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ASSESSMENT OF THE DEADWEIGHT LOSS ARISING FROM THE INFORMATION ASYMMETRY IN THE BANKING MARKET

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Abstract. Market failures lead to the deadweight (welfare) loss for the society. Assessment of the deadweight loss started with so called the Harberger Triangles, where Harberger offered a clear and persuasive derivation of the triangle method of analyzing the deadweight loss and applied the method to estimate deadweight losses due to income taxes in the United States. Harberger's approach is based on the deviation of market equilibrium measured in terms of price and quantity. When analyzing the information asymmetry as one of the market failures authors have identified in the literature variables for "price" and "quantity". Research hypothesis is that there is the deadweight loss arising from the information asymmetry in euro area. Research then presents the approach how to calculate the deadweight loss arising from the information asymmetry using the following variables: "price" – interest rates (loans). quantity" – exposure of loans on banks' balance sheets. Research methods used: literature analysis, regression analysis, mathematical analysis tools (integrals).

Keywords*: banking market, deadweight loss, information asymmetry, market regulation, model construction.*

JEL Classification: D60, G18

INTRODUCTION

Market failures lead to the deadweight (welfare) loss for the society. Assessment of the deadweight loss started with so called the Harberger Triangles (Harberger, 1964a; 1964b; 1966; 1971), where Harberger offered a clear and persuasive derivation of the triangle method of analyzing the deadweight loss and applied the method to estimate deadweight losses due to income taxes in the United States. Harberger's approach is based on the deviation of market equilibrium measured in terms of price and quantity. When analyzing the information asymmetry as one of the market failures authors have identified in the literature variables for "price" and "quantity". Research hypothesis is that there is the deadweight loss arising from the information asymmetry in euro area. Research then presents the approach how to calculate the deadweight loss arising from the information asymmetry using the following variables: "price" – interest rates (loans). quantity" – exposure of loans on banks' balance sheets. Results show that econometrically assessed demand functions used in the calculation of the deadweight loss have sufficient explanatory power and statistical significance of the variables.

1. LITERATURE REVIEW

Assessment of the deadweight loss started with so called the Harberger Triangles (Harberger, 1964a; 1964b), where Harberger offered a clear and persuasive derivation of the triangle method of analyzing deadweight loss and applied the method to estimate deadweight losses due to income taxes in the United States. Harberger (1966) shortly thereafter produced estimates of the welfare cost of the United States' capital taxes. In a subsequent survey, Harberger (1971) clarified various aspects of this method and addressed several its perceived shortcomings.

Harberger's approach is based on the deviation of market equilibrium measured in terms of price and quantity (see Fig. 1).

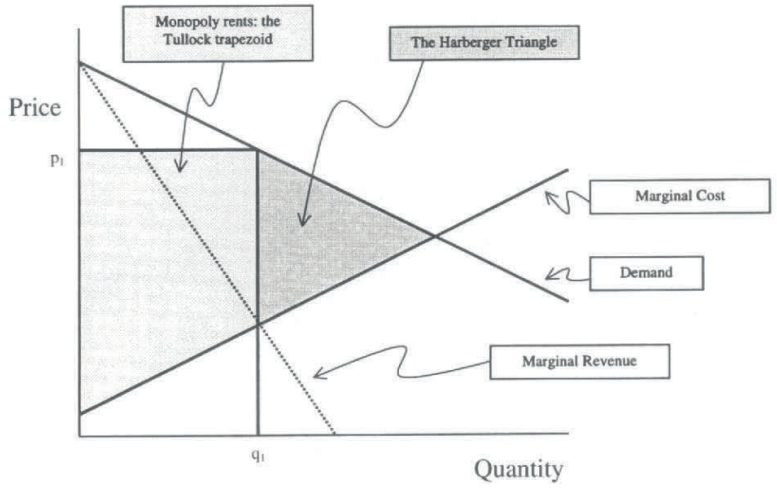

Fig. 1. The Harberger Triangle (Hines, 1999).

Asymmetric information should result in additional charges due to higher risk associated with lack of full understanding of the project or business activity to be co-financed by the bank. Johnson and So (2017) in the analysis of financial market trading activities concluded that informed traders in the financial market face a leverage constraint that generates a trade-off between smaller price impact in equity markets and additional leverage in options markets. Because informed traders receive correlated signals, this trade-off causes the fraction of informed trade occurring in options versus equity markets to fluctuate over time depending on the nature of the signals informed traders receive. In contrast, uninformed traders' choice of trading venues is relatively uncorrelated, and thus the fraction of uninformed trade in each market is relatively stable over time. As a result, periods of heightened information asymmetry manifest in abnormally high or low option-to-stock volume ratios, relative to the level of ratios that occurs in the absence of private information.

General idea of the deadweight loss identification and visual interpretation reflected in the Fig. 1 has been adjusted for the case of information asymmetry, e.g., by Furubotn and Richter (2005). The case with information asymmetry in the supply side is reflected in the Fig. 2. The deadweight loss is reflected in the triangle from supply function adjustment (S + TC).

