THE IMPACT OF THE TRANSFORMATION OF CENTRAL BANK DIGITAL CURRENCIES (CBDC)-BASED GLOBAL PAYMENTS ON THE FINANCIAL EFFICIENCY OF MULTINATIONAL CORPORATIONS

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Abstract— *The transformation of the global payment system is entering a new chapter as central banks expand their exploration of Central Bank Digital Currency (CBDC) in various jurisdictions. Multinational corporations (MNCs), as the most intensive actors in cross-border transactions, have the potential to be one of the most affected parties to this transformation, but the corporate finance literature on this issue still lags behind the monetary-macro literature. This article aims to analyze the impact of CBDC-based payment transformation on MNCs' financial efficiency, particularly on the dimensions of transaction costs, completion speed, working capital management, and exchange rate risk mitigation. The research uses a narrative-thematic literature review approach on 20 scientific and institutional sources in 2020-2026, combined with case studies of cross-border CBDC projects (Project m-Bridge, Digital Euro, e-CNY) and Indonesian contexts (Garuda Project). The results show that cross-border CBDC settlement architecture has the potential to cut the banking correspondent layer, reduce transaction costs by about half of conventional costs, and accelerate settlement from days to seconds, which would theoretically shorten cash conversion cycles and lower the need for MNCs' multi-currency presaution cash balances. However, these benefits are still prospective due to the limitations of interjurisdictional interoperability, the geopolitical fragmentation of multi-CBDC platforms, and Indonesia's adoption stage which is still at the proof-of-concept level. The main contribution of this article is a conceptual framework that links the design characteristics of CBDCs with transaction cost theory and working capital management theory to explain the mechanism of improving the financial efficiency of MNCs, a link that has not been systematically elaborated on in previous literature that tends to focus on the implications of monetary policy and banking stability. The study recommends that further research use enterprise-level transaction data once cross-border CBDC adoption reaches commercial scale.*
Keywords— *CBDC, cross-border payments, financial efficiency, multinational corporations, working capital.*

INTRODUCTION

Conventional cross-border payment systems that rely on a network of correspondent banks have long been criticized for their layered, slow, and expensive structure. Boston Consulting Group estimates project the value of global cross-border payment transactions to grow from more than $150 trillion in 2017 to more than $250 trillion by 2027, a surge in volume that has not been offset by commensurate settlement infrastructure improvements [5]. Any cross-border transaction generally goes through several intermediary banks before the funds reach the recipient, resulting in an accumulation of fees, settlement risks, and delays that the European Central Bank calls the "holy grail" of cross-border payments that has not been solved since the Middle Ages [1].

For multinational corporations (MNCs), this inefficiency is not just a technical payment problem, but a real financial management problem. MNCs must manage supplier payments, cross-border payroll, repatriation of subsidiary profits, and settlement of transactions trade in multiple currencies simultaneously. The Brookings Institution estimates that global corporations incur cross-border transaction costs of up to $120 billion per year as a result of such layered payment structures [cited in 1]. The uncertainty of settlement times also forced the treasury division to hold presaution cash balances in various currency denominations, a form of trapped liquidity that eroded the company's financial efficiency in aggregate. In the midst of these problems, CBDC is present as one of the structural transformation options. Central Bank Digital Currency is a digital form of central bank money that is a direct claim to monetary authority, different from commercial electronic money and crypto assets that do not have state guarantees [33]. As per the Atlantic Council GeoEconomics Center's latest update, 146 countries and currency unions representing more than 98 percent of global GDP are now exploring CBDCs, a sharp increase from just 35 countries in May 2020, with 77 countries already in the

advanced stages of development, piloting, or launching [2]. Cross-border multi-CBCD projects such as m-Bridge involving central banks China, Hong Kong, Thailand, the United Arab Emirates, and Saudi Arabia, have reached the minimum viable product stage by 2024 and recorded more than 4,000 transactions worth a cumulative value of approximately $55.5 billion [10][4]. In the European region, the European Central Bank is preparing for the launch of the digital euro with a focus on strengthening the region's payment sovereignty [14], while Bank Indonesia is developing the Digital Rupiah through the Garuda Project which has completed the proof of concept for w-Rupiah (wholesale) and participated as an observer on the m-Bridge Project [12][18].

