



RIGA TECHNICAL
UNIVERSITY

Kristaps Freimanis

DEVELOPMENT OF THE STATE REGULATION MODEL IN THE BANKING SECTOR

Summary of the Doctoral Thesis



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RIGA TECHNICAL UNIVERSITY

Faculty of Engineering Economics and Management
Institute of Civil Engineering and Real Estate Economics

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REGULATION MODEL IN THE BANKING
SECTOR**

Summary of the Doctoral Thesis

Scientific supervisor

Professor Dr. oec.

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DOCTORAL THESIS PROPOSED TO RIGA TECHNICAL UNIVERSITY FOR THE PROMOTION TO THE SCIENTIFIC DEGREE OF DOCTOR OF SCIENCE

To be granted the scientific degree of Doctor of Science (Ph. D.), the present Doctoral Thesis has been submitted for the defence at the open meeting of RTU Promotion Council on 24 November 2023 10.00 at the Faculty of Engineering Economics and Management of Riga Technical University, 6 Kalnciema Street, Room 209.

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DECLARATION OF ACADEMIC INTEGRITY

I hereby declare that the Doctoral Thesis submitted for review to Riga Technical University for promotion to the scientific degree of Doctor of Science (Ph. D.) is my own. I confirm that this Doctoral Thesis has not been submitted to any other university for promotion to a scientific degree.

Kristaps Freimanis (signature)

Date:

The Doctoral Thesis has been written in English. It consists of an Introduction, 3 chapters, and Conclusions and Recommendations. The total number of pages is 144, without the appendices. It includes 38 tables, 36 figures, 65 formulas, and 7 appendices, which provide explanation and illustrate the research content. The Bibliography contains 236 titles.

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Introduction

Topicality of the Research

The financial market is extremely important for the proper functioning of the economy. The experience of many countries in the world shows that failures in this market could lead to serious social consequences affecting, most probably, every citizen. This situation has pushed governments to act and introduce regulations aimed at preventing crises arising from failures in the financial market. Over the years, the extent of the regulations has risen significantly, especially after crises in recent decades.

On the other hand, it is important to promote competition, which, as per Smith (2002),¹ leads the economic system towards equilibrium and is considered as the basic building block of modern market economies. Regulation can potentially have adverse effects on the competition; therefore, it is important to find the balance between the two. Dangers from overregulation have often been put in the spotlight by market participants (Michel, 2016; Reichwald, 2016), mostly addressing the issue with innovations when regulations scale up. Even some regulators have warned that too complex regulation poses risks for seeing the real risks building in the financial systems (Noonan, 2021). In separate interviews with the Financial Times, Norway and Denmark's financial supervision chiefs address the issue of too complex regulation requiring substantial resources to implement them and manage to see the big picture.

The objective (aim) of the Doctoral Thesis is to develop the regulation model to find the equilibrium point between the welfare (deadweight) loss arising from market failures and subsequent government regulation costs. The model is developed in the banking sector within the financial market.

The Hypothesis of the Doctoral Thesis: There is an equilibrium point between the welfare (deadweight) loss arising from the market failures and subsequent government regulation costs in the banking sector.

Research questions:

- What are the market failures in the banking sector?
- What is the deadweight loss of those market failures?
- What are the regulation costs in the banking sector?
- What is the equilibrium point between the deadweight loss and regulation costs?

The Main Tasks of the Doctoral Thesis are formulated as follows:

1. To conduct the literature analysis on the banking sector within the financial market:
 - 1.1. Describe the financial market and banking sector (specification of the research object) and the perfect competition model in it.
 - 1.2. Identify the market failures in the banking sector and existing approaches to assessing them.
 - 1.3. Identify the regulation principles of the banking sector and existing approaches to assessing the regulation costs in the banking sector.
2. To develop the regulation model, which consists of:

¹ Publication based on the original in 1776.

- 2.1. Regulation intensity: the methodology for the scale of government intervention assessment.
 - 2.2. Deadweight loss: the methodology for the welfare (deadweight) loss assessment.
 - 2.3. Regulation costs: the methodology for the government regulation costs' (regulatory costs, compliance costs, indirect costs) assessment.
3. To validate the model.

The Object of the Doctoral Thesis is the banking sector participants as a group.

The Subject of the Doctoral Thesis is the government regulation in the banking sector within the financial market.

Assumptions and Limitations. The model is applicable to mixed market economies, which primarily rely on the private sector as producer and distributor of goods and services. Validation of the model in some parts has been conducted on euro area data due to data availability limitations.

Theoretical Framework of the Research. The theoretical framework of the research is based on the insights of researchers, scientists, and governmental and international institutions in the books, scientific articles, study reports, conference materials, and development planning documents published mainly abroad from 1936 to 2021.

Methodological Framework of the Research and the Research Design. The methods used in the research and overall research design are described in Table 1.

Table 1

The Research Design

RESEARCH STRUCTURE		JUSTIFICATION	APPLIED METHODS
Theoretical aspects of the banking sector regulation	Description of the perfect competition model	To identify and characterise the reference points to reveal the nature of market failures	Monographic and descriptive method, induction method, deduction method, graphic method
	Identification of the market failures	To identify and characterise the source of the deadweight loss, which is subject to government intervention in the economy	Monographic and descriptive method, induction method, deduction method, content analysis, mapping, synthesis
	Identification of the principles of regulation	To identify and characterise the source of regulation costs arising from policy measures targeted at minimisation of the deadweight loss	Monographic and descriptive method, induction method, deduction method, content analysis, mapping, synthesis, triangulation (incl. expert method)
	Identification of existing approaches to assessing the deadweight loss and regulation costs	To shape the theoretical backbone for the methodology of the regulation model created by author	Monographic and descriptive method, induction method, deduction method, mapping
Development of the Government Regulation Model	Development of the regulation intensity measurement scale	To create necessary units for functions of deadweight loss and regulation costs assessment	Induction method, deduction method, analysis, synthesis, scaling
	Development of the deadweight loss assessment functions	To develop banking sector specific functions needed for the identification of equilibrium point	Induction method, deduction method, analysis, synthesis, mathematical analysis
	Development of the regulation costs assessment functions	To develop banking sector specific functions needed for the identification of equilibrium point	Induction method, deduction method, analysis, synthesis, mathematical analysis
Validation of the Government Regulation Model	Validation of the regulation intensity measurement scale	To validate the robustness of the developed regulation intensity measurement scale	Induction method, deduction method, analysis, scaling, ranking
	Validation of the deadweight loss assessment functions	To validate the robustness of the developed functions	Induction method, deduction method, analysis, synthesis, mathematical analysis, iteration method, regression analysis
	Validation of the regulation costs assessment functions	To validate the robustness of the developed functions	Induction method, deduction method, analysis, synthesis, mathematical analysis, regression analysis
	Validation of the overall model	To validate the robustness of the equilibrium point	Induction method, deduction method, analysis
	Feedback from the industry	To validate the robustness of all model aspects	Expert method, survey, analysis

Scientific Novelty of the Research:

1. Identification of the banking sector market failures needed for the assessment of the deadweight loss in the banking sector.
2. Identification of the principles of regulation needed to set up the regulation model.
3. Development of the quantitative regulation model:
 - 3.1. Development of the regulation intensity measurement scale.
 - 3.2. Development of methodology for the deadweight loss assessment (information asymmetry, market power imbalances, negative spillovers, market abuse and others).
 - 3.3. Development of methodology for the assessment of regulation costs (regulatory, compliance, indirect costs).
4. In the case of Latvia, for the first time in the Latvian banking sector:
 - 4.1. The regulation intensity was assessed.
 - 4.2. The equilibrium point between the deadweight loss and regulation costs was assessed.

Theses for defence:

1. There have been 12 principles of the regulation, with the top 5 covering the current regulatory agenda: “cost-benefit balanced”, “risk-based”, “consistency and competitive neutrality”, “high quality transparent decision-making and enforcement” and “international coordination, convergence, and implementation in policy and rulemaking”.
2. Developed quantitative regulation model has the following characteristics:
 - 2.1. Regulation intensity measurement scale: it is based on the Regulation Intensity Index with values in the interval [0; 100]. The Regulation Intensity Index is calculated as average from 5 indices: Index from the questionnaire based on the Bank Regulation and Supervision Survey from the World Bank and 4 indices based on the *Index of Economic Freedom*. The regulation intensity for Germany is higher than for the UK and the USA.
 - 2.2. Deadweight loss assessment: the deadweight loss decreases with increased regulation intensity level.
 - 2.3. Regulation costs assessment: the regulation costs increase with increased regulation intensity level.
3. An equilibrium point exists between the decrease of the deadweight loss and the increase of regulation costs with increasing regulation level.
4. In the Latvian banking sector, the regulation intensity is lower than the equilibrium point.

The research results were published in journals (including the regulatory economics area-specific *Public Policy and Administration*), full-text conference proceedings, the chapter in the books and in conference abstract books.

List of the Scientific Publications (generally recognised peer-reviewed publications)
Papers in journals.

1. Šenfelde, M., Freimanis, K. (2021). Assessment of Compliance Costs in the Banking Market. *Economics and Organization of Management*, Vol. 43, No. 3, pp. 14–27. ISSN 2307-2318. e-ISSN 2707-9899. Available from: <https://doi.org/10.31558/2307-2318.2021.3.2>
2. Freimanis, K., Šenfelde, M. (2023). Variables of the Harberger Triangle in the Financial Market. *International Journal of Economics and Business Research*. [In print]. **SCOPUS indexed.**
3. Freimanis, K., Šenfelde, M., Juscius, V. (2023). Assessment of the Deadweight Loss Arising from the Imperfect Competition in the Banking Market. *Public Policy and Administration*, Vol. 22, Nr. 1, pp. 9–19. ISSN 1648-2603. ISSN 2029-2872. Available from: <https://doi.org/10.5755/j01.ppa.22.1.33723>. **SCOPUS indexed.**

Papers in full-text conference proceedings:

4. Freimanis, K., Šenfelde, M. (2020). Approach of Scaling the Level of Government Intervention in the Financial Market. *Finance: New Challenges, New Opportunities, 11th International Scientific Conference “Business and Management 2020”*, Vilnius, Lithuania, 7–8 May 2020. VGTU Press, 2020, pp.407-416. ISBN 978-609-476-231-4. e-ISBN 978-609-476-230-7. ISSN 2029-4441. e-ISSN 2029-929X. Available from: <https://doi.org/10.3846/bm.2020.591>. **Web of Science indexed.**
5. Freimanis, K., Šenfelde, M. (2021). Methodology for the assessment of regulation costs in the banking market. *International Scientific Conference “Contemporary Issues in Business, Management and Economics Engineering 2021”*, Vilnius, Lithuania, 13–14 May 2021. Vilnius Gediminas Technical University, 2021, pp. 1–8. e-ISBN 978-609-476-260-4. e-ISSN 2538-8711. Available from: <https://doi.org/10.3846/cibmee.2021.600>. **Web of Science indexed.**²
6. Freimanis, K., Šenfelde, M. (2022). Assessment of the effect of regulator's communication on the financial market participants. *International Scientific Conference “Business and Management 2022”*, Lithuania, Vilnius, 12–13 May 2022. Vilnius Gediminas Technical University, 2022, pp. 466–472. ISBN 978-609-476-288-8. e-ISBN 978-609-476-289-5. ISSN 2029-4441. e-ISSN 2029-929X. Available from: <https://doi.org/10.3846/bm.2022.857>. **Web of Science indexed.**
7. Freimanis, K., Šenfelde, M. (2023). Assessment of the Deadweight Loss Arising from the Information Asymmetry in the Banking Market. *Scientific Conference on Economics and Entrepreneurship Proceedings*, Riga, Latvia, 13 October 2022. RTU Press, pp. 49–56. ISSN 2256-0866. Available from: <https://doi.org/10.7250/scee.2022.005>. **Web of Science indexed.**²
8. Freimanis, K., Šenfelde, M. (2023). Development of the Regulation Index in the Banking Market. *International Scientific Conference “Business and Management 2023”*, Lithuania, Vilnius, 11–12 May 2023. Vilnius Gediminas Technical University, 2023,

² Proceedings submitted for evaluation to the Web of Science.

pp. 95–101. ISBN 978-609-476-333-5. e-ISBN 978-609-476-334-2. ISSN 2029-4441. e-ISSN 2029-929X. Available from: <https://doi.org/10.3846/bm.2023.1078>. **Web of Science indexed.**²

Chapter in the book:

9. Freimanis, K., Šenfelde, M. (2023). Principles of the optimal government regulation in the financial market. Chapter in the book “New Challenges for the Banking Industry: Searching a Balance Between Corporate Governance, Sustainability, and Innovation.” Palgrave Macmillan Studies in Banking and Financial Institutions. Springer Nature: Switzerland.

