analysis of data for 2012-2019, the author concludes the dynamic development of trade in aquatic products since China joined the WTO, i.e., in 2001 (p. 117).

- b. Based on the stochastic gravity model, it is also proven that the trading volume of aquatic products increases with the GDP per capita of Shandong province and importing countries. A similar effect is shown for the internal market size, while the distance between trading partners has a negative effect. In the latter context, the author rightly points to the positive impact of infrastructural projects aimed at expanding and modernizing sea and land transport routes.
- c. The author's observation that the Shandong province prefers trading partners characterized by relatively high financial and monetary freedom remains debatable. The group of key export markets for aquatic products under the Belt and Road Initiative includes countries with quite large disproportions in this respect. It would be good to explain this in more detail. On the one hand, countries with a particularly high export potential of aquatic products (p. 117) are not necessarily countries with a stable, strong financial market and currency and a transparent and effective monetary policy. On the other hand, since the largest importers of aquatic products from the Shandong province are countries outside the Belt and Road Initiative (mainly Japan and the United States), there is a question of to what extent the export potential to those markets is used and whether focusing on Belt and Road Initiative countries will not cause Shandong province's products to lose their position in today's most profitable markets? Doubts may be raised because the source data used for the calculations, particularly those from the Shandong province (figures 4.1-4.7, table 4.3), have not been included in the appendix, which makes reliable verification of the calculations impossible.

*Generally, however, the considerations presented in this chapter are characterized by high maturity, insight, and a good substantive level.*

## **Chapter 5. Data envelopment analysis model and variable selection**

In Chapter 5, the author uses DEA modeling to measure the trade efficiency of aquatic products. As the methodological issues have already been signaled earlier, I focus on the study's

results. Tables 5.1-5.8 (pp. 128-141) show the trade efficiency values of the 31 major countries of the Belt and Road Initiative.

Comprehensive, scale, and pure technical efficiency are given and commented on for each subsequent year. In summary Figure 5.1, a relatively stable level of mean values of the three indicators listed here is demonstrated for the 31 Belt and Road Initiative countries. At the same time, a recommendation is made regarding strengthening the management level and implementing organizational and technological innovations (p. 143). The Tobit method and the CLAD index results are obtained for 2012, 2014, 2016, and 2019 for all 31 countries (p. 151). Again, there is no justification for selecting just these periods from the entire eight-year time range.

Interestingly, the research results indicate the negative impact of the degree of currency freedom (2014, 2019), monetary freedom (2014, 2019), Liner Transport Connectivity Index (2016), and Trade and Transport Infrastructure Index (2012) on trade efficiency improvement of the discussed trading partners. Undoubtedly, the invisible hand of the market, deregulation, and improved connectivity are conducive to promoting and developing trade between countries. So, some partial results should be considered interesting or even intriguing.

The subchapter summarizing the longest chapter of the dissertation (5.6) contains only two short paragraphs. In addition to general observations about the greatest trade potential for the five Belt and Road Initiative countries, the need to diversify the export strategy to take advantage of the export opportunities of Shandong Province, in just one sentence, the author mentions trade efficiency as an inherent attribute of trade potential, which in turn plays a large role in trade promotion (p. 154).

*Nevertheless, this part of the empirical analysis proves the author's great methodological skills, the maturity of the research workshop, as well as competence - although undoubtedly requiring improvement - in interpreting the results obtained.*

## **Chapter 6. Conclusions, recommendations, and further research**

In chapter 6, the author concisely recalls the most important conclusions from the first two chapters, then discusses the results of the empirical chapters 3-5 in more detail, referring to the research hypotheses formulated in the Introduction. Observations are made regarding the diversity of the Belt and Road Initiative countries in terms of GDP per capita, tariff and growth rates, and quality of the business environment.

In the context of the above, referring to the categorization of export markets into four groups, the author postulates the diversification of trade strategies in terms of these groups.

(although it is difficult to imagine, for example, a relatively coherent strategy for the second category of countries, where the author situates countries such as Sri Lanka, Poland, Qatar, Lebanon, or Iran). Interestingly, in the next paragraph, the author points to heavy dependence on export as a problem that "should be solved in no time" (p.157). There is doubt about what this "dependence" results from, why it is considered a problem, and how to solve it and balance the reasons for consuming export potential and reducing export dependence.