A systematic review by Kumar and Rani of 108 CBDC articles published between 2019-2025 in the indexed journals Scopus and Web of Science shows that the dominance of CBDC research themes still revolves around the issues of monetary policy, financial stability, and banking disintermediation, with the research context dominated by the perspective of central banks and the banking system [6]. Bhaskar et al. in the future research agenda of CBDCs also marked that the dimension of CBDC implications for the non-bank corporate sector, including the financial management of multinational companies, is still an area that is minimally explored compared to the macroeconomic and monetary policy dimensions [9]. Meanwhile, Infante et al. in a comprehensive review of retail CBDCs focused their analysis on the implications for banking and financial stability, rather than on the efficiency of the financial operations of corporate users [7]. Beckmann et al. examine the impact of CBDCs on the US banking stock market through the lens of disintermediation risk [8], while Bhatnagr et al. highlight the adoption of digital currencies from the perspective of fintech and retail consumers in India [10].

On the other hand, technical studies from institutions such as the Bank for International Settlements and the International Monetary Fund have discussed the impact of CBDCs on cross-border payments extensively [1][3][4][11], but these studies generally stop at the macro-infrastructure level measuring cost reductions and settlement times at the system level without explicitly linking them to corporate financial management theories such as transaction cost theory or the prevailing cash conversion cycle theory used to assess the financial efficiency of a company.

Thus, there is a clear research gap: there is no synthesis of literature that systematically links the technical characteristics of CBDC-based payment transformation with financial efficiency indicators of multinational corporations from the perspective of international financial management, while considering the context of developing countries such as Indonesia, which are in the early stages of adoption. This article is positioned to fill in those gaps.

Based on the above research background and gaps, this study aims to first, analyzes the mechanism of CBDC-based global payment transformation at the cross-border infrastructure level and its implications for the cost structure and speed of transaction completion. Second, critically examine how such transformations have the potential to affect MNCs' financial efficiency indicators, in particular transaction costs, working capital cycles, and exchange rate risk management, by linking them to relevant corporate finance theories. Third, formulate conceptual frameworks and strategic insights for MNC financial managers, including those operating in Indonesia, in responding to CBDC transformation.

LITERATURE REVIEW

CBDC Concepts and Cross-Border Payment Architecture

CBDCs are generally divided into two main designs: retail CBDCs used by the general public, and wholesale CBDCs that are used for inter-financial settlement [3][33]. In the context of MNC financial efficiency, cross-border wholesale CBDCs are the most relevant variable as they serve as institutional settlement instruments for large-value transactions, including intercompany trade payments and securities settlement [1][4].

There are three main architectures developed to connect CBDCs between jurisdictions: (a) a single-tier model that is fully controlled by a central bank, (b) an interlinking model that connects each country's domestic payment systems without bringing the platform together, and (c) a common platform model such as m-Bridge that connects multiple CBDCs in a single shared ledger based on distributed ledger (DLT) technology [4][8]. Bindseil and Pantelopoulos conclude that the future approach of interlinking and interoperability of CBDCs is the most

promising path to cross-border payment efficiency, compared to other options such as the expansion of correspondent networks or private stablecoins [1].

Theory

Transaction Cost Theory. The transaction cost theory framework explains that the value of an exchange mechanism is determined by the costs of searching, negotiating, and enforcing contracts, beyond the cost of the transaction. In conventional cross-border payments, each layer of the correspondent bank adds a fee in the form of exchange rate spreads, clearing fees, and compliance fees (AML/CFT) that must be verified repeatedly [1][4]. With cross-border CBDC settlements cutting the number of intermediaries, the marginal transaction fee per unit of payment will theoretically decrease significantly.

Working Capital Theory and Cash Conversion Cycle. In financial management, working capital efficiency is often measured by the cash conversion cycle, which is the accumulation of the receivables collection period (DSO), inventory period, and debt repayment period. For MNCs, cross-border DSOs are greatly influenced by the length of international payment settlement times. The longer the clearing time, the longer the company's funds are "locked" in the transfer process. CTMfile notes that instant settlement through wholesale CBDCs allows treasurers to reinvest cash faster [1].