Conference thesis:

10. Freimanis, K., Šenfelde, M. (2019). Features of the Balanced State Regulatory Framework in the Financial Market. “*Scientific Problems of Engineering Economics of Construction and Real Estate Management, Regions and Territories Development ICEREE’2019*” organised within the 60th International Scientific Conference of Riga Technical University: Book of Abstracts, Riga, Latvia, 27–28 September 2019. RTU Press, 2019, p. 17, ISBN 978-9934-22-369-3.
11. Freimanis, K., Šenfelde, M. (2021). Sample Selection Criteria for the Validation of Compliance Cost Assessment Methodology in the Banking Market. “*Scientific Problems of Engineering Economics of Construction and Real Estate Management, Regional and Territorial Development ICEREE’2021*” organized within the 62nd International Scientific Conference of Riga Technical University: Book of Abstracts, Riga, Latvia, 30 September 2021. Riga: RTU Press, 2021, pp. 41–41. ISBN 978-9934-22-677-9.
12. Freimanis, K., Šenfelde, M. (2023). Development of the Imperfect Competition Measurement Index in the Banking Market. “*12th International Conference on Applied Economics “Contemporary Issues in Economy”*”: Book of Abstracts, Olsztyn, Poland, 29–30 June 2023. Olsztyn: Instytut Badań Gospodarczych, 2023, pp. 64. ISBN 978-83-65605-61-0. <https://doi.org/10.24136/eep.abs.2023.1>

The research results were discussed at international scientific conferences in Latvia, Lithuania, Poland, Ukraine, France, and Spain and were reflected in relevant scientific publications. The comments and suggestions received at the conferences and during peer reviews of the articles were considered and the appropriate changes in the research were done.

List of Conferences:

1. Riga Technical University, 60th International Scientific Conference of Riga Technical University “Scientific Problems of Engineering Economics of Construction and Real Estate Management, Regions and Territories Development (ICEREE’2019)”, 27–28 September 2019, Riga, Latvia, conference presentation “*Features of the Balanced State Regulatory Framework in the Financial Market*”.

2. International Scientific Conference “Contemporary Issues in Business, Management and Economics Engineering 2021”, 13–14 May 2021, Vilnius, Lithuania, conference presentation “*Methodology for the assessment of regulation costs in the banking market*”.
3. Riga Technical University, 62nd International Scientific Conference of Riga Technical University “Scientific Problems of Engineering Economics of Construction and Real Estate Management, Regional and Territorial Development ICEREE'2021”, 30 September 2021, Riga, Latvia, conference presentation “*Sample Selection Criteria for the Validation of Compliance Cost Assessment Methodology in the Banking Market*”.
4. International scientific-practical conference “Transformation of Socio-Economic Systems in the Context of the Challenges Faced by Global Economic Development”, 7–8 October 2021, Vinnytsa, Ukraine, conference presentation “*Assessment of Compliance Costs in the Banking Market*”.
5. International Scientific Conference “Business and Management 2022”, 12 – 13 May 2022, Vilnius, Lithuania, conference presentation “*Assessment of the effect of regulator's communication on the financial market participants*”.
6. International Scientific Conference “Wolpertinger Annual Conference 2022”, 31 August – 3 September 2022, Madrid, Spain, conference presentation “*Principles of the optimal government regulation in the financial market*”.
7. International Scientific Conference SCEE 2022, 13 October 2022, Riga, Latvia, conference presentation “*Assessment of the deadweight loss arising from the information asymmetry in the banking market*”.
8. International Scientific Conference “Business and Management 2023”, 11–12 May 2023, Vilnius, Lithuania, conference presentation “*Development of the Regulation Index in the Banking Market*”.
9. International Scientific Conference “12th International Conference on Applied Economics “Contemporary Issues in Economy””, 29–30 June 2023, Olsztyn, Poland, conference presentation “*Development of the Imperfect Competition Measurement Index in the Banking Market*”.
10. International Scientific Conference “Conference on Responsibility and Ethics in Business & Finance”, 4 July 2023, Nice, France, conference presentation “*Analysis of Responsibility Failures in the Financial Market Failures*”.

Participation in projects

The Doctoral Thesis was supported by the European Social Fund within Project No. 8.2.2.0/20/I/008, “Strengthening of PhD students and academic personnel of Riga Technical University and BA School of Business and Finance in the strategic fields of specialisation” of the Specific Objective 8.2.2 “To Strengthen Academic Staff of Higher Education Institutions in Strategic Specialisation Areas” of the Operational Programme “Growth and Employment”.

Practical use of research results: The research results have been included in the study course “Market Economy’s Problems and Policy” of the Master level study programme “Economics”.

Chapter 1 provides a description and analysis of current insights from other scientists, researchers, government, and international institutions regarding existing approaches to assessment of the deadweight loss arising from market failures and evaluation of government regulation (from the level and cost perspectives).

Chapter 2 provides a detailed description of the methodologies developed by the author to fulfil set tasks:

- the methodology for the scale of government intervention assessment,
- the methodology for the welfare (deadweight) loss assessment,
- the methodology for the government regulation costs assessment.

Chapter 3 provides validation of developed methodologies and the overall model. The case of Latvia has been reviewed as an example. In this Chapter are included comments from the industry, i.e., regulators of the banking sector.

In the appendices, detailed tables, calculations, and the presentation for the regulator have been included.

1. THEORETICAL CONTEXT OF THE BANKING SECTOR REGULATION

In this Chapter, the author analyses existing classifications of principles of government intervention in the banking sector within the financial market in the form of regulation. Classifications and comments from researchers have been systematised, compared, and similarities and differences revealed.

The author research principles of government intervention in the banking sector in the form of regulation by (a) defining attributes of the well-functioning banking sector, i.e., the specification of the banking sector and then defining the perfect competition in there, (b) summarising what market failures have been observed so far in the banking sector, and (c) further summarising policy objectives, instruments, and principles for government regulation. The author has identified in the literature 12 principles of government regulation, including the recently highlighted topic of climate-related risks. In this part of the literature analysis, the triangulation method has been used:

- 1) qualitative text analysis has been used to identify the principles of the regulation;
- 2) a quantitative metric of the number of sources has been used to identify the most common principles;
- 3) expert analysis of 20 foreign supervisory authorities has been used to test the robustness of identified principles; out of 20 authorities contacted, two provided feedback and comments.

In total, 185 sources have been analysed in this Chapter, the majority of which are journal papers:

- journal papers: 99 (54 %);
- government and international institutions' publications: 52 (28 %);
- books: 15 (8 %);
- other academic publications, including university working papers: 15 (8 %);
- other industry publications: 4 (2 %).

The full bibliography list is disclosed at the end of the Doctoral Thesis.

1.1. Specification of the research object

The author has reviewed the descriptions of the financial system and financial market to specify the place of the banking sector within the financial system. Based on the literature analysis in this respect, Fig. 1.1 has been developed to visually reflect that place.

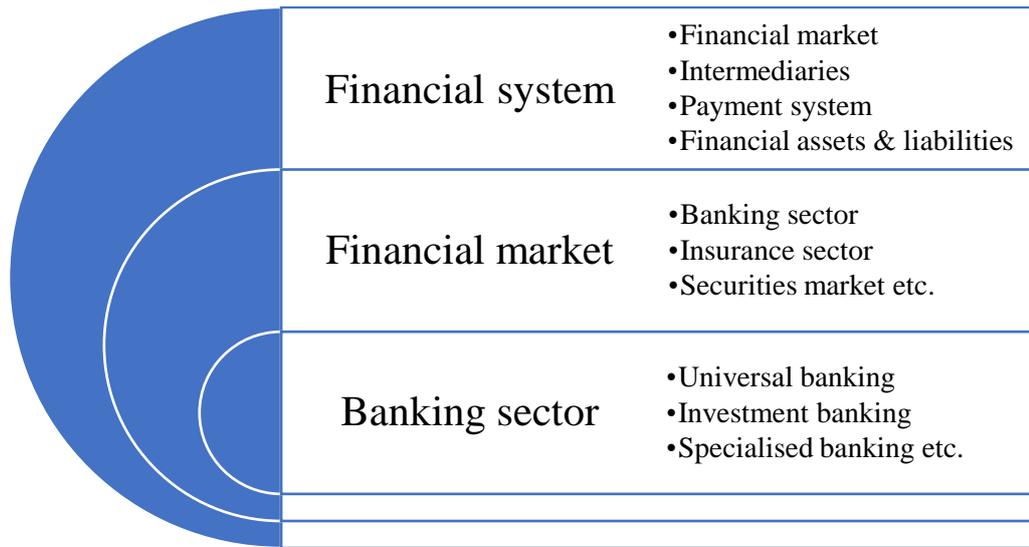


Fig. 1.1. The banking sector within the financial system (created by the author based on Juko, 2019; OECD, 2010; Congressional Research Service, 2020).

1.2. Perfect competition in the banking sector

To set up the reference model for the analysis of market failures, the author has defined a perfect competition model specifically for the banking sector in the following steps:

- Literature analysis of conditions defined for the general perfect competition model.
- Synthesis of banking sector-specific perfect competition model. The comparison is reflected in Table 1.1.

Considering (a) the specification of the banking sector, (b) the description of conditions of perfect competition in any given market, and (c) OECD's (2010) comments for the expected outcomes of the well-functioning banking sector, the author has summarised the description of perfect competition in the banking sector:

1. Effective and efficient allocation of liquidity and capital.
2. Effective and efficient pooling, management and transfer of risks accompanied by correct risk pricing. This aspect covers prudent risk-taking behaviour as well.
3. Sufficient shock resistance with the ability to self-correct.
4. General confidence in the functioning of the banking sector. This aspect covers the condition of "perfect information".

The summary has been made in Table 1.1 (created by the author based on Smith, 2002; Walras, 1874; Arrow & Debreu, 1954; McKenzie, 1959; Aumann, 1964; Novshek & Sonnenschein, 1987; Besanko & Thakor, 1992; Rajan, 1992; Petersen, Rajan, 1994; Petersen, Rajan, 1995; Boot, Thakor, 2000; Marquez, 2002; Perotti and Suarez, 2002; Dell'Ariscia, Marquez, 2004; Allen & Gale, 2004; Boyd & De Nicolò, 2005; Allen & Gale, 2007; Dell'Ariscia, Laeven, Igan, 2008; Claessens, 2009; OECD, 2010; Healy, 2015).

Table 1.1

The Banking Sector in the Perfect Competition Model
(created by the author based on the abovementioned sources)

General concept	Banking sector*
1. No market player can affect price 2. No market barriers 3. All companies receive normal profits 4. Goods and services are homogenous 5. Information available fully for no price 6. Factors of production perfectly mobile	1. Effective and efficient allocation of liquidity and capital (1–6) 2. Risks: a) effective and efficient pooling, management, and transfer of risks (1–6) b) correct risk pricing (5) c) prudent risk behaviour (1) 3. Sufficient shock resistance (1, 2, 6) 4. General confidence in the functioning of the financial market (5)

**Numbers in brackets correspond to the numbering of the general concept.*

Table 1.1. shows that banking sector specifics reveal in underlining the risk perspective in the market operations.

Ajefu and Barde (2015) stress the importance of consideration of equity in the discussion of market effectiveness and efficiency, pointing to the concepts of fairness and social justice. This could require looking for some trade-offs between economic efficiency and equity.

1.3. Market failures in the banking sector

Market failures have been assessed based on the reference model of the perfect competition. Thereby, the deviation from the abovementioned conditions is defined as market failure (OECD, 2010; Ajefu, Barde, 2015). The author has analysed general and banking market-specific market failures in the scientific literature and speeches of the European Central Bank staff, which justifies the government's intervention. The result of this analysis is reflected in Table 1.2.

Table 1.2

Banking Sector Market Failures in the Speeches
(created by the author based on European Central Bank, 2021)

Market failures in the scientific literature	Market failures in the speeches
Asymmetric information	<ul style="list-style-type: none"> ● Ineffective market discipline (transparency) ● Asymmetric information for customers (banking and investment services) ● Information friction ● Financial instruments that entail risks that are difficult to assess and price ● Complex financial institutions (transparency) ● Generalised uncertainty regarding counterparty risk ● Moral hazard

Table 1.2 continued

Market failures in the scientific literature	Market failures in the speeches
	<ul style="list-style-type: none"> • Adverse selection • Uncertainty about the definition of green activity
Negative spillovers <i>Systemic risk</i>	<ul style="list-style-type: none"> • Financial contagion • Pricing of climate risk • Investor over-reliance on the rating agencies and models • Pro-cyclicality of the financial system (mark-to-market accounting standards, the dependence of collateral values and leverage ratios on asset prices) • Biased system of incentives that lead investors to excessive risk-taking • Excessive borrowing by the financial industry and the private sector due to the prevailing low interest rates • Financial system as a channel for the transmission of shocks • Herd behaviour
Market power imbalances	-
Market abuse	<ul style="list-style-type: none"> • Conflicts of interest, e.g., rating agencies who are paid by issuers of financial instruments
<i>(Not covered in the literature)</i>	<ul style="list-style-type: none"> • Fragmentation of market self-regulation • Global imbalances in current account positions and capital flows across major economies • Regulatory arbitrage • Structural inefficiencies in debt and collateral enforcement • Inefficient consumption-led boom-and-bust cycles

Summary in Table 1.2 shows that much of the focus has been concentrated on information asymmetry and negative spillovers, particularly systemic risk, while market power imbalances (imperfect competition) and market abuse were not in so much focus for the European Central Bank in the observed period.

Analysis of the speeches shows that new risks have been identified by the staff of the European Central Bank, which have not been classified yet in the scientific literature, e.g., fragmentation of market self-regulation, regulatory arbitrage, etc. Existing failure types also have some new dimensions, e.g., climate risk-related issues in “Asymmetric information” and “Negative spillovers”.