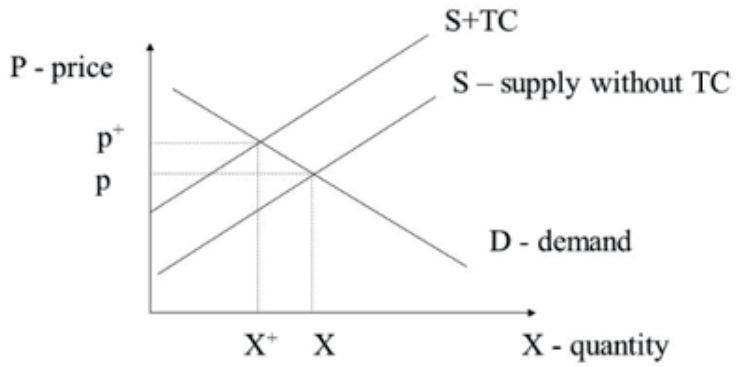

Fig. 2. Deadweight loss due to information asymmetry (Furubotn & Richter, 2005).

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 can be expressed as

$$\int_{q(X^*)}^{q(X)} [D(q) - p]dq \tag{1}$$

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

To specify variables "price" and "quantity" for banking market, authors have reviewed the articles regarding this aspect and summarized the result in the Table 1.

Table 1. Variables of the Harberger Triangle in the case of information asymmetry (author's developed)

Research paper	Variable for "price"	Variable for "quantity"
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
Crawford, Pavanini, Schivardi, 2018	credit price (interest rate)	credit supply
Corrado, Schuler, 2017	quadratic loss function	output gap variance, volatility of inflation
Johnson, So, 2017	N/A	option-to-stock, volume ratios
European Central Bank, 2016 Hey, 2003	NPL* price, quality	quantity of NPLs
Einav, Finkelstein, 2011	price (and expected cost) of the insurance contract	quantity of insurance demand

Based on information in the Table 1 authors conclude that most appropriate and widely available (statistical databases of local authorities and supranational bodies, e.g., the European Central Bank) variables for "price" and "quantity" would be "interest rates of loans" and "exposure of loans on banks' balance sheets" accordingly.

2. METHODOLOGY

To develop the methodology for the assessment of economic losses due to information asymmetry authors evaluated available data on the market level, e.g., national, and supranational statistical databases, reports of supervisory authorities and financial statements of banks regarding credit balances, interest incomes and interest rates.

At first, authors define the function following the logic in Formula 1, i.e.,

$$i = f(bal) \tag{2}$$

where *bal* – exposure of loans on the bank balance sheet, *i* – loan interest rates.

Subsequently, the deadweight loss from asymmetric information can be expressed as the integral from exposures (*bal*), i.e.,

$$DWL_{as} = \int_{q(X*)}^{q(X)} [D(q) - p]dq = \int_{bal(i*)}^{bal(i)} [D(bal) - i]dbal, \tag{3}$$

where DWL_{as} – the deadweight loss from asymmetric information, $bal(i^*)$ – exposures with loan interest rates considering asymmetric information, $bal(i)$ – exposures with loan interest rates without asymmetric information.

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 authors have used the following approach to assess the deadweight loss:

$$DWL_{as} = \int_{bal(i*)}^{bal(i)} [D_1(bal) - D_2(bal)]dbal \tag{4}$$

where $D_1(bal)$ – demand function of uncollateralized loans, $D_2(bal)$ – demand function of collateralized loans.

Demand function $i = D(bal)$ is econometrically assessed based on actual transaction data with following approach to data collection and function's assessment:

- additional control variable of market reference rate, e.g., 3-month EURIBOR or 6-month EURIBOR, which are the most popular reference rates in the loan contracts in the eurozone. This variable is influencing the interest payments of bank's clients, subsequently should be included in the modelling interest income for the bank. In the period when those reference rates were negative in most of the loan contracts adjustment were made to apply "0%" rate. This aspect is taken account in this model.
- additional control variable of bank's administrative costs, e.g., cost-to-income ratio, which measures bank's operational efficiency.

Demand function is based on the actual data since only concluded loan agreements represent the sample of loan applications which were eligible for financing considering all selection criteria (creditworthiness, sufficient amount of initial cash etc.) – thereby representing the customers able to pay.

3. RESULTS

Authors 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).

$D_1(bal)$ – demand function of uncollateralized loans was assessed based on the data of consumer loans, which do not use collaterals as risk minimization measure. Interest rate data excludes the most popular money market index used for loans – 3-month EURIBOR.