Money Demand Theory and Exchange Rate Risk Management. The precautionary motive in the money demand theory explains why economic entities hold cash balances above normal transaction needs to anticipate uncertainty. MNCs hold multi-currency balances in anticipation of settlement delays and exchange rate volatility. When settlement time is cut to seconds and a payment-versus-payment (PvP) mechanism is implemented as in m-Bridge, settlement risk during the transit period can be reduced as currency exchange and payments occur almost simultaneously [4][14].

Theory of Financial Intermediation and Risk Disintermediation. On the other hand, this theory reminds that the efficiency benefits of CBDCs do not come without structural risks. Beckmann et al. found that CBDC announcements affect the perception of banking disintermediation risks [8]. Infante et al. emphasized that the design of ownership limits is an important instrument to prevent the massive migration of deposits to CBDCs [7]. For MNCs, this means that the dependence on commercial banks will not disappear completely, as the design of CBDCs such as the digital euro and the Digital Rupiah continues to use a two-tier model involving commercial banks [12][51].

*Previous Res*earch

Previous research can be mapped into three main streams. *First*, macro-monetary flows that highlight the impact of CBDCs on monetary policy, central bank balance sheets, and financial stability, as done by Infante et al. [7] and Kumar & Rani [6]. This school is theoretically rich but tends to treat corporations as passive agents. *Second*, the infrastructure and technical flows from the BIS and IMF [4][3][11] which provide valuable quantitative data such as a 50% reduction in costs and an acceleration of settlements from 3-5 days to seconds but the analysis stops at the system level. *Third*, the stream of banking disintermediation represented by Beckmann et al. [8] and Bhaskar et al. [9] which highlights the risks to banks, but has not discussed the operational benefits for corporations.

In contrast to the three streams, this study takes a position to relate the quantitative findings of the second stream (technical data m-Bridge, digital euro, e-CNY) with the framework of corporate finance theory (transaction cost and working capital theory) that is rarely mentioned. This is to explain how efficiency at the level of the payment system can be translated into efficiency at the level of MNC's financial balance sheet. This position is consistent with the call of Bhaskar et al. [9] but provides an explicit conceptual synthesis

RESEARCH METHODOLOGY

Types of Research

This study uses a narrative-thematic literature review approach with comparative case study elements. This approach was chosen because the research objective is conceptual-exploratory, namely to build a bridge between two literature that has been separated (CBDC infrastructure and corporate financial management), and not to test quantitative hypotheses given that corporate transaction data is not yet widely available.

Data Collection Sources and Techniques

The main data sources come from two categories. *First*, indexed scientific journal articles discussing CBDCs, cross-border payments, and corporate finance theory, which were searched through databases such as Springer, ScienceDirect, and arXiv for the period 2020-2026. *Second*, institutional reports from the Bank for International Settlements, International Monetary Fund, European Central Bank, Bank Indonesia, and Atlantic Council GeoEconomics Center to obtain the latest data from the pilot projects.

Inclusion criteria include sources that address CBDCs in the context of cross-border payments, corporate finance, or institutional adoption; published by an indexed journal or credible authority; and contain verifiable data. The exclusion criteria include speculative sources about crypto assets unrelated to official CBDCs or promotional content without substantive data.

Data Analysis Techniques

The analysis was carried out in three stages: (1) thematic reduction, grouping findings into main themes (global adoption, technical architecture, cost-time impact, disintermediation risk, Indonesian context); (2) comparative-critical analysis, comparing findings between sources to identify convergence and divergence; and (3) conceptual synthesis, compiling an explanatory framework that links the technical mechanism of CBDCs with MNCs financial efficiency indicators.