1.4. Principles of the regulation

Based on the results in Table 1.2 the author has defined the principles of regulation. Those principles give a foundation for the identification of relevant regulation costs. The results of the principles are reflected in Table 1.3 and Fig. 1.2.

Many aspects have been covered by several authors, e.g., “risk based” has been covered 8 times. Meanwhile, climate-related responsibilities started to appear only recently. A lot of aspects that BCBS (2012) has included in its principles cover surveillance thereby, the author has included in the list only those aspects that cover the regulation area.

Table 1.3

Summary Table of Researchers’ Conclusions on the Principles of Regulation
(created by the author based on the sources mentioned in the table)

	Cost-benefit balanced	Confidentiality	Precaution	Risk-based	Sound incentives	Comprehensiveness	Consistency and competitive neutrality	High quality, transparent decision-making, and enforcement	Systematic review	International coordination, convergence, and implementation in policy and rulemaking	Accountability	Management of climate-related risks
Bhattacharya, Boot, Thakor, 1998				X			X					
Freixas, Gabillon, 1999				X								
Wyplosz, 2001			X									
Lockwood, 2002										X		
Crampton, 2002							X					
Dell’Arricia, Marquez, 2006										X		
Llewellyn, 2006	X											
Brunnermeier et al., 2009				X						X		
Hertog, 2010	X											
OECD, 2010	X	X	X	X	X	X	X	X	X	X		
BCBS, 2012		X		X	X	X	X			X	X	
Teall, 2013	X					X						
BCBS, 2013				X				X		X		
Ajefu, Barde, 2015	X											
Buck, 2015				X						X		

Table 1.3 continued

	Cost-benefit balanced	Confidentiality	Precaution	Risk-based	Sound incentives	Comprehensiveness	Consistency and competitive neutrality	High quality, transparent decision-making, and enforcement	Systematic review	International coordination, convergence, and implementation in policy and rulemaking	Accountability	Management of climate-related risks
ESMA, 2016				X								
Coombs, 2016								X				
Mester, 2017				X	X						X	
Kozarević, Polić, Perić, 2017							X					
Panagopoulos, Chatzigagios, Dokas, 2018							X	X				
Mnuchin, Phillips, 2018								X		X		
World Bank, 2019				X								
Chester, 2020							X					
BCBS, 2021		X				X				X	X	
Crisanto, Ehrentraud, 2021	X	X		X								
Demekas, Grippa, 2021												X
IMF, 2021					X	X						
Noonan, 2021				X			X					
Groll, Halloran, McAllister, 2021				X				X				
Principles for Good Financial Regulators, n/d								X				

68 % of sources refer to the following 5 principles: “cost-benefit balanced”, “risk-based”, “consistency and competitive neutrality”, “high quality transparent decision-making, and enforcement” and “international coordination, convergence, and implementation in policy and rulemaking” (see Fig. 1.2.). The most important principles in Fig. 1.2 are coloured green, while all others – blue.

Many aspects that BCBS (2012) has included in its principles cover surveillance; thereby the author has included in the list only those aspects that cover regulation area.

Further analysis focuses on the “Top 5” principles to give background for regulation costs assessment.

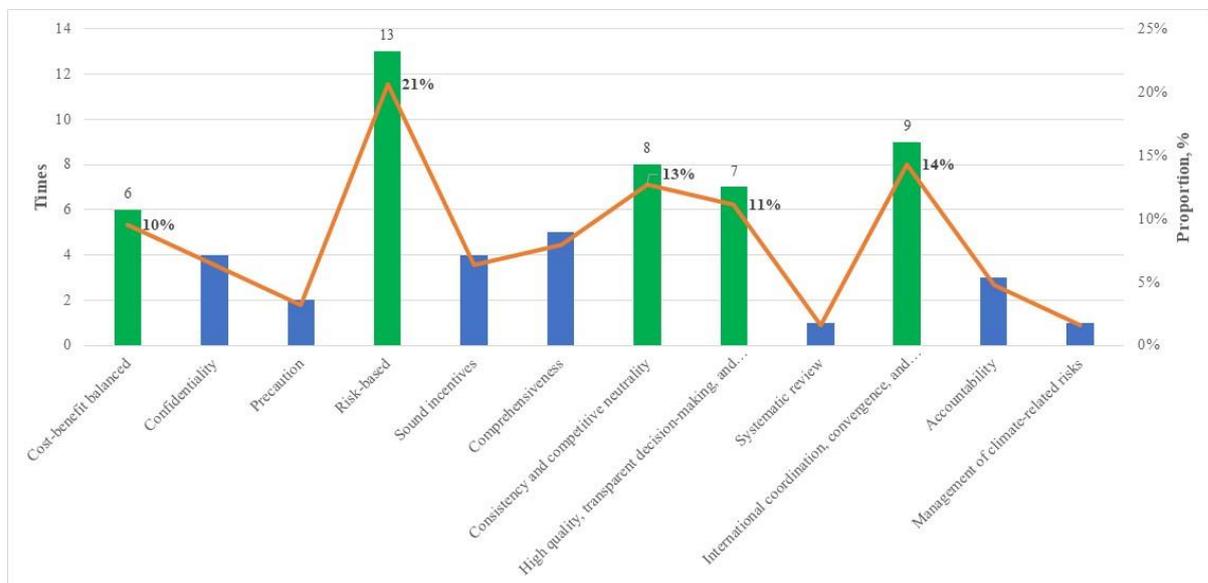


Fig. 1.2. The most important principles of regulation (created by the author based on the sources mentioned in Table 1.3).

Expert analysis of 20 foreign supervisory authorities has been used to test the robustness of identified principles. Two authorities answered the request: the Danish Financial Supervisory Authority and the Bank of Slovakia. Other authorities either declined or did not answer. The choice of authorities was based on the participation in the euro area or close neighborhood with the Baltic region (Poland, Sweden, and Denmark). Some authorities from the euro area could not be contacted due to the absence of an e-mail and contact form with an enabled option to add the file.

Supervisory authorities were asked whether, in their view, the Top 5 regulation principles retrieved from the literature analysis (the abovementioned 5 principles that 68 % of sources refer to) cover the current regulator’s agenda and topicality. The Danish Financial Supervisory Authority on that question commented, “I believe that you have retrieved relevant core principles”. Additionally, a comment was given that the principle of “cost-benefit balanced” includes “the political choice to decide and accept some growth offer (less economic growth benefit) given the risk aversion, and therefore a risk aversion balancing less likelihood/probability to suffer high crisis impact”. The Bank of Slovakia additionally shared the principles of proportionality, independence, and equal treatment.

1.5. Theoretical backbone of methodologies for the Government Regulation Model

In this Section, the author elaborates on the results of the literature analysis for the deadweight loss arising from market failures and regulation costs derived from the regulation principles.

Table 1.4

The link Between the Top 5 Regulation Principles and Regulation Costs
(created by the author)

Regulation principle	Regulation costs	Comments
Cost-benefit balanced	Regulatory costs, compliance costs	Both – regulator and market participant – consider this principle when deciding on their actions regarding regulation.
Risk-based	Regulatory costs, compliance costs	Both – regulator and market participant – consider this principle when deciding on their actions regarding regulation.
Consistency and competitive neutrality	Indirect costs	This principle covers market environment-related matters.
High quality transparent decision-making, and enforcement	Compliance costs	This principle covers the extent of how much efforts will be required from market participant to comply with regulations.
International coordination, convergence, and implementation in policy and rulemaking	Indirect costs	International coordination is often managed through supranational institutions, e.g., the European Central Bank. Thereby, communication aspects are important as it is one of the main tools those institutions use to transmit their policy targets.

Deadweight loss measurement

Based on the approach of the Harberger Triangles (Harberger, 1964a; 1964b; 1966; 1971), where Harberger offered a clear and persuasive derivation of the triangle method of analysing deadweight loss, the methodology for assessing market failures was disclosed.

The deadweight loss of **market power imbalances** can be expressed as

$$\int_{q(X^*)}^{q(X)} [D(q) - S(q)]dq, \quad (1.1)$$

where $q(X^*)$ is quantity with market power imbalances and $q(X)$ is equilibrium quantity in the competitive market

Considering that the demand is expressed as $p = D(q)$, supply without transaction costs (TC): $p = S(q)$ and supply with TC: $p = S^*(q)$, the deadweight loss of **asymmetric information** can be expressed as

$$\int_{q(X^*)}^{q(X)} [D(q) - p]dq, \quad (1.2)$$

where $q(X^*)$ is quantity with asymmetric information and $q(X)$ is equilibrium quantity in the competitive market.

Considering that the social benefit is expressed as $p = SB(q)$ and social cost: $p = SC(q)$, the deadweight loss of **negative spillovers** can be expressed as

$$\int_{q(X^*)}^{q(X)} [SC(q) - SB(q)]dq, \quad (1.3)$$

where $q(X^*)$ is quantity with Pareto efficient equilibrium and $q(X)$ is quantity with market equilibrium.

In Table 1.5 the author summarises what variables have been used as “price” and “quantity”.

Table 1.5

Variables of the Harberger Triangle (created by the author based on the research papers listed in the table)

Market failure	Research paper	Variable for “price”	Variable for “quantity”
Asymmetric information	DeFusco, Tang, Yannelis, 2022	Price, cost, or willingness to pay for the loan as a share of the initial loan amount	Share of potential borrowers in the market
Asymmetric information/ market power imbalances	Crawford, Pavanini, Schivardi, 2018	Credit price (interest rate)	Credit supply
Negative spillovers	BIS, 2018 Cerutti et al., 2017 Bruno, Shin, 2015	Interest rates	Bank capital flows

Table 1.5 continued

Market failure	Research paper	Variable for “price”	Variable for “quantity”
	Correa et al., 2015 Tonzer, 2015 Cetorelli, Goldberg, 2012		
Asymmetric information	Corrado, Schuler, 2017	Quadratic loss function	Output gap variance volatility of inflation
Asymmetric information	Johnson, So, 2017	<i>not described</i>	Option-to-stock volume ratios
Asymmetric information	European Central Bank, 2016 Hey, 2003	NPL* price and quality	Quantity of NPLs
Asymmetric information	Einav, Finkelstein, 2011	Price (and expected cost) of the insurance contract	Quantity of insurance demand
Market power imbalances	Oroz, Salas, 2003 Fernández de Guevara et al., 2005	Interest rates of loans, deposits, and interbank market	GDP
Market power imbalances	Freixas, Rochet, 1997	Interest rates of loans, deposits, and interbank market	<i>not described</i>

* NPL – non-performing loan

Other research mostly covers variables for “price”, e.g., international financial spillovers (Fratzscher et al., 2014; Mishra et al, 2014; IMF, 2016). DeFusco, Tang and Yannelis (2022) as “price” offer “willingness to pay for the loan as a share of the initial loan amount”, which could be challenging to observe in data.

Government regulation intensity measurement

When it comes to the quantification approaches of government intervention level and regulation intensity:

- some literature defines the level of intervention from the **government spending** perspective, e.g., Kormendi and Meguire (1985), Ram (1986), Alexander (1994), Evans (1997), Kneller, Bleaney, and Gemmell (1998), Afonso and Jalles (2011).
- Gorgens et al. (2003), Loayza et al. (2004), Djankov et al. (2006), Jalilian et al. (2007), and Jacobzone et al. (2010) developed the **regulatory indicator** using the

data from surveys to construct the indicator values. Some research uses other indicators, like Doing Business, Index of Economic Freedom, etc.

- Djankov et al. (2002), in the case of start-up companies, used the **number of official procedures to be completed and time taken** to assess the regulatory burden. **Time perspective** was the focus of Ciccone and Papaioannou's (2007) research when they evaluated the time taken to obtain legal status to operate a firm in 1999 as a measure of regulatory burden.

Before the 2000s, the debate about the intervention level and regulation intensity in the financial market was more theoretical. In the early 2000s, the theoretical debate moved into the empirical field thanks to the World Bank's release of Bank Regulation and Supervision Survey data (World Bank, 2001; 2003; 2007; 2011; 2019a). Based on those data and insights, Agoraki et al. (2011), Anginer et al. (2014), and Delis and Kouretas (2011) observed and evaluated the regulatory environment and developed several indices, which show different angles of the regulatory environment. Marchionne, Pisicoli, and Fratianni (2022) are investigating the banking sector and are also using the approach with indices. They define the Regulation Index as the "100 – Financial Freedom Index" (Index of Economic Freedom, 2022).

Government regulation costs measurement

Hertog (2010), as examples of government regulation costs, mentions (a) information gathering costs for decision making on the efficient price level for the firm, (b) monitoring costs of firm's behaviour, and (c) enforcement of regulation costs. Jacobzone et al. (2010) highlight activities that the government need to perform to guarantee quality in the regulation process, which gives another insight into the types of costs the government faces.

Meanwhile, OECD for policymakers developed regulatory cost assessment guidance, which includes a taxonomy of regulation costs. OECD defines regulatory costs as all the costs attributable to adopting a regulatory requirement, whether direct or indirect in nature and whether borne by business, consumers, government, and its respective authorities (i.e., taxpayers) or other groups (OECD, 2014). As part of regulatory costs are regulation costs, i.e., costs borne by the government, i.e., "Administration and enforcement costs". OECD considers them into the category of compliance costs since they are related to the achievement of the underlying regulatory objective and are an unavoidable part of the cost of regulation. In OECD's view, relevant cost items here are (a) the costs of publicising the existence of the new regulations, (b) developing and implementing new licensing or registration systems, (c) assessing and approving applications and processing renewals, (d) devising and implementing inspection and/or auditing systems, and (e) developing and implementing systems of regulatory sanctions to respond to non-compliance. In recent years, OECD has not published any updates regarding the abovementioned methodology.

