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INFORMATION SHEET ON THE NEW CONTRIBUTIONS OF THE DISSERTATION

Dissertation title: The Impact of Financial Development on the Circular Economy – The Role of Institutional Quality

Major: Finance and Banking Code: 9340201

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The dissertation, "The Impact of Financial Development on the Circular Economy – The Role of Institutional Quality," examines the measurement of the circular economy (CE) at the national level and the relationships among financial development (FD), institutional quality, and CE performance. Using data from 109 countries over the period 2002–2024, including 30 developed and 79 developing countries, the dissertation makes the following contributions.

1. Theoretical and academic contributions

First, the dissertation extends the systems-based approach to the CE at the macroeconomic level. Rather than equating the CE solely with recycling or end-of-life waste treatment, the study brings carbon efficiency, energy efficiency, energy transition, and material pressure into a common analytical framework. It thus shows that assessing

the circular transition requires simultaneous consideration of resource-use efficiency, changes in the energy mix, and environmental pressures. This approach broadens the scope of CE research from the product, firm, and sector levels to the national level and provides a conceptual basis for comparing economies at different stages of development.

Second, the dissertation clarifies the context-dependent nature of the relationship between FD and the CE. The financial system can mobilize, screen, and allocate capital, but an increase in the volume of credit does not automatically produce more circular outcomes. Financial flows may support clean technologies, renewable energy, and circular infrastructure, or they may continue to expand carbon- and material-intensive industries. The direction of capital allocation and the conditions under which the financial system operates must therefore be considered alongside the direction of the effect of FD.

Third, the dissertation introduces institutional quality as an important moderating condition in the relationship between FD and the CE. Six dimensions are examined separately: control of corruption, government effectiveness, political stability, rule of law, regulatory quality, and voice and accountability. This approach makes it possible to identify channels associated with transparency, policy implementation, the stability of expectations, contract enforcement, and the monitoring of financial flows. By connecting financial intermediation theory, sustainable signaling theory, sustainable development disruption theory, and institutional theory, the dissertation helps explain why the effect of finance varies across countries, rather than attributing such differences solely to income levels or the size of the financial system.

2. Methodological and empirical contributions

First, the dissertation constructs a macro-level composite CE index based on four dimensions: carbon efficiency, energy efficiency, energy transition, and material pressure. The indicators are aligned in terms of their expected direction, standardized, and combined using principal component analysis (PCA), allowing weights to be determined by the structure of the data rather than assigned entirely on a subjective basis. Applying PCA to the pooled sample and normalizing the resulting index to a range of 0 to 1 provides a common measurement basis for comparisons across countries and over time.

Second, the study provides quantitative evidence of differences in CE performance between the two country groups. The developed-country group has a mean index value of 0.864, compared with 0.413 for the developing-country group. Levene's, Welch's, and Mann–Whitney U tests are used to assess this difference. The study also documents greater dispersion within the developing-country group. Its empirical contribution lies in applying the same measure and observation period to examine the gap and trends in the circular transition, rather than comparing separate, non-equivalent indicators.

Third, the dissertation integrates PCA and Bayesian regression into a single analytical process, from the measurement of CE performance to the examination of its relationships with FD and institutional quality. Separate estimation for the 30 developed and 79 developing countries allows the posterior means, credible intervals, and probabilities of the direction of effects to be assessed for each group. The results indicate that the direct effect of FD is positive and relatively stable in developed countries, but smaller and less stable in developing countries. All six interaction coefficients between FD and the dimensions of institutional quality are positive in the developed-country group; in the developing-country group, the strength of the posterior evidence varies across dimensions. The study thereby adds evidence of development-context heterogeneity in the finance–institutions–circularity relationship.

Finally, the dissertation compares the results with those from ordinary least squares (OLS), fixed-effects models (FEM), random-effects models (REM), and two-way fixed-effects models, and conducts sensitivity checks using an alternative outcome measure, lagged variables, the exclusion of crisis periods, and different prior specifications. These checks help assess the stability of the findings, but are not presented as fully resolving endogeneity or establishing definitive causal relationships.

3. Practical contributions and policy implications

First, the proposed CE index provides a reference framework for policymakers and research institutions to monitor carbon efficiency, energy efficiency, energy transition, and material pressure at the national level. Its consistent structure supports comparisons of progress, the identification of transition gaps, and the recognition of dimensions

requiring attention. Applying the index should be accompanied by regular data updates and the inclusion of additional domestic indicators. As acknowledged in the dissertation, the index does not directly capture the full range of material loops, such as repair, reuse, remanufacturing, and the share of secondary materials. It should therefore not be treated as the sole measure of the entire CE.

Second, the findings provide a basis for distinguishing policies that expand the scale of finance from those that improve the quality of capital allocation. For developed countries, the priority is to channel existing financial resources into high-value circular activities, link financial disclosures to resource-use outcomes, and address greenwashing. For developing countries, expanding access to finance should be accompanied by better project data, stronger appraisal capacity, long-term funding, and risk-sharing mechanisms. The empirical differences between the two groups indicate that financial-support policies should be adapted to implementation conditions rather than based on a single model.

Third, the dissertation indicates that financial policies need to be coordinated with institutional improvements. Control of corruption and voice and accountability are associated with transparency and oversight of the use of funds; government effectiveness and regulatory quality relate to the capacity to design and implement policies; and political stability and the rule of law provide conditions for projects that require long-term financing. For banks and investors, the findings suggest incorporating information on emissions, energy, material use, and product life cycles into credit appraisal, risk management, and post-disbursement monitoring. For firms, transparent project information and reliable environmental data can support access to transition finance.