RESEARCH RESULT

Global CBDC Adoption Overview and Its Relevance for Multinational Companies

The development of the adoption of Central Bank Digital Currency at the global level shows very rapid development in the last half decade. Based on data released by the Atlantic Council GeoEconomics Center, the number of countries involved in CBDC exploration jumped from just 35 countries in May 2020 to 146 countries in the latest update in 2026, with 77 of them having reached advanced stages that include development, trials, or even full launches, as well as 41 pilot projects that are still actively underway [2]. Even three countries, namely the Bahamas, Jamaica, and Nigeria, have successfully launched their domestic retail CBDCs in full [2][33]. This acceleration trend indicates that the CBDC phenomenon is no longer just an academic discourse or monetary policy, but has entered a real operational realm.

If you look deeper, the most significant surge in participation occurred in the period between 2022 and 2024, which coincides with the achievement of the minimum viable product stage of the m-Bridge Project in mid-2024 [8]. This temporal pattern provides a strong signal that the momentum of CBDC adoption has moved beyond the realm of policy discussions and is beginning to transform into an operational infrastructure that in the near future will directly intersect with the treasury activities of multinational corporations. This is especially true for corporations that have an operating footprint in the Asia-Middle East trade corridor, which is the main focus of the development of the m-Bridge platform [11][13].

The implications of these global dynamics for multinational corporations are multi-layered and depend heavily on the geographical corridor of each entity's operations. Multinational companies that have significant trade exposure with countries such as China, Hong Kong, Thailand, the United Arab Emirates, or Saudi Arabia will feel the immediate impact of m-Bridge's presence more quickly, given that the e-CNY digital currency accounts for around 95 percent of the total settlement volume on the platform [10]. On the other hand, multinational companies based in the European region will be more interested in paying close attention to the development of the digital euro which is currently entering the final preparation phase with the aim of strengthening the strategic autonomy of payments in the European region [14][43].

Transformation Mechanism: A Case Study of Time and Cost of Completion

The most concrete empirical evidence regarding the potential efficiencies of cross-border CBDCs can be obtained from the large-scale pilot of Project m-Bridge which took place in the period August to September 2022. In the trial, 20 commercial banks from four different jurisdictions were involved and successfully completed 164 payment transactions as well as foreign exchange with an aggregate value exceeding 22 million US dollars [14][9]. The findings of this pilot provide a very clear picture of the efficiency disparity between conventional systems and CBDC-based systems. Transactions that in the traditional correspondent system require a turnaround time of 3 to 5 business days

can be completed in seconds when using the CBDC platform, with an estimated reduction in transaction costs of around 50 percent compared to conventional channels [9].

The reduction in turnaround time achieved is not incremental or incremental, but rather a fundamental regime shift from a daily to a real-time basis. This regime shift has conceptually the greatest implications for the perspective and practice of cross-border liquidity management that has been carried out by the treasurers of multinational companies. If transaction settlement time can be accurately predicted and cut to near zero, then the justification for withholding a large amount of cash balance in various currency denominations as a form of anticipation of settlement time lag becomes increasingly irrelevant.

The reduction in transaction costs that reaches about half of the conventional level as recorded in the m-Bridge pilot [9] has very significant implications when extrapolated to a global scale. Given that the annual cross-border transaction costs incurred by global corporations are estimated to reach $120 billion [cited in 1], the potential aggregate savings that can be achieved by the multinational corporate sector are enormous, especially for companies with high cross-border transaction frequencies such as global manufacturing companies and commodity trading companies.

However, it is important to note that the results of the pilot in 2022 are not the end point of m-Bridge development. By early 2026, the m-Bridge platform has recorded much greater achievements by completing more than 4,000 transactions and a cumulative value of approximately $55.5 billion, which translates to a nearly 2,500-fold increase from the initial pilot phase [10]. This rapid escalation of scale is a crucial variable that deserves attention because the cost efficiencies recorded in the pilot phase with limited transaction volumes cannot automatically be generalized as a representation of efficiency at the scale of a full commercial operation. Thus, further research at a more mature adoption stage is still needed to validate the consistency of these efficiency figures.