Compliance costs measurement

OECD (2014) has offered the following approaches to assessment of the selected cost items:

- (a) Direct labour costs – wage costs are determined by the amount of time taken to complete the required compliance activities and the hourly wage rate of the relevant staff. This approach requires detailed data gathering from the regulated entities.
- (b) Overheads – 50 % of the direct wage costs attributable to regulatory compliance.
- (c) Equipment costs – estimated the total cost of new equipment purchases prompted by the need to comply with the regulation and discounted by an appropriate percentage amount.
- (d) Materials costs – market prices for certain products multiplied by relevant quantity. In some cases, adjusted market prices can be used in case the regulation causes a shift in the product’s demand-supply equilibrium.
- (e) The costs of external services – the figure from accounting records.

Simkovic and Zhang’s (2019) quantification approach is to calculate the percentage of an industry’s labour costs paid to perform regulation-related tasks.

New South Wales Government's (NSW, 2008) approach to assessing substantive compliance costs is as follows:

$$SCC = UC \cdot P \cdot F, \quad (1.4)$$

where SCC is substantive compliance costs, UC is the unit cost (the cost of training, equipment, or other expenditure), P is population (the number of businesses affected), and F is frequency (the amount of training or the number of equipment required).

And administrative costs are as follows:

$$AC = I \cdot T \cdot P \cdot F, \quad (1.5)$$

where AC is administrative costs, I is inputs (the hourly wages costs, overhead and non-wage costs or the cost of an external service provider), T is time (required to complete the activity, in hours), P is population (the number of businesses affected), and F is frequency (the number of times the activity is completed each year).

New South Wales Government's approach is rooted in the Standard Cost Model, which uses this type of calculations to assess costs per administrative activity.

As a more high-level approach, regulators use the assessment of compliance cost effects based on market surveys, e.g., the European Banking Authority’s launched questionnaires in 2020 (EBA, 2020) to assess reporting costs. Based on the financial market survey, ICF (2019) has found that for banks and financial conglomerates, **one-off compliance costs are 2.89 % of total operational costs** and **on-going compliance costs – 2.60 % of total operational costs**.

Indirect costs measurement

Indirect costs capture all other effects of regulation apart from regulatory and compliance costs. In the Standard Cost Model (SCM Network, 2006), indirect costs are defined as the impact that regulation has on market structures, consumption patterns and the cost of delays. It includes barriers to entry through licensing, holding costs and restrictions on innovation. In the

OECD taxonomy (OECD, 2014), financial, opportunity and macroeconomic costs are mentioned.

In the Standard Cost Model (SCM Network, 2006), indirect costs are quantified as follows:

$$IC = CV \cdot P \cdot I \cdot Q, \quad (1.6)$$

where IC is indirect costs, CV is the annual capital value of approvals, P is the estimate of percentage borrowed/spent, I is the annual interest rate divided by 365, and Q is the average delay (in days) to process or gain approvals.

A more high-level model is presented by Brian Titley Consulting (2015) using the approach of Partial Equilibrium Analysis.

Effect of the communication

As a special case of indirect costs, the communication of the regulator has been analysed (justification for this is revealed in Table 1.4). In this doctoral research, it has been performed based on a collection of speeches by the European Central Bank due to the availability of data.,

Neretina, Sahin, and de Haan (2020), to measure the impact of an event, have used the term “the abnormal return of a security”, which is calculated as the difference between the actual return and the normal return over certain so-called “the event window”. The term “the event window” means the period when the event has been observed, measured in days. Normal returns are estimated using the market model as follows:

$$R_{i,t} = \alpha_i + \beta_i R_{m,t} + \varepsilon_{i,t}, \quad (1.7)$$

where $R_{i,t}$ is the daily return of equity of bank i at time t , and $R_{m,t}$ is the return of a market portfolio (the S&P 500 returns index).

The residuals or abnormal returns (AR) implied by the market model are given by,

$$AR_{i,t} = R_{i,t} - (\hat{\alpha}_i + \hat{\beta}_i R_{m,t}), \quad (1.8)$$

where the circumflex indicates that the parameter concerned is estimated. The abnormal returns are summed over the relevant window around the event date to compute the cumulative abnormal return (CAR). In their baseline model, abnormal returns are cumulated for the 3-day window (-1; +1).

Effect of the communication: *identification of the event*

Born, Ehrmann, and Fratzscher (2011) assessed speeches and interviews of the Central Bank Governor with the following conditions:

1. Each speech was allocated to a certain trading day. Communications during weekends were allocated to the following Monday, communications in the evening – such as dinner speeches – to the subsequent trading day.
2. Only the first report about a given statement was chosen, which typically originated from a newswire service. This choice has the advantage that the reporting is timely, usually comes within minutes of each statement, and is mostly descriptive without

providing much analysis or interpretation. To avoid double counting, all subsequent reports or analysis of the same statement were discarded.

3. The search was conducted only in the English language.

In these speeches and interviews, Born, Ehrmann, and Fratzscher (2011) were looking for specific words which characterise the communication related to financial stability, such as “volatile”, “volatility”, “risk”, “ad-verse”, “pressures”. Based on the software for automated textual analysis, they computed a score for each individual speech or interview. Then, they transformed the resulting scores into a discrete variable, which takes the value of -1 for the lowest third of the distribution, a value of 0 for the middle part of the distribution, and a value of $+1$ for the upper third of the distribution. That is, a value of $+1$ corresponds to a relatively optimistic text, while a value of -1 corresponds to a relatively pessimistic statement.

2. DEVELOPMENT OF THE GOVERNMENT REGULATION MODEL

The author in this chapter has discussed the construction principles of the Regulation Model. Basic guidelines for the model construction have been defined based on the inspiration from Johnson and So's (2017) approach to the construction of the multimarket information asymmetry measure:

- 1) ease of implementation – whether the data are broadly available;
- 2) clarity of interpretation;
- 3) empirical effectiveness – the model covers all material costs and other exposures.

In general, the model is reflected in Fig. 2.1, covering the ideas described in the literature review:

- the deadweight loss decreases with increasing regulation;
- regulation costs increase with increasing regulation;
- there is an equilibrium point between the two, i.e., the point where deadweight loss equals regulation costs; after this point, there is no economic justification for further increase in regulation intensity;
- the deadweight loss and regulation costs are measured in the currency units, e.g., euro;
- there are no measurement scales for government regulation intensity or intervention level.

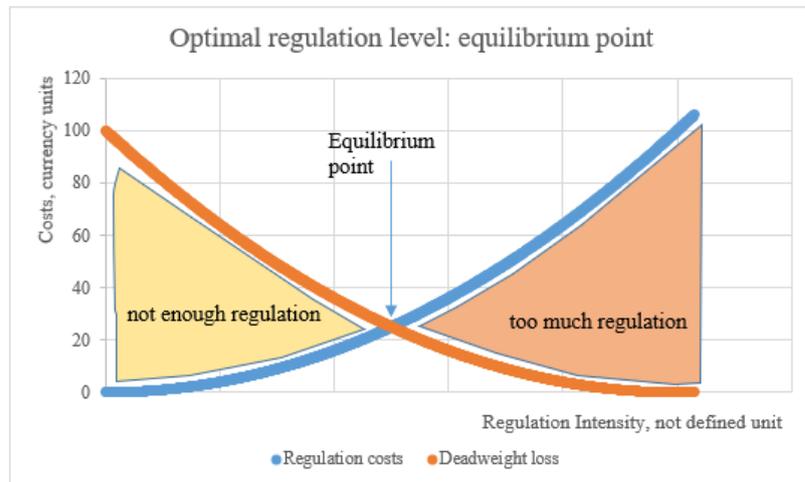


Fig. 2.1. General concept of the model (created by the author).

Considering the abovementioned, the author has developed the approach to address the following issues:

- 1) equations for the deadweight loss and regulation costs are needed;
- 2) a measurement scale for the evaluation of government regulation intensity is needed.

The summary of the approach is described in Table 2.1.

Table 2.1

The Concept of the Model (created by the author)

Model bloc	Construction approach	Data source
Deadweight loss assessment	Assessment of not produced GDP (GDP output gap) Values in % of GDP	<ul style="list-style-type: none"> • Databases of the European Central Bank and the Bank of Latvia, • Eurostat
Regulation costs assessment	Assessment of costs Values in % of GDP	<ul style="list-style-type: none"> • Databases of the European Central Bank and the Bank of Latvia, • Eurostat • Bloomberg • Annual reports of regulators
Additional activity		
Regulation intensity measurement scale	Regulation Intensity Index based on: <ul style="list-style-type: none"> • Questionnaire with 23 points • Index: 100 – Business Freedom • Index: 100 – Monetary Freedom • Index: 100 – Investment Freedom • Index: 100 – Financial Freedom Values of Regulation Intensity Index [0; 100]	<ul style="list-style-type: none"> • The World Bank's prepared <i>The Bank Regulation and Supervision Survey</i> • <i>Index of Economic Freedom</i> database

The deadweight loss is assessed for the following market failures:

- imperfect competition or market power imbalances,
- asymmetric information,
- negative spillovers,
- market abuse and others.

Regulation costs are assessed for the following cost types:

- regulatory costs,
- compliance costs,
- indirect costs.

Considering the abovementioned, the general concept of the model has been developed in the following way (see Fig. 2.2.):

- Deadweight loss > regulation costs. Deadweight loss exceeds the regulation costs, so the suggested policy decision would be to increase the regulation intensity.
- Deadweight loss = regulation costs. Breakeven point, it is not suggested to further increase the regulation intensity.
- Deadweight loss < regulation costs. Government intervention is not economically justified as regulation costs exceed the economic loss for society. A suggested policy decision would be to decrease the regulation intensity.

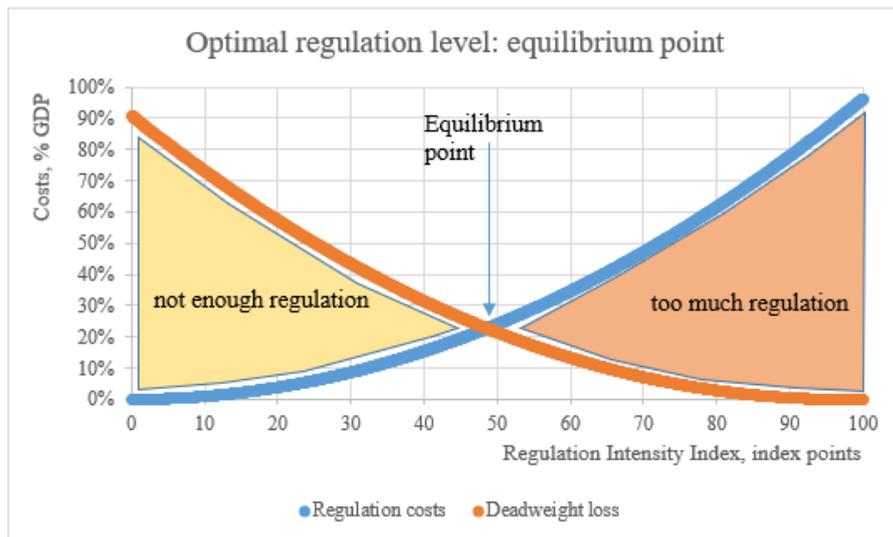


Fig. 2.2. The graphical concept of the model (created by the author)

This Chapter is organised to describe step by step the concept reflected in Table 2.1 and Fig.2.2. It eventually leads to the equilibrium point: $f(DWL) = f(Reg\ costs)$, where

$$f(DWL) = \{DWL_{Reg(1)}; DWL_{Reg(2)}; \dots; DWL_{Reg(n)}\} \quad (2.1)$$

and

$$f(Reg\ costs) = \{Reg\ costs_{Reg(1)}; Reg\ costs_{Reg(2)}; \dots; Reg\ costs_{Reg(n)}\}. \quad (2.2)$$

In Sections 2.2 and 2.3, descriptions of methodologies for variables $DWL_{Reg(1)}$, $DWL_{Reg(n)}$, $Reg\ costs_{Reg(1)}$ and $Reg\ costs_{Reg(n)}$ are described. Section 2.1 is dedicated to the methodology for index $Reg(n)$.

Eventually, the equilibrium point is defined as $\{DWL_{Reg(n)}; Reg(n)\}$, which satisfies the condition $DWL_{Reg(n)} = Reg\ costs_{Reg(n)}$.

2.1. Regulation intensity measurement scale

Based on the ideas from the literature review the author has decided to create the **Regulation Intensity Index** with values in the range [0;100]. The Regulation Index is calculated as an average from 5 indices:

- Index from the questionnaire based on the Bank Regulation and Supervision Survey from the World Bank,
- Index: 100 – *Business Freedom* based on the *Index of Economic Freedom*,
- Index: 100 – *Monetary Freedom* based on the *Index of Economic Freedom*,
- Index: 100 – *Investment Freedom* based on the *Index of Economic Freedom*,
- Index: 100 – *Financial Freedom* based on the *Index of Economic Freedom*.