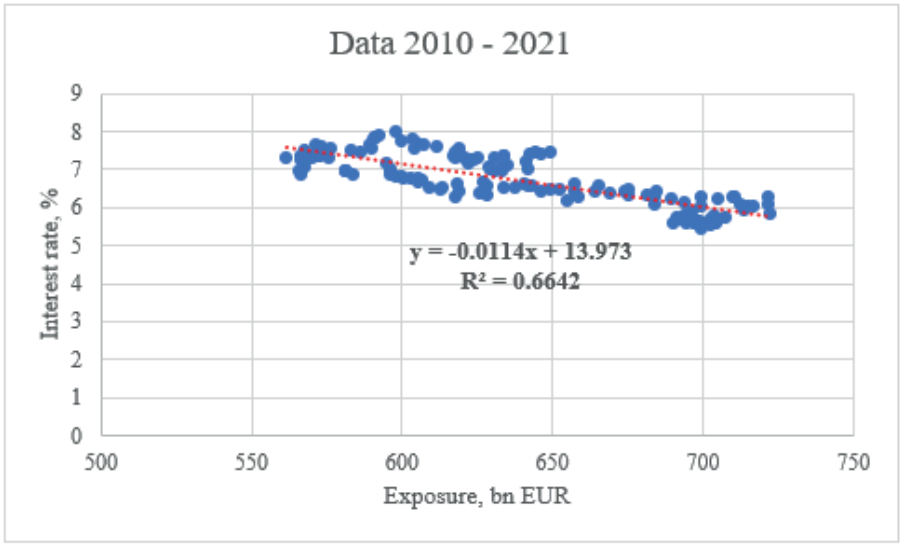

Fig. 3. Demand function of uncollateralized loans
(created by the authors based on ECB Statistical Data Warehouse, 2022).

The function is econometrically assessed as follows:

$$D_1(bal) = -0.0114bal + 13.973 \quad (5)$$

$D_2(bal)$ – demand function of collateralized loans was assessed based on the data of mortgages, which use collaterals as risk minimization measure. Interest rate data excludes the most popular money market index used for loans – 3-month EURIBOR.

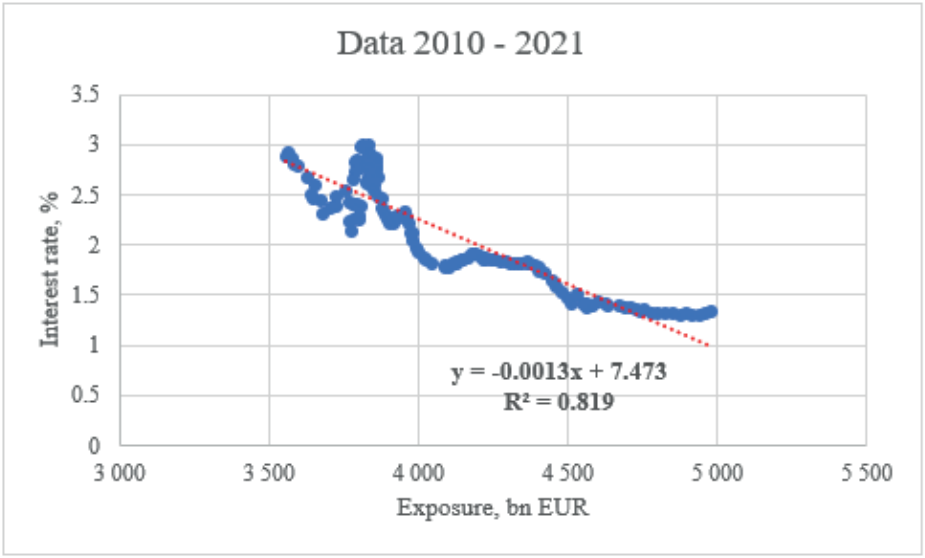

Fig. 4. Demand function of collateralized loans
(created by the authors based on ECB Statistical Data Warehouse, 2022).

The function is econometrically assessed as follows:

$$D_2(bal) = -0.0013bal + 7.473 \tag{6}$$

R^2 for functions are 66 % and 82 % respectively and variables are statistically significant with probability of 95 %.

Finally, the deadweight loss can be assessed as follows,

$$DWL_{as} = \int_{bal(i*)}^{bal(i)} [-0.0101bal + 6.5]dbal \tag{7}$$

This function can be used in the euro area banking market for the assessment of information asymmetry.

Including in this formula amounts of bal (i) and bal (i*), which are 650 and 600 bn EUR respectively, the following results can be obtained,

$$DWL_{as} = \int_{600}^{650} [-0.0101bal + 6.5]dbal = 9.375\ bn\ EUR \tag{8}$$

*data has excluded the Cost-to-Income ratio as for the all euro area data points start only from Q2 2015.

Results show that the deadweight loss arising from the information asymmetry in euro area banking market is approximately 9.375 bn EUR.

CONCLUSION

Research results show that the linear function can be used in the euro area banking market for the assessment of the deadweight loss arising from the information asymmetry, which is approximately 9.375 bn EUR.

Research hypothesis is that there is the deadweight loss arising from the information asymmetry in euro area. Considering the abovementioned, **the hypothesis is confirmed**.

The deadweight loss calculation function has been assessed based on econometrically assessed demand functions, which have sufficient explanatory power and statistical significance of the variables.

Data has excluded cost-to-income ratio as for the all euro area data points start only from Q2 2015. In other currency areas or local country-level assessments this ratio could be included as well.

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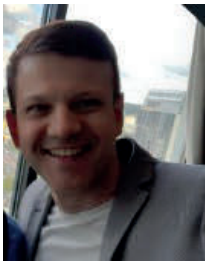

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