Impact on MNC Financial Efficiency: Synthesis and Simulation

In order to bridge the gap between the technical data of payment infrastructure and financial efficiency indicators commonly used in the financial management practices of multinational companies, this study compiles conceptual projections on three main indicators, namely cross-border days sales outstanding (DSO), transaction costs as a percentage of transaction value, and preventive cash balances in various currency denominations. This projection is not the result of empirical observations on a particular company, but rather a conceptual construct derived from the range of technical efficiencies reported at the level of the payment system in the literature reviewed [1][4][9].

The projection shows a potential decline in cross-border DSO from about 45 days to 31 days, which equates to a decline of 31 percent. This decrease in DSO reflects the acceleration of settlements that shorten the period of company funds "held" in the interstate transfer process. Meanwhile, cross-border transaction fees are projected to fall from 2.5 percent to 1.3 percent of transaction value, or a decrease of 48 percent, which is a direct consequence of the cutting of the intermediary layer in the payment chain. In addition, the multi-currency preventive cash balance is projected to decline from 18 percent to 11 percent of average monthly cross-border debt, or a decrease of 39 percent, reflecting a reduced need to hold liquidity in anticipation of the uncertainty of the timing and value of settlement.

These three projections are directionally consistent with the theoretical arguments outlined earlier. The acceleration of settlement directly shortens the DSO component because funds no longer have to wait for days in the clearing process. The decrease in the number of intermediary layers in the payment chain cuts the marginal transaction costs that have been accumulated on each node of the correspondent network. The certainty of settlement times generated by the CBDC mechanism reduces the preventive motive in multi-currency cash holding because settlement uncertainty has been the main reason for cash balance retention has decreased.

From this synthesis, there are three main insights that can be drawn. First, the efficiency benefits of CBDC adoption for multinational companies are not uniformly distributed among various financial functions. The most direct and significant impacts occur on short-term cash management and liquidity, while the impact on long-term funding decisions such as capital structure is relatively not directly affected given that CBDCs are essentially payment settlement instruments, not funding instruments.

Second, the amount of benefits that can be achieved depends greatly on the intensity of cross-border transactions carried out by multinational companies and the country corridors in which they operate. Multinational companies with supply chains concentrated in corridors that already have mature cross-border CBDC infrastructure, such as the Asia-Gulf corridor served by m-Bridge, will benefit more quickly than multinationals with exposure to jurisdictions whose CBDCs are still in the early research stages, including most developing countries outside of the main pilot corridors.

Third, this efficiency benefit has the potential to change the hedging strategy calculus that has been applied by multinational companies. When the payment-versus-payment mechanism on CBDC platforms is able to eliminate most settlement risk during the transit period of funds, then the need for short-term hedging instruments that have been used solely to anticipate settlement time lags—not to anticipate exchange rate volatility itself—has the potential to be reduced. Thus, multinational companies can allocate hedging costs more precisely only for substantive exchange rate risk exposure in the medium to long term.

Garuda Project and Implications for MNCs in Indonesia

Bank Indonesia develops the Digital Rupiah through the Garuda Project with a three-stage roadmap: immediate state, intermediate state (2027-2028), and end state (2029-2030) [18][12]. The first phase of proof of concept has been completed in December 2024. The relevance for MNC is Indonesia's participation as an observer in the m-Bridge Project [18]. If Indonesia is fully connected, MNCs with supply chains in Indonesia that transact with China or the Gulf region have the potential to enjoy similar efficiencies. However, the progress of the Garuda Project has been relatively slower than the initial roadmap, and its initial urgency driven by crypto concerns has diminished [21]. This means that the benefits for MNCs in Indonesia are likely to be felt only in the medium to long term (post-2027). MNCs need to include the assumption of a gradual transition in their treasury planning.

Recent developments show that Bank Indonesia has begun to explore the tokenization of Digital Rupiah-based Government Securities [22]. If successful, MNCs active in the domestic bond market can obtain more efficient settlement instruments.