Index from the questionnaire based on the Bank Regulation and Supervision Survey

Based on the description above the author has developed the simple Formula (2.3) for calculation of the Index value from the questionnaire:

$$I_1 = \frac{n}{23} \cdot 100, \quad (2.3)$$

where n is the value of assessment from the questionnaire.

Indices from the *Index of Economic Freedom*

Four other indices have been used from the Index of Economic Freedom (2022). The overall score for this index is assessed based on the following components covering four areas of the economy as follows:

- Rule of Law:
 - Property Rights
 - Government Integrity
 - Judicial Effectiveness
- Government Size:
 - Tax Burden
 - Government Spending
 - Fiscal Health
- Regulatory Efficiency:
 - Business Freedom
 - Labour Freedom
 - Monetary Freedom

- Open Markets:
 - Trade Freedom
 - Investment Freedom
 - Financial Freedom

The area “Rule of Law” in the Regulation Intensity Index covering the banking market is already fully covered by the World Bank’s Bank Regulation and Supervision Survey, which explores the legal environment in every detail. The area “Government Size” is more attributed to the general government and not directly related to the banking market activities. Meanwhile, the areas “Regulatory Efficiency” and “Open Markets” would contribute to the Regulation Intensity Index with indicators for the specific cultural behaviour of market participants, consumer preferences, everyday interaction with authorities and other aspects falling outside of the scope of the World Bank’s Bank Regulation and Supervision Survey.

From those six components, four have been selected to be included in the Regulation Intensity Index: Business Freedom, Monetary Freedom, Investment Freedom, and Financial Freedom. Those components are close to the banking market. It was also important to select up to 4–5 indices so the first index from the questionnaire has sufficient weight on the overall Regulation Intensity Index.

Considering that the abovementioned indices reflect the freedom of certain economic activities, for regulation purposes inverse values have been selected, as shown in Formulas (2.4) – (2.7):

$$I_2 = 100 - \textit{Business Freedom} \quad (2.4)$$

$$I_3 = 100 - \textit{Monetary Freedom} \quad (2.5)$$

$$I_4 = 100 - \textit{Investment Freedom} \quad (2.6)$$

$$I_5 = 100 - \textit{Financial Freedom} \quad (2.7)$$

Based on Formulas (2.3) – (2.7), the overall **Regulation Intensity Index** is expressed as follows, with parameter α to be validated:

$$RII = \alpha \cdot I_1 + \alpha \cdot I_2 + \alpha \cdot I_3 + \alpha \cdot I_4 + \alpha \cdot I_5 \quad (2.8)$$

2.2. Deadweight loss assessment

Generally, the deadweight loss can be assessed as the sum from deadweight losses of separate market failures (identified in Section 1.3), i.e.,

$$DWL_{Reg(n)} = DWL_{as} + DWL_{spill} + DWL_{abuse} + DWL_{power} + DWL_{other}, \quad (2.9)$$

where $DWL_{Reg(n)}$ is the deadweight loss at a single point or the RII; DWL_{as} is the deadweight loss from asymmetric information; DWL_{spill} is the deadweight loss from negative spillovers; DWL_{abuse} is the deadweight loss from market abuse; DWL_{power} is the deadweight loss from market power imbalances; and DWL_{other} is the deadweight loss from other market failures.

Formula (2.9) corresponds to the deadweight loss at a single point of the Regulation Intensity Index (RII). The function graphically reflected in Fig. 2.2 can be written as in Formula (2.1).

Based on the information in Tables 1.2 and 1.5, the author has proposed the variables for “price” and “quantity” to be used for the Harberger Triangles’ assessment (see Table 2.2). The proposal is based on the review of approaches of other researchers (Table 1.5) and comments from the European Central Bank on market failures (Table 1.2).

Another perspective of the proposal of variables is to be able to measure it in the currency units or percentage so that the deadweight loss can be assessed in the terms of currency.

Table 2.2

Proposed Variables of the Harberger Triangle (created by the author)

Market failure	Variable for “price”	Variable for “quantity”
Asymmetric information Market power imbalances	Interest rates (deposits, loans)	Exposure of deposits and loans on banks’ balance sheets
Negative spillovers	Interest rates (market)	Bank capital flows (cash flow)
Market abuse	Accruals for issued loans and guarantees	Exposure of loans on banks’ balance sheets and guarantees on off-balance sheets

Asymmetric information

The empirical literature on testing for asymmetric information (Chiappori, Salanié, 2000; Einav, Jenkins, Levin, 2012; Ioannidou, Pavanini, Peng, 2022) shows that collaterals are used in the models to capture the presence of asymmetric information. Thereby, the author has used the following approach to assess the deadweight loss:

$$DWL_{as} = \int_{bal(i^*)}^{bal(i)} [D_1(bal) - D_2(bal)] dbal, \quad (2.10)$$

where $D_1(bal)$ is the demand function of uncollateralised loans and $D_2(bal)$ is the demand function of collateralised loans.

Market power imbalances

The deadweight loss from market power imbalances can be expressed as the integral from exposures (bal):

$$DWL_{power} = \int_{q(X^*)}^{q(X)} [D(q) - S(q)] dq = \int_{bal(i^*)}^{bal(i)} [D(bal) - S(bal)] dbal, \quad (2.11)$$

where $bal(i^*)$ is the exposure with excess interest rate level and $bal(i)$ is the exposure with equilibrium interest rate level.

Negative spillovers

The deadweight loss from negative spillovers can be expressed as the integral from exposures (bal):

$$DWL_{spill} = \int_{q(X^*)}^{q(X)} [SC(q) - SB(q)]dq = \int_{bal(i^*)}^{bal(i)} [SC(bal) - SB(bal)]dbal, \quad (2.12)$$

where $bal(i^*)$ is the capital transfer balance of observable economy before the shift of interest rates of major economy and $bal(i)$ is the capital transfer balance of observable economy after the shift of interest rates of major economy.

Market abuse

The deadweight loss from market abuse can be expressed as the sum from excess accruals:

$$DWL_{abuse} = \sum_{i=1}^N (Exc - Acc) \cdot bal, \quad (2.13)$$

where Exc is excess accruals, Acc is the normal level of accruals, bal is the exposure of loans on banks' balance sheets and guarantees on off-balance sheets, and N is the number of periods when market abuse was observed.

If other market failures need to be assessed, the approach is expected to be like in Formula (2.13) – an excess level of measure will be assessed (interest rates, accruals, etc.) and multiplied by a relevant quantity (exposures of loans, deposits, or any off-balance sheet items):

$$DWL_{other} = \sum_{i=1}^N (Exc - Norm) \cdot bal, \quad (2.14)$$

where Exc is the excess level of measure, $Norm$ is the normal level of measure, bal is the exposure of loans, deposits, or any off-balance sheet items, and N is the number of periods when market failure was observed.

2.3. Regulation costs assessment

Regulation costs are assessed for the following cost types:

- regulatory costs,
- compliance costs,
- indirect costs.

Like the deadweight loss formulas, the regulation's costs assessment corresponds to the regulation costs at the single point of the Regulation Intensity Index. The function, graphically reflected in Fig. 2.2, can be written as $f(Reg\ costs)$.

Modelling of the regulatory costs

Based on the input from previous research described above, the author has developed the following regulatory costs assessment process consisting of the Source Identification, Cost Selection and Calculation phases.

The regulatory costs should be assessed as follows:

$$y_n = MiP_n + MaP_n + \frac{1}{a} \cdot \frac{1}{b} \cdot SC, \quad (2.15)$$

where y is regulatory costs, MiP is applicable microprudential regulator's costs, MaP is applicable macroprudential regulator's costs, SC is the government's staff costs, a is the number of ministries in the government, and b is the number of policy-making departments within the responsible ministry (e.g., Ministry of Finance).

Modelling of the compliance costs

Considering the approaches of other scientists, the author in this research has chosen to use a broader definition of compliance costs – certain fraction of one-off and ongoing operational costs. This approach would be more general and, thereby, would allow to compare the results of different banking market participants.

Considering the results of previous research, the compliance costs should be assessed in two ways: (a) one-off costs (α_0 in Formula (2.16)) and (b) ongoing costs (β_0 in Formula (2.16)).

Thereby, Formula (2.18) should be adjusted as follows:

$$y_n = \begin{cases} n = 1, \dots, 8: (0.2 \cdot (\alpha_0 + n \cdot 0.12 \%) + \beta_0 + n \cdot 0.25 \%) \cdot x \\ n = 9, \dots: (0.2 \cdot (\alpha_8 + (n - 8) \cdot 0.05 \%) + \beta_8 + (n - 8) \cdot 0.10 \%) \cdot x' \end{cases} \quad (2.16)$$

where $\alpha_0 = 1.94 \%$, $\beta_0 = 0.63 \%$ (corresponds to the year 2009 and any prior year).

Modelling of the indirect costs

Considering the results of Guiso, Sapienza and Zingales (2007) and Brian Titley Consulting (2015), the indirect costs could be assessed as follows:

$$y_n = (q_n - q_{n-1}) \cdot (i_n - i_{n-1}) - (acc_{n-1} - acc_n), \quad (2.17)$$

where y is the bank's indirect costs, q is the loan volumes, i is interest rates, and acc is the accruals of loans.

The effect of communication

Additionally, the effect of communication has been described as a particular case of indirect costs. The effect of communication is assessed based on the approaches of Petrella, Resti (2013), Morgan, Peristiani, Savino (2014), Candelon, Sy (2015), Sahin, de Haan (2016), Flannery, Hirtle, Kovner (2017), Neretina, Sahin and de Haan (2020), Hwang, Lustenberger, and Rossi (2021), and Born, Ehrmann and Fratzscher (2011).

Technically, the assessment of speeches has been performed using the words listed in Table 2.3.

Table 2.3

The Words Used for the Speech Assessment
(created by the author)

Speech category	Word	Used in search
Optimistic	Recovery	“recover”
Optimistic	Stable/stability	“stab”
Optimistic	Grow/growth	“grow”
Optimistic	Positive	“positive”
Optimistic	Sustainable/sustainability	“sustainab”
Pessimistic	Uncertainty	“uncertain”
Pessimistic	Volatile/volatility	“olatile”
Pessimistic	Adverse	“adverse”
Pessimistic	Recession	“recession”
Pessimistic	Pressure	“pressure”

The author has used the following formula to find the abovementioned words in the speeches:

$$N = \frac{x - x'}{y}, \quad (2.18)$$

where N is the number of strings found; x is the number of characters in the speech; x' is the number of characters in the speech, which is exempt from the string to be searched; and y is the number of characters in the string to be searched.

The author has chosen the approach of assessing normal and abnormal returns to assess the reaction to the Central Bank’s communication (Formulas (1.7) and (1.8)). In Table 2.4, the author has summarised the assessment of the financial market participants’ reaction to the Central Bank’s communication.

Table 2.4

Summary of the Market Participants’ Reaction
(created by the author)

Speech category	Value of CAR	Assessment of reaction
Optimistic	$CAR > 0$	Expected reaction (positive)
	$CAR < 0$	Adverse reaction (negative)
	$CAR = 0$	No reaction
Pessimistic	$CAR > 0$	Adverse reaction (positive)
	$CAR < 0$	Expected reaction (negative)
	$CAR = 0$	No reaction
Neutral	$CAR > 0$	Adverse reaction (positive)
	$CAR < 0$	Adverse reaction (negative)
	$CAR = 0$	Expected reaction (no reaction)

* CAR – the cumulative abnormal return

For optimistic speech, the expected reaction is a positive CAR ; subsequently for pessimistic speech, it is a negative CAR . Other reactions are “adverse” or “no reactions”.

To assess the annual communication-related indirect costs and include them in the model, the following formula has been developed:

$$Com = 0.5 \cdot \sum_{i=1}^n CAR \cdot fi \cdot qty + 0.5 \cdot \sum_{i=1}^m CAR \cdot fi \cdot qty, \quad (2.19)$$

where Com is communication-related indirect costs, fi is the value of the chosen financial instrument in the selected period, qty is the quantity of chosen financial instrument in the selected period, n is the number of periods during the first year, and m is the number of periods during the second year.

The approach is to assess the average number of two years to minimise the effect of fluctuations in the financial markets on the assessment of indirect costs. A typical practical issue is the availability of data for the full assessment of the effect on the country level. In case, e.g., only one bank in the country can be assessed through this approach, the effect on the country level is approximated via extrapolation:

$$CCom = Com \cdot \frac{k}{l}, \quad (2.20)$$

where $Ccom$ is the communication-related indirect costs on the country level; k is the total banking assets in the country; and l is the total assets of the bank, whose communication effect was assessed with Formula (2.20).