Referring to hypotheses, the author argues that the importing country's GDP per capita has a "significant positive correlation role in promoting the export of aquatic products trade" (p. 157), which does not fully correspond with the wording of H1<sub>1</sub>. However, similarly to the GDP per capita of the exporting country (in fact, Shandong province), the impact on trade in the analyzed assortment is positive. The positive impact is also proven concerning the population size of importing country and the negative - for the population size of the exporting country and the distance between trading partners (which results from the logic of the gravity model). In a very cautious way, the author argues that WTO membership favors trade development, especially when the organization's members include the Chinese side and the importing country (p. 157). A positive correlation with the trade in aquatic products is also proven in the degree of currency freedom, Ship Transport Connectivity Index, and financial freedom (p. 158), thus confirming hypotheses H2<sub>2</sub>-H2<sub>5</sub>. However, modeling in Chapter 5 does not provide clear conclusions here in all analyzed years.

Once again, the Belt and Road Initiative countries with the greatest trade potential are indicated. In this context, the need to diversify export strategies in terms of individual target markets - "various methods for different countries in accordance with their respective situation" (p. 158), as rightly states the author. However, there is no elaboration or even hints as to what this diversification of the approach in trade policy would consist of (by the way, will its costs not exceed, at least for some trading partners, the potential benefits?).

Subchapter 6.2 contains recommendations, in particular regarding the better use of the resource advantages, modernization of the "aquatic products export industry" (p.159), optimization of the export structure of aquatic products, expansion of the export market, use of the full potential of trade in the discussed assortment. It also postulates increased support for the aquatic products sector on the part of local governments (referring to the Shandong province and the urban centers located within it? it is not clear what the division of competences is in terms of trade, industrial and technological policy), improvement of the quality of logistics services, development of the marine economy.

What is missing in the recommendations is the answer to the question about countries outside the Belt and Road Initiative, which play a huge role in importing aquatic products from the Shandong province (United States, Japan, Germany, or the United Kingdom). Should their role be limited? Does trading with them still have development potential? Should local authorities shift their trade strategies more strongly to ASEAN countries, risking reduced trade volumes and losing their competitive position in important target markets such as North America or Japan? Such questions also make it necessary to decide to what extent trade relations can be considered in the following format: province-third country.

The dissertation was submitted in 2022. This year the Regional Comprehensive Economic Partnership entered into force (signed in November 2020), involving ASEAN, China, Japan, the Republic of Korea, Australia, and New Zealand. It is crucial to ask a question about the impact of this mega-regional trade bloc on the prospects for the development of export in aquatic products by the Shandong province. Subchapter 6.3 briefly identifies areas for further research.

## **5. The formal side of the dissertation**

The bibliography includes 107 literature items, which should be considered satisfactory. Nevertheless, within the first category ("Volume form publications"), there are both books, statistical yearbooks (for example, by China Agriculture Publishing House), and academic papers (for example, from the International Economic Review or the European Journal of Political Economy). Meanwhile, in the second category of literature items, only "Articles" are listed. In the case of some of the cited sources, the full names of the authors are given, and sometimes only their initials (for example, Milner, Chris; Bergstrand, J.H.). In the "Websites" category, sources are not listed in alphabetical order or any other key. It is incomprehensible to classify press articles in the "other sources" category and not in the "articles" category (since academic papers or journal articles are not used here as a label). There are also 39 tables, 16 figures, and two pictures in the text.

However, the author makes a few small editing mistakes without negatively affecting the dissertation's formal characteristics.

## **6. Conclusion**

Overall, I give the Ph.D. dissertation that was submitted a positive evaluation. The author succeeds, in my opinion, in elevating the topic because the work addresses crucial cognitive and practical issues. The author interprets the findings of empirical research and formulates

recommendations. As a young researcher, the author demonstrates the capacity to choose literature, technique, and data and uses sophisticated and advanced research methods for quantitative analysis. The dissertation that was submitted should be praised for its formal aspects.

In conclusion, I state that Jiayu Ru's dissertation entitled „*Problems of aquatic products export from Shandong province to Belt and Road Initiative countries*” meet the substantive and formal requirements for doctoral theses in the Act on Academic Degrees and Academic Titles and on Academic Degrees and Titles in the Field of Art of 14 March 2003 (Article 13.1.). Taking into account the above, I propose that the doctoral dissertation of Jiayu Ru be admitted to the next stages of the proceedings. This dissertation is classified in the discipline of *Economics and Finance*.



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