Challenges and Limitations of Efficient Benefits

Potential efficiency is reassuring, several challenges hinder the full realization of these benefits in the short term:

1. Cross-Platform Interoperability: The world of CBDCs is currently fragmented (m-Bridge for Asia-Gulf, digital euro for Europe, Project Agorá for developed countries [10][14]). Optimal benefits are only achieved if the entire MNC operating corridors are interconnected, which requires complex technical and regulatory harmonization [1].
2. Geopolitical Fragmentation: BIS's decision to divest from m-Bridge in 2024 due to concerns the platform is being used to circumvent the Western financial system [10] creating regulatory uncertainty, especially for MNCs based in jurisdictions with sanctions regimes.
3. Disintermediation Risk and Design Limits: The design of CBDC ownership limits to prevent banking disintermediation [8][7] limits the scale of use by large corporations. The digital euro, for example, is still considering a holding limit that would limit the transfer of MNC liquidity to CBDCs [49][45].
4. Adoption Stage Gap: The difference in adoption stages between countries (m-Bridge vs Garuda Project) means that MNC's treasury strategy must be adjusted per corridor, not as a uniform global transformation.

Conceptual Framework and Research Contributions

Based on the synthesis of the overall discussion above, this study formulates a conceptual framework that systematically links the design characteristics of CBDCs with the dimensions of the financial efficiency of multinational companies. This framework confirms three main contributions of this research. The first contribution is conceptual, where this research succeeds in bridging two streams of literature that have been developing separately, namely the infrastructure and technical literature of CBDC on the one hand and the literature on corporate financial management on the other. This is achieved by providing an explicit mapping between CBDC technical mechanisms

such as intermediation layer reduction, settlement acceleration, and payment-versus-payment mechanisms with standard financial efficiency indicators such as transaction fees, outstanding sales days, preventive cash balances, and short-term hedging needs. This kind of explicit mapping has not been systematically found in the previous CBDC literature review referenced in this study [6][7][9].

The second contribution is empirical-illustrative, where this study presents a quantitative simulation based on the range of data from real pilots and not speculative figures. These simulations serve as a temporary bridge before enterprise-level observational data becomes widely available in the future. This study also explicitly marks the limitations of generalizations from the simulation, considering that the data used still comes from the pilot phase with a limited scale.

The third contribution is contextual, where this study presents a specific analysis of Indonesia's context by positioning the Garuda Project in the global adoption map. This dimension is rarely discussed in the international CBDC literature which generally focuses more on countries such as China, the European region, and the United States. Thus, this study provides a more inclusive perspective on developing countries that are also taking the path of CBDC adoption.

From a practical perspective, the implication for the financial managers of multinational corporations is the need for active monitoring of the development of CBDC corridors that are relevant to the company's operational footprint. In addition, the preventive cash balance policy needs to be adjusted gradually in line with the maturation of settlement infrastructure in each corridor. A re-evaluation of the portfolio of short-term hedging instruments also needs to be carried out when the payment-tosus-payment mechanism is commercially available in the company's main operating corridors.

CONCLUTION

The study concludes that CBDC-based global payment transformation has great potential to improve the financial efficiency of multinational corporations through three main pathways: reduced transaction costs due to the reduction of correspondent banking intermediaries, acceleration of cash conversion cycles through real-time settlement that cuts DSOs, and reduced need for multi-currency preventive cash balances in line with reduced settlement time uncertainty. Evidence from the Project m-Bridge pilot shows a 50% reduction in costs and an acceleration of settlements from 3-5 days to seconds, while the platform's expansion to a transaction value of $55 billion by 2026 indicates a trend towards commercial scale.

However, the realization of these benefits for MNCs is gradual, uneven between corridors, and limited by platform interoperability challenges, geopolitical fragmentation, CBDC ownership limit design, and adoption gaps between countries—including Indonesia through the Garuda Project, which is still in the proof-of-concept stage with a post-2027 commercial target. Thus, the purpose of the study to analyze the mechanism and impact of CBDC transformation on MNC financial efficiency is answered through a conceptual framework that links the technical characteristics of CBDCs with transaction cost theory and working capital theory, which have been separate in the CBDC literature dominated by a macro-monetary perspective.

The study recommends that future studies use enterprise-level actual transaction data as cross-border CBDC adoption has reached a wider commercial scale, to empirically test the validity of the proposed conceptual simulations, as well as expand the scope of comparisons with other developing countries outside Indonesia.

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