2.4. Overall model

1. The equilibrium point is defined as $\{DWL_{Reg(n)}; Reg(n)\}$, which satisfies the condition $DWL_{Reg(n)} = Reg \text{ costs}_{Reg(n)}$.
2. The deadweight loss $DWL_{Reg(n)}$ is defined as a sum of all deadweight losses from the identified market failures:

$$DWL_{Reg(n)} = \left(\begin{array}{c} \int_{bal(i^*)}^{bal(i)} [D_1(bal) - D_2(bal)] dbal \\ \bigcup_{bal(i^*)}^{bal(i)} \int [D(bal) - S(bal)] dbal \\ \bigcup_{bal(i^*)}^{bal(i)} \int [SC(bal) - SB(bal)] dbal \\ \bigcup_{i=1}^N (Exc - Acc) \cdot bal \bigcup_{i=1}^N (Exc - Norm) \cdot bal \end{array} \right)$$

3. The regulation costs $Reg\ costs_{Reg(n)}$ are defined as a sum of all identified regulation cost types:

$$Reg\ costs_{Reg(n)} = \left(\begin{array}{c} MiP_n + MaP_n + \frac{1}{a} \cdot \frac{1}{b} \cdot SC \\ \bigcup \left\{ \begin{array}{l} n = 1, \dots, 8: (0,2 \cdot (\alpha_0 + n \cdot 0,12\%) + \beta_0 + n \cdot 0,25\%) \cdot x \\ n = 9, \dots: (0,2 \cdot (\alpha_8 + (n - 8) \cdot 0,05\%) + \beta_8 + (n - 8) \cdot 0,10\%) \cdot x \end{array} \right. \\ \bigcup (q_n - q_{n-1}) \cdot (i_n - i_{n-1}) - (acc_{n-1} - acc_n) \\ \bigcup \left(0,5 \cdot \sum_{i=1}^n CAR \cdot fi \cdot qty + 0,5 \cdot \sum_{i=1}^m CAR \cdot fi \cdot qty \right) \cdot \frac{k}{l} \end{array} \right)$$

3. VALIDATION OF THE GOVERNMENT REGULATION MODEL

Validation of the model is done by model blocs as of Table 2.1:

- deadweight loss assessment,
- regulation costs assessment,
- *additional activity*: regulation measurement scale.

Validation is performed based on the data from the databases of the European Central Bank, the Bank of Latvia, Eurostat, Bloomberg, annual reports of regulators, the World Bank's Bank Regulation and Supervision Survey and the database of the Index of Economic Freedom.

The validation logic is set by each bloc separately:

- *Deadweight loss assessment*: Validation done with selected euro area countries or euro area in general covered by the database of the European Central Bank, considering that some data are needed on a detailed level.
- *Regulation costs assessment*: Validation done with euro area countries or selected countries outside the euro area if data are available.
- *Additional activity*: Regulation measurement scale. Validation done with 4 selected countries representing different regulations. Considering that the World Bank's Bank Regulation and Supervision Survey and the database of the Index of Economic Freedom cover the world, the geographical region is not the limitation.

Each of the blocs have their research hypothesis:

- *Deadweight loss assessment*: The deadweight loss decreases with increased regulation intensity level.
- *Regulation costs assessment*: The regulation costs increase with increased regulation intensity level.
- *Additional activity*: Regulation measurement scale. The hypothesis is that the regulation intensity for Germany will be higher than for the UK, the USA, and Russia.

The order of subsections follows the order of blocs as mentioned above.

To show the combined result of the overall model, the case of Latvia has been viewed. Details are revealed in Section 3.4.

3.1. Validation of the regulation intensity measurement scale

Index from the questionnaire based on the Bank Regulation and Supervision Survey

Methodology validation is performed for the selected countries: Germany, the United Kingdom (UK), the United States of America (USA) and the Russian Federation (Russia). Those countries have been selected as they represent different approaches in the regulation of the economy and, subsequently financial market. It is expected that the most stringent regulatory requirements will be in Germany, followed by the UK, the USA, and finally, the less stringent requirements will be in Russia. The author has set the hypothesis that the regulation intensity for Germany will be higher than for the UK, the USA, and Russia; in other words, the order of countries in their stringency of regulatory requirements will be as follows: Germany, UK, USA, Russia.

Results show that the abovementioned hypothesis is confirmed: The regulation intensity for Germany is higher than for the UK, USA, and Russia. It should be noted that the UK, USA, and Russia have the same values. Expectation in general is that Russia will report higher regulation level. Obviously, this index, which captures mainly regulatory documents, is reflecting the same level of regulation restrictions as for other major economies – the UK and the USA. In Table 3.1, index values have been calculated based on the values of “n” (see Formula (2.3)).

Table 3.1

Questionnaire Index Values (created by the author)

	Germany	UK	USA	Russia
Index	82.6	69.6	69.6	69.6

Indices from the Index of Economic Freedom

Here, in Table 3.2, the index values and subsequent inverse values are reflected for Germany, the UK, the USA, and Russia. This index captures other aspects of restrictions, not only formal documents. Thereby, it is evident that Russia reports, as expected, higher level of regulatory restrictions.

Table 3.2

Economic Freedom Index Values

(created by the author based on the Index of Economic Freedom, 2022)

	Germany	UK	USA	Russia
Business Freedom	87.2	79.1	87.5	62.5
Monetary Freedom	79.5	83.0	82.3	68.0
Investment Freedom	80.0	80.0	85.0	30.0
Financial Freedom	70.0	80.0	80.0	30.0
100 – Business Freedom	12.8	20.9	12.5	37.5
100 – Monetary Freedom	20.5	17.0	17.7	32.0
100 – Investment Freedom	20.0	20.0	15.0	70.0
100 – Financial Freedom	30.0	20.0	20.0	70.0

Combined index

Summarising the results, in Table 3.3, the Regulation Intensity Index is reflected for the selected countries. The Combined index, which captures both – regulatory documents and regulatory practices – shows a more accurate view of the situation in the country. Parameter α was validated with the following values:

$$\alpha_1 = 0 \%, \alpha_2 = 17 \%, \dots, \alpha_5 = 17 \%$$

$$\alpha_1 = 14 \%, \alpha_2 = 14 \%, \dots, \alpha_5 = 14 \%$$

$$\alpha_1 = 25 \%, \alpha_2 = 13 \%, \dots, \alpha_5 = 13 \%$$

$$\alpha_1 = 50 \%, \alpha_2 = 8 \%, \dots, \alpha_5 = 8 \%$$

$$\alpha_1 = 75 \%, \alpha_2 = 4 \%, \dots, \alpha_5 = 4 \%$$

$\alpha_1 = 100 \%, \alpha_2 = 0 \%, \dots, \alpha_5 = 0 \%$ The most appropriate approach, considering the need to balance all aspects of regulation, was chosen:

$$\alpha_1 = 14 \%, \alpha_2 = 14 \%, \dots, \alpha_5 = 14 \%$$

Table 3.3

Regulation Intensity Index Values (created by the author)

	Germany	UK	USA	Russia
Regulation Intensity Index	33.2	29.5	27.0	55.8

The combined Regulation Intensity Index shows a slightly changed order of countries in their stringency of regulatory requirements: Russia, Germany, the UK, and the USA. Therefore, the conclusion is that the Regulation Intensity Index's result corresponds to the common sense. Therefore, the original hypothesis is partially confirmed.

3.2. Validation of the methodology of deadweight loss assessment

The research hypothesis for this section is as follows: the deadweight loss decreases with increased regulation intensity level. This hypothesis is validated in two parts:

- Calculation of the deadweight loss corresponding to the single point of the Regulation Intensity Index for each identified market failure. The basic approach for geographical choice was to look for the euro area data, but some exceptions were made with comments on the reason. Details are revealed in Table 3.4.
- Econometric assessment of the relationship between the deadweight loss and regulation intensity. This assessment was performed for one country – Latvia. Based on the results, a conclusion about the hypothesis is set, and results have been included in the overall model.

Econometric models were tested for the presence of heteroscedasticity. In most cases, the significance level of 5 % was used to decide whether the null hypothesis cannot be rejected. If other significance levels were used, it was indicated.

Table 3.4

Deadweight Loss Validation (created by the author)

Market failure	Formula	Areas selected for validation	Principal results
Asymmetric information	(2.10)	Euro area	9.4 bn EUR
Market power imbalances	(2.11)	Samples of 9 countries from the euro area*	1.6 bn EUR (Latvia) 1.1 bn EUR (Slovenia) 0.4 bn EUR (Malta) 0.3 bn EUR (Luxembourg) No deadweight loss for others
Negative spillovers	(2.12)	Euro area	No deadweight loss**
Market abuse and others***	(2.13), (2.14)	Euro area	0.7–1.6 tn EUR

*Calculation depends on the Herfindahl-Hirschman index, which is assessed only on the level of individual countries.

** The euro area does not report significant capital flows when material changes in interest rates occur.

***Due to the data limitations analysed together.

Deadweight loss assessment from asymmetric information

The author has validated the methodology based on euro area data from the European Central Bank and local regulator (Bank of Latvia, 2022; ECB Statistical Data Warehouse, 2022; FCMC Statistics, 2022). Including in this formula amounts of $bal(i)$ and $bal(i^*)$, which are 650 and 600 bn EUR, respectively, the following results were obtained,

$$DWL_{as} = \int_{600}^{650} [-0.0101bal + 6.5]dbal = 9.375 \text{ bn EUR} \quad (3.1)$$

Results show that the deadweight loss arising from the information asymmetry in the euro area banking market is approximately 9.375 bn EUR. The hypothesis is confirmed based on the results above.

Deadweight loss assessment from market power imbalances

The author validated the methodology based on euro-area data from the European Central Bank and local regulator (Bank of Latvia, 2022; ECB Statistical Data Warehouse, 2022; FCMC Statistics, 2022) for the samples of euro area countries:

- 1) representing different sizes, e.g., Germany vs. Latvia; geographical regions, e.g., Malta vs. France; and development levels, e.g., Slovenia vs. Luxembourg;
- 2) covering approximately 50 % of the total number of euro area countries (9 out of 19) at the end of 2022;
- 3) data covers the period from 2003 to 2022.

Results of demand and supply functions' parameter assessment are used to assess the deadweight loss of selected countries due to imperfect competition in banking markets. This calculation is reflected in Table 3.5 and the Herfindahl-Hirschman index to show changes in

the market concentration in the context of deadweight loss. To exclude the effects of GDP growth and inflation from the assessment, an adjusted number for 2022 has been calculated. This adjusted number has been used for deadweight loss calculation purposes.

Table 3.5

HHI and Calculated Deadweight Loss for Selected Countries (created by the author based on ECB Statistical Data Warehouse, 2022; Eurostat, 2022)

Country	HHI		Exposures, bn EUR			Interest rates, %		Deadweight loss	
	2017	2022	2017	2022	2022*	2017	2022	bn EUR	% GDP
Austria	374	407	321	392	360	3.5	3.1	N/A	N/A
Belgium	1 102	1 319	294	388	353	1.9	1.4	N/A	N/A
Germany	250	289	2 560	3 072	2 870	1.7	1.2	N/A	N/A
France	574	661	2 183	2 759	2 578	1.6	1.2	N/A	N/A
Luxembourg	256	293	113	130	112	1.8	1.5	0.3	0.4
Latvia	1 237	1 848	12	11	8.5	4.5	6.8	1.6	4.6
Malta	1 599	1 701	10	12	9.8	2.6	2.2	0.4	2.7
Slovakia	1 332	1 511	49	65	57	1.9	1.1	N/A	N/A
Slovenia	1 133	1 415	19	21	17.7	2.8	1.9	1.1	2.1

*GDP growth and inflation-adjusted data.

Jenny and Weber (1983) assessed on the whole economy that deadweight loss could be up to 12 % from GDP. Their data covered the French economy. From this angle, data in Table 3.5 seem to be relevant as the max value is for Latvia (4.6 % from GDP), which experienced the most significant increase in the banking market concentration from the sample. Thereby, the deadweight loss calculations for selected countries show results corresponding to the expectation to be lower than 12 %. Many countries experienced insignificant changes in market concentration, which are reflected in the data – exposures increased, and interest rates decreased.

Deadweight loss assessment from negative spillovers

The author has validated the methodology based on euro area data from the European Central Bank (ECB Statistical Data Warehouse, 2022). Data shows that the euro area does not report significant capital flows when material changes in interest rates occur (see Fig. 3.1), thereby, no deadweight loss can be assessed due to this market failure.

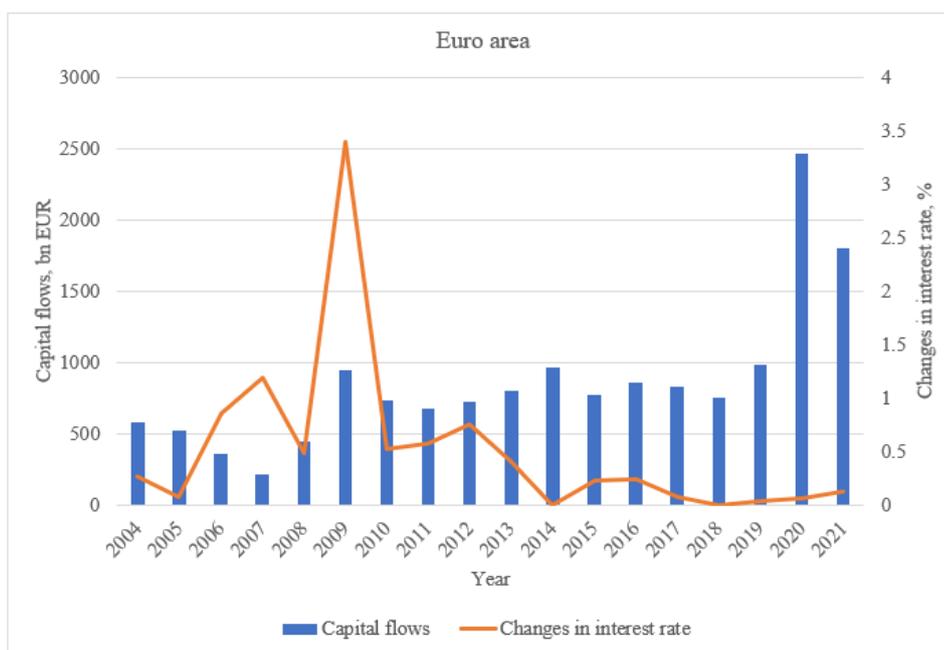


Fig. 3.1. Capital flows and changes in interest rates (created by the author based on ECB Statistical Data Warehouse, 2022).

Deadweight loss assessment from other market failures

The author has validated the methodology for market abuse and other market failures based on euro area data from the European Central Bank (ECB Statistical Data Warehouse, 2022). In Table 3.6, the author has summarised the analysis results of excess provisions in the euro area in the period 2007–2021, which corresponds to data availability in the European Central Bank.

Table 3.6

Average Excess Level of Provisions in the Euro Area (created by the author based on ECB Statistical Data Warehouse, 2022)

Year	Provisions, % of total assets	Excess provisions, % of total assets	Assets, tn EUR	Excess provisions, tn EUR
2012	3.93 %	0.61 %	221.2	1.4
2013	4.12 %	0.80 %	200.8	1.6
2017	3.42 %	0.10 %	700.6	0.7

Results show that the hypothesis is confirmed, and excess accruals have been reported. In total, in 2012, 2013 and 2017, they amounted to 3.7 tn EUR.

Relationship between deadweight loss and regulation intensity

Summarising the results from the assessment of the deadweight loss arising from market failures, the deadweight loss was assessed through years and combined with results of the Regulation Intensity Index for Latvia. As a result, the equation for deadweight loss was econometrically assessed:

$$DWL = -0.0067 \cdot Reg(n) + 0.2794 \quad (3.2)$$

The equation has an explanatory power of 82 % and a *p-value* significantly less than 1 %. Based on this result, the conclusion was made: the deadweight loss decreases with increased regulation intensity level. **The hypothesis is confirmed.**

3.3. Validation of the methodology of regulation costs assessment

The research hypothesis for this section is as follows: the regulation costs increase with increased regulation intensity level. The basic approach for geographical choice was to look for the euro-area data, but some exceptions were made with comments on the reason. Details are revealed in Table 3.7. Regulation costs are assessed for the following cost types:

- regulatory costs,
- compliance costs,
- indirect costs.

Econometric models were tested for the presence of heteroscedasticity. In most cases, the significance level of 5 % was used to decide whether the null hypothesis cannot be rejected. If other significance levels were used, it was indicated.

Table 3.7

Regulation Costs Validation (created by the author)

Regulation costs	Formula	The area selected for validation	Principal results
Regulatory	(2.15)	Europe, North America, Russia*	Hypothesis confirmed
Compliance	(2.16)	Baltics**	Hypothesis confirmed
Indirect	(2.17) (2.19)	Euro area (major European banks)***	Hypothesis rejected

* The area matched with the Regulation Intensity Index validation (slightly wider).

** The area was chosen narrower due to more detailed data requirements.

*** Communication effect's details are revealed for two major European banks, but the costs are assessed on the euro-area level.

Regulatory costs assessment

Based on the regulation-level measurement methodology described in Section 2.1 the author has assessed the government regulation intensity level in the countries of the European Union, the United Kingdom, the United States, Canada, and Russia. For this test, the following countries were chosen to evaluate different levels of government intervention: Latvia, Lithuania, Estonia, Poland, Bulgaria, Finland, Czech Republic, Denmark, Croatia, and France.

The choice of countries was based on several arguments to capture representative selection: (a) countries that match the area of Regulation Intensity Index, (b) countries with different levels of regulation, (c) countries with different levels of economic development, (d) countries with different geographical location, (e) countries showing different points in the World Bank's Bank Regulation and Supervision Survey.

In the Selection phase, several cost items were excluded from relevant categories due to the following reasons:

- other period cost recharge with no details on reasons (1 case);
- one-off costs not related to business-as-usual (1 case).

The author ran the econometric test on the function IC, which explains the relationship between government regulation level and regulation costs. If the polynomial function is used with order 3, R-squared is approx. 44 %, which is the medium result (see Formula (3.3)):

$$y = -8 \cdot 10^{-7}x^3 + 7 \cdot 10^{-5}x^2 - 0.0023x + 0.0234, \quad (3.3)$$

where y is regulation costs to GDP (basis points) and x is Regulation Intensity Index.

Results show that **the hypothesis is confirmed:** the regulatory costs increase with increased regulation intensity level.

Outliers in the abovementioned relationship are, e.g., Latvia, which, comparably to neighbours, has high regulatory costs, measured per cent of GDP. If compared to Lithuania, Latvian regulatory costs are two times higher.

Compliance costs assessment

The methodology is tested by the largest banks in the Baltic States:

- The Baltic banking market specifics is a comparably high integrity level – many banks operate here on a pan-Baltic level considering operational and legal models.
- The model is tested on individual banks to better understand whether macro-level numbers could make sense.

Based on previously developed methodology, the author has assessed the government regulation intensity level in the Baltic countries.

Parameters α and β were assumed based on the European financial market survey ICF (2019): $\alpha = 2.89 \%$, $\beta = 2.60 \%$. Interpretation of the significant regulation was based on the official European Commission's website stating all basic financial market regulations (European Commission, n.d.). Criteria for the scope of regulations to be reviewed were as follows:

- Regulation should fall between 2001 – 2021.
- Regulations should be related to the operations of commercial banks, exceptions included:
 - a) insurance and pensions regulations,
 - b) investment funds regulations,
 - c) general company reporting and auditing requirements.

Compliance costs are used from the financial statements of major Baltic banks, based on the data collected by Bloomberg Finance L.P. (n.d.). Data are adjusted to reflect reporting standards as per IFRS 16 by Bloomberg. Time series of major Baltic banks were reviewed, and two banks were chosen for validation based on the conclusions of selection – Swedbank AB and SEB AB.

Additionally, the author adjusted data by the inflation rate, calculated from the annual data of the Harmonised Index of Consumer Prices, HICP (2015 = 100), collected from the Eurostat (n.d. c) for Estonia, Latvia, and Lithuania.

Functions for Swedbank are as follows:

$$y = 0.7043x^3 - 34.58x^2 + 563.6x - 3008 \quad (3.4)$$

$$y = 4 \cdot 10^{-5}x^3 - 0.0023x^2 + 0.0464x - 0.3067 \quad (3.5)$$

Functions for SEB are as follows:

$$y = 0.6308x^3 - 31.418x^2 + 520.94x - 2817.7 \quad (3.6)$$

$$y = 4 \cdot 10^{-5}x^3 - 0.0021x^2 - 0.0395x + 0.2486 \quad (3.7)$$

where y is compliance costs, m EUR or % of GDP; x is government regulation intensity level (points) or Regulation Intensity Index.

R-squared for the functions is in the range from 74 % to 90 %, all orders of variable x are statistically significant with probability 94–95%.

Polynomial function with order 3 was suitable for the function's assessment, considering that an increase in the intervention level did not immediately result in the compliance cost increase. Relationship in broad terms is like what Hertog (2010) predicted; however additional insights have been observed – when the intervention becomes more intense, the cost rise increases. Polynomial function within the specified range is the one able to capture such type of relationship. Results show that **the hypothesis is confirmed**: the compliance costs increase with increased regulation level.

Indirect costs assessment

Considering the list of significant regulations disclosed in the previous chapter, the year 2014 was chosen for observations of interest rate changes in the euro area based on data from the European Central Bank (ECB Statistical Data Warehouse, 2022).

The result shows that no interest rate increase was observed after the introduction of a significant number of regulations.

Results show that **the hypothesis is rejected**: general indirect costs increase with increased regulation intensity level. Further, the special case of the effect of communication was analysed.

Effect of the communication

The author has selected the speeches of the European Central Bank (2021). The European Central Bank issues speeches regularly (every week), however, the author has chosen samples of speeches to cover the most important topics which can affect the financial market and to

provide space for opportunity to train the model of normal returns. The samples cover 2020 and 2021, in total, 24 speeches.

As a financial market participant from France was selected the largest euro-area’s bank BNP Paribas SA and as market index – CAC40. As a financial market participant from Germany was selected Deutsche Bank and as market index – DAX. Thereby, the two most important economies accounting for half of the euro area GDP with their largest banks are covered. These market players are most affected by the decisions and communication of the European Central Bank (hereinafter – ECB) in the banking sector due to their significant exposure. Two different markets are chosen to validate results, i.e., looking for potentially opposite reactions to the same signal.

Principal results are disclosed in Table 3.8 for BNP Paribas and Deutsche Bank. In case the result is revealed with a minus sign, the conclusion is that communication had a mostly positive, cost-averse effect, i.e., no additional indirect costs due to communication should be added to the model. The summary in Table 3.8 precisely shows this case.

Table 3.8

Summary of Communication Costs
(created by the author based on Bloomberg Finance L.P., n/a)

Bank	2020	2021	Average
BNP Paribas	12.12 m EUR	-16.62 m EUR*	-2.25 m EUR
Deutsche Bank	-88.97 m EUR	-34.59 m EUR	-61.78 m EUR

* “Minus” means the effect opposite to costs.

If the result is revealed without the minus sign, a further step is to extrapolate those costs to the country level.

3.4. Validation of the overall model

As mentioned in the beginning of this Chapter, to show the combined result of the overall model, the case of Latvia has been viewed. Thereby further, the calculations for Latvia have been described.

The overall model is validated on the data of Latvia:

- Regulation intensity measurement scale as per Section 3.1.
- Calculations of the deadweight loss as per Section 3.2.
- Calculations of the regulation costs as per Section 3.3.

Regulation Intensity Index

Table 3.9

Regulation Index Values for Latvia (created by the author based on the Bank Regulation and Supervision Survey, 2019; Index of Economic Freedom, 2022)

	100 – BF	100 – MF	100 – IF	100 – FF	BS	RII
2022	18.1	16.2	15.0	40.0	87.0	35.3
Average 1996–2022	24.9	22.8	24.6	38.1	68.9	35.9

BF – Business Freedom, MF – Monetary Freedom, IF – Investment Freedom, FF – Financial Freedom, BS – Bank Regulation and Supervision Survey

Deadweight loss

Deadweight loss is assessed for the market failures at the end of Section 3.2. Those results were used in the overall model. Visualisation of the result is reflected in Fig. 3.2.

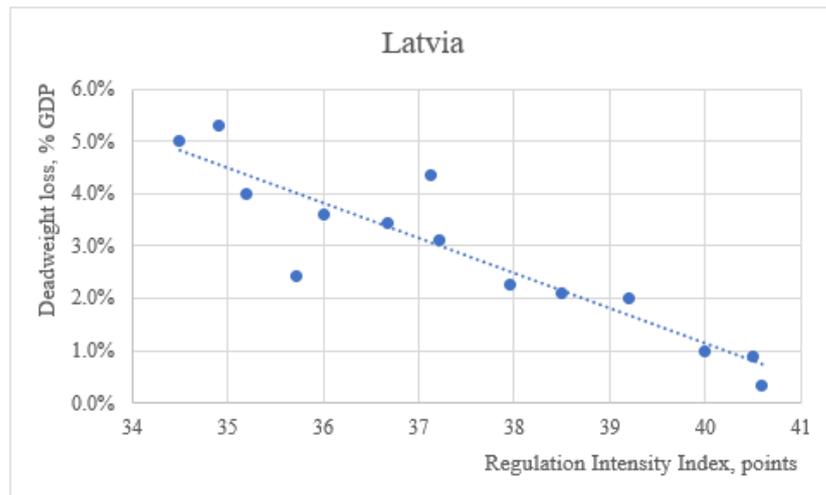


Fig. 3.2. Relationship between the deadweight loss and regulation intensity (created by the author).

Regulation costs

In Table 3.10, regulatory costs in two major positions are disclosed – the Bank of Latvia and the Financial and Capital Market Commission (FCMC).

Table 3.10

Regulatory Costs in Latvia* (created by the author based on the Bank of Latvia, 2022)

Year	Bank of Latvia, mln EUR	FCMC, mln EUR	% GDP
2011	27.9	5.2	0.17 %
2012	29.3	5.8	0.16 %

Table 3.10 continued

Year	Bank of Latvia, mln EUR	FCMC, mln EUR	% GDP
2013	42.2	6.3	0.21 %
2014	34.8	6.9	0.18 %
2015	33.4	7.4	0.17 %
2016	39.4	8.6	0.19 %
2017	37.6	9.9	0.18 %
2018	36.1	10.7	0.16 %
2019	36.7	10.8	0.15 %
2020	32.7	10.8	0.14 %
2021	32.7	11.2	0.13 %

* As major exposures, only microprudential and macroprudential regulators are included.

The results regarding the compliance costs are reflected in Table 3.11.

Table 3.11

Compliance Costs in Latvia
(created by the author based on ECB Statistical Data Warehouse, 2022)

Year	Operational costs, m EUR	One-off compliance costs		Ongoing compliance costs		% GDP
		% Op costs	m EUR	% Op costs	m EUR	
2008	979.6	1.94 %	19.0	0.63 %	6.2	0.10 %
2009	823.0	1.94 %	16.0	0.63 %	5.2	0.11 %
2010	785.0	2.06 %	16.1	0.88 %	6.9	0.13 %
2011	700.1	2.18 %	15.3	1.13 %	7.9	0.12 %
2012	680.9	2.30 %	15.7	1.38 %	9.4	0.11 %
2013	716.9	2.42 %	17.3	1.63 %	11.7	0.13 %
2014	720.1	2.54 %	18.3	1.88 %	13.5	0.13 %
2015	782.0	2.66 %	20.8	2.13 %	16.7	0.15 %
2016	912.2	2.78 %	25.4	2.38 %	21.7	0.19 %
2017	903.2	2.90 %	26.2	2.63 %	23.8	0.19 %
2018	755.5	2.95 %	22.3	2.73 %	20.6	0.15 %
2019	684.5	3.00 %	20.5	2.83 %	19.4	0.13 %
2020	661.0	3.05 %	20.2	2.93 %	19.4	0.13 %
2021	695.7	3.10 %	21.6	3.03 %	21.1	0.13 %

In Formula (3.8), the compliance costs' function in the context of the Regulation Intensity Index has been reflected. Considering the comparably low data amount and large scale, explanatory power for functions is medium: 61 %.

$$Compl\ costs = -2 \cdot 10^{-6} \cdot Reg(n)^3 + 0.0002 \cdot Reg(n)^2 - 0.0053 \cdot Reg(n) + 0.0598 \quad (3.8)$$

Regarding indirect costs, results in Section 3.3. are applicable to Latvia as well due to the membership of the euro area. In other words, neither interest rates nor the reaction of financial

market indicators to the communication of the European Central Bank as a special case of policy transmission tools indicate any indirect regulation costs for Latvia.

Results of regulation costs relationship with regulation intensity are reflected in Fig. 3.3 and Formula (3.9). The equation has an explanatory power of 66 % and a *p-value* less than 1%.

$$Reg\ costs = 0.0001 \cdot Reg(n) - 0.0025 \quad (3.9)$$

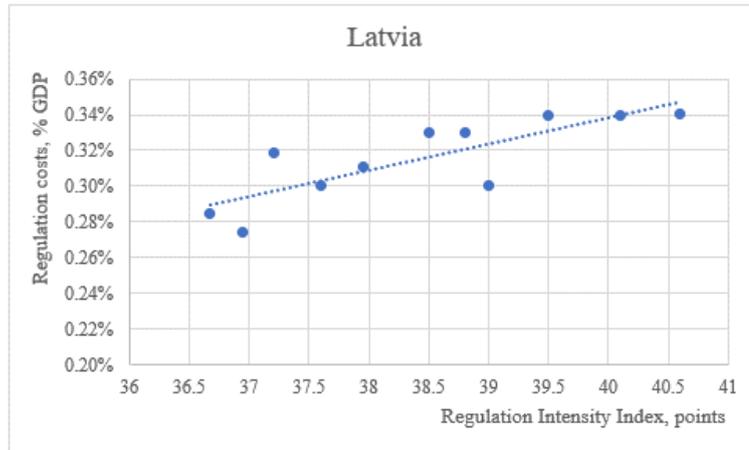


Fig. 3.3. Relationship between the regulation costs and regulation intensity (created by the author).

Overall model

All results combined, the overall model shows that:

- equilibrium regulation costs are 0.36 % from GDP;
- equilibrium Regulation Intensity Index is 41.0;
- in 2022, in Latvia, Regulation Intensity Index was 35.3.

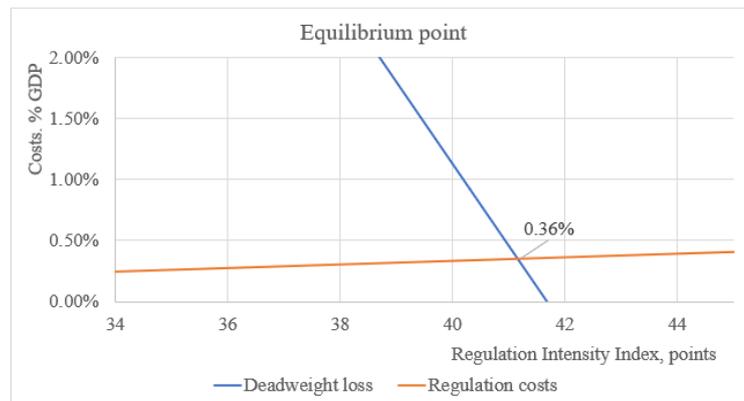


Fig. 3.4. Equilibrium point in the case of Latvia (created by the author).

Based on the results, the following conclusion has been made by the author: considering the deadweight loss from market failures, there is a potential to increase the regulation intensity of the Latvian banking market.

3.5. Feedback from the industry

The author has prepared the presentation to communicate the research results to the regulator of the Latvian banking market and receive feedback.

The following questions were asked after presenting the material:

- Are, in your view, all material banking market failures disclosed in research?
- Do you have any comments or suggestions regarding the model construction approach (Table 2.1)?
- Are approximations of regulation costs, in your view, acceptable?
- Do you have any comments or suggestions?

The material was sent to the Bank of Latvia on 3 January 2023. The answer was received on 24 January 2023. The following comments were given by the representative of the Bank of Latvia:

- All material banking market failures are disclosed. Additionally, a comment was made that the market failure of pecuniary externality would be worth considering in the analysis of the systemic risk of the financial system.
- Approximations of regulations costs are acceptable; however, narrowing to the banking sector was suggested.

The comments were analysed and considered in the update of the Doctoral Thesis:

- The market failure of pecuniary externality was left out of the scope of this research due to the limitation of the banking sector in the financial market.
- Narrowing to the banking sector was implemented.

On 11 March 2023, presentations for international regulators were sent. However, regulators either did not respond to the request or declined to review with a kind comment “currently regulators are busy with high priority operational issues”. Positive answers were received only from the Danish Financial Supervisory Authority and the Bank of Slovakia, who commented on the principles of regulation: this discussion is reflected in Section 1.4.

CONCLUSIONS AND RECOMMENDATIONS

Considering the findings of the conducted literature analysis, analytical results and empirical findings of the conducted research, the following has been concluded by the author:

1. The literature review revealed that there are four major types of financial market failures: asymmetric information, negative spillovers, market power imbalances, and market abuse. The analysis of the European Central Bank speeches revealed additional types of failures, not covered by the abovementioned four types: fragmentation of market self-regulation, global imbalances in current account

positions and capital flows across major economies, regulatory arbitrage, structural inefficiencies in debt and collateral enforcement, and inefficient consumption-led boom-and-bust cycles.

2. In the literature review, the author has identified 12 principles of optimal government regulation. 68 % of sources refer to the following top 5 principles: (a) cost-benefit balanced; (b) risk-based; (c) consistency and competitive neutrality; (d) high quality, transparent decision-making and enforcement; and (e) international coordination, convergence, and implementation in policy and rulemaking. Those principles cover the aspects of regulation costs, risk awareness, quality, and regulatory cooperation.
3. Hertog (2010), in the analysis of previous research, revealed three types of costs arising from the regulation: regulatory costs, compliance costs, and indirect costs. These costs are derived from the top 5 regulation principles identified in the literature analysis.
4. The deadweight loss decreases with increasing regulation, and regulation costs increase with increasing regulation. There is an equilibrium point between the two, i.e., the point where the deadweight loss equals the regulation costs. After this point, there is no economic justification for a further increase in regulation intensity. Hertog (2010) defines this point as a “trade-off” between the resources allocated to increasing levels of regulatory intervention and decreasing levels of inefficient firm behaviour.
5. The Government Regulation Model consists of the methodology for the Regulation Intensity Index $Reg(n)$ and for the equilibrium point: $f(DWL) = f(Reg\ costs)$.
6. The Regulation Intensity Index is calculated as an average from 5 indices:
 - Index from the questionnaire based on the Bank Regulation and Supervision Survey from the World Bank.
 - Index: $100 - Business\ Freedom$ based on the *Index of Economic Freedom*.
 - Index: $100 - Monetary\ Freedom$ based on the *Index of Economic Freedom*
 - Index: $100 - Investment\ Freedom$ based on the *Index of Economic Freedom*
 - Index: $100 - Financial\ Freedom$ based on the *Index of Economic Freedom*.
7. The Deadweight loss is assessed for the following market failures:
 - imperfect competition or market power imbalances,
 - asymmetric information,
 - negative spillovers,
 - market abuse and others.
8. Developed formulas correspond to the deadweight loss at a single point of the Regulation Intensity Index. To analyse the deadweight loss with the Harberger Triangle, the author proposes to use the following variables:
 - Imperfect competition or market power imbalances: as a variable for “price” to use the interest rates on loans and/or deposits; as variable for “quantity” to use the exposure of deposits and/or loans on banks’ balance sheets.

- Asymmetric information: as a variable for “price” to use the interest rates on loans and/or deposits; as variable for “quantity” to use the exposure of deposits and/or loans on banks’ balance sheets.
 - Negative spillovers: as a variable for “price” to use the interest rates from financial market indicators; as a variable for “quantity” to use the bank capital flows (cash flow),
 - Market abuse and others: as a variable for “price” to use the accruals for issued loans and guarantees; as variable for “quantity” to use the exposure of loans on banks’ balance sheets and guarantees on off-balance sheets.
9. In the cross-year calculations, it is important to exclude the effect of GDP growth and inflation; thereby, the exposure should be adjusted by relevant ratios before running the deadweight loss calculations.
10. Regulation costs are assessed for the following cost types:
- regulatory costs,
 - compliance costs,
 - indirect costs, including the effect of communication.
11. Developed formulas correspond to the regulation costs at a single point of the Regulation Intensity Index.
12. The equilibrium point is defined as $\{DWL_{Reg(n)}; Reg(n)\}$, which satisfies the condition $DWL_{Reg(n)} = Reg\ costs_{Reg(n)}$.
13. The deadweight loss $DWL_{Reg(n)}$ is defined as a sum of all deadweight losses from identified market failures, i.e.:
- Imperfect competition or market power imbalances are expressed as an integral between the demand and supply functions. The supply function includes adjustments of Adjusted Lending Margin and Loan-to-Deposit ratios.
 - Asymmetric information is expressed as an integral between the demand functions of uncollateralized loans and collateralized loans,
 - Negative spillovers are expressed as the integral of bank capital flows,
 - Market abuse and others are expressed as a sum of excess accruals or other excess ratios.
14. The regulation costs $Reg\ costs_{Reg(n)}$ are defined as the sum of all identified regulation cost types, i.e.:
- Regulatory costs are expressed as operational costs of microprudential, macroprudential regulators and financial market policy maker's labour costs.
 - Compliance costs are expressed as the sum of one-off costs and ongoing costs with initial values of $\alpha_0 = 1.94\%$, $\beta_0 = 0.63\%$ (corresponds to the year 2009 and any prior year).
 - Indirect costs are expressed as multiplication of changes in loan volumes and interest rates with adjustment of changes in accrual values. Additionally, the effect of communication has been included and expressed as the sum of

Cumulative abnormal return (*CAR*) has been adjusted by total banking assets in the country.

15. Validation of the Overall model shows that:

- equilibrium regulation costs are 0.36 % of GDP,
- equilibrium Regulation Intensity Index is 41.0,
- in 2022 in Latvia, the Regulation Intensity Index was 35.3,
- Considering the deadweight loss from market failures, there is potential to increase the regulation of the Latvian banking market.

16. The hypothesis of the Doctoral Thesis: there is an equilibrium point between welfare (deadweight) loss arising from market failures and subsequent government regulation costs in the banking sector. Considering the research results, **the hypothesis is confirmed.**

17. Summary of the Theses for defence:

- Regulation measurement scale: The regulation intensity for Germany is higher than for the UK and the USA.
- Deadweight loss assessment: The deadweight loss decreases with increased regulation intensity level.
- Regulation costs assessment: The regulation costs increase with increased regulation intensity level.
- An equilibrium point exists between the decrease of the deadweight loss and the increase of regulation costs with increasing regulation level.
- In the Latvian banking sector, the regulation intensity is lower than the equilibrium point.

18. Summary of the research questions:

- Market failures in the banking sector, see point 1.
- Deadweight loss of those market failures, see point 7.
- Regulation costs in the banking sector, see point 10.
- The equilibrium point between the deadweight loss and regulation costs, see point 12.

Considering the methodological basis, the analytical framework, the experimental conduct, and the acquired results of the conducted research as well as their interpretation, the following have been **recommended** by the author:

For the regulator of the financial market:

1. To include the deadweight loss and regulation costs assessment in the annual reports of the regulator to inform stakeholders regarding the overall situation in the regulation area.
2. To use this assessment in the communication with stakeholders to justify the current regulation burden.

3. To cooperate with financial market policymakers in the government to properly assess all regulatory costs and identify any indirect costs from the regulation.

For the financial market policy maker:

4. To contribute information in regulatory costs assessment and identification of indirect costs.
5. To validate the regulator's calculations and contribute with an alternative view to the discussion of the deadweight loss and regulation costs assessment and equilibrium point identification.

For the financial market participants:

6. To contribute with an alternative view to the discussion of the deadweight loss and regulation costs assessment and balance point identification.
7. To propose alternative approaches to tackling the financial market failures and subsequently help minimize the deadweight loss, which could be used as justification for lessening the regulation burden.

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