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1. The Compensation Model of the Digital Euro: Mission Impossible

In its proposal for the regulation of the Digital Euro ($D \in$), the European Commission largely adopts the compensation model outlined by the ECB, wherein the consumer is to bear no costs, and only the merchant is expected to cover the expenses incurred on the private sector side for establishing the new payment system. However, the legislative proposal contains contradictions that are likely to undermine the compensation model. The financing of the $D \in$ continues to be on shaky ground.



The Compensation Model of the Digital Euro: Mission Impossible

(hg) The ECB has recently initiated the next phase for the planned Digital Euro (hereinafter referred to as D€). Following the delineation of the design and ecosystem, the ECB's two-year preparation phase commences on November 1, 2023. Concurrently, the legal framework proposed by the European Commission at the end of June 2023 ("Regulation on the establishment of the digital euro"¹) is set to be deliberated and adopted at the EU level in collaboration with the Council and Parliament. The draft regulation incorporates the design plans for the new, predominantly account-based payment system outlined by the ECB up to that point.

A fundamental pillar of the construct is the mandatory involvement of existing Payment Service Providers (PSP), which, similar to conventional privately issued payment systems, are intended to serve as the system interface to users (consumers, merchants, public entities) in the D€ system as well

The ECB only assumes central functions such as system management, settlement and clearing, and fraud prevention. PSPs are responsible for onboarding (KYC), D€ account management, issuance of the payment application, interface with private money current accounts (funding & defunding), and other "digital euro payment services." In the typical fourparty system, PSPs can take on the role of both "distributors" and/or "acquirers."

This enforced "public-private partnership" needs to be financed somehow. The costs of the Eurosystem are borne by the ECB and easily funded from the revenues generated by the creation of the $D \in ($ "seigniorage"). There are no concerns

about feasibility on that side. The private aspect of the partnership is expected to finance itself solely through user fees without cross-subsidization from the public funds. However, these fees will not be left to the free market but will be regulated. The ECB has designed a compensation model² for this purpose, which is now codified in detail in Article 17 of the planned regulation by the European Commission. In the following discussion, we will analyze the compensation model and examine its feasibility.

Not only does these basic principles underlying the "business case" in the planned D€ regulation warrant a thorough and critical analysis, but the entire decision-making process is also subject to scrutiny.

The legal framework is the only component of the D \in that comes about democratically. Members of the European Parliament can still influence certain aspects and finely adjust some screws. The rest is ultimately decided in a tower in Frankfurt by 25 individuals (the ECB Council). This includes the final decision to introduce the D \in , which, from my perspective, is now just a formality.

By the way: It raises the question for me whether such an epochal decision needs a bit more democratic underpinning. After all, we're not talking about the new design of euro banknotes here. The D \in is a game-changer that could fundamentally alter our existing monetary system as a mixture of public and private money. But that's just a side note.

Our Comment:

To outline the key points of the compensation model for readers with limited time: the merchant, and only the merchant, foots the bill! They are expected to cover the costs incurred by private-sector PSPs on the acquirer

and distributor sides for the D€ payment system (including a reasonable profit margin) through corresponding acceptance fees (MSC - Merchant Service



The merchant, and only the merchant, foots the bill!

It would be quite naive to assume that merchants would not notice this.

Charges). A portion of the MSC is intended to be transferred to finance the distributor side through the familiar construct of an Interchange Fee (referred to as "inter-PSP Fee" in the D€ Regulation) well-known in the card industry. We will delve into this in more detail later.

Why are only merchants tapped for financing? The answer is simple: The ECB has set the premise that consumers or individuals should not be charged fees when using the D€³. While this free-of-charge directive applies only to the "basic digital euro payment services" offered by PSPs, the corresponding list according to Annex II of the D€ Regulation leaves little room for exceptions. A PSP may, if applicable, charge fees only for additional value-added services (such as "conditional payments") to its private customers (consumers).

A conventional current account with basic functions typically incurs fees for the consumer⁴. Is the ECB attempting to encourage consumers to open a D€ account with a zero-price policy? The zero-default risk of the digital ECB Euro is not exactly the compelling selling point due to deposit insurance. The pricing approach could work, as why else would a banked consumer open another, more or less functionally equivalent current account at their bank unless they were saving on fees?

In contrast to the merchant, who has no choice due to acceptance obligations (considering $D \in \mathbb{R}$ as legal tender), the use of $D \in \mathbb{R}$ for the consumer should be voluntary. Zero pricing and acceptance obligations could overcome the well-known network dilemma of a new payment system.

Is the digital euro a "public good"?

The ECB, however, provides different justifications for this rather crucial system requirement. In the context of the required fee-free usage for consumers, the argument is repeatedly made that the D€ is a "public good."

The presumed originator of this thesis is Fabio Panetta, the former member of the ECB Executive Board responsible for the D€ and current head of the Italian Central

Bank. He has emphasized this connection on several occasions⁵, such as here:

"The first principle is that, as a public good, the digital euro should serve society. We believe consumers should be able to use it free of charge for basic day-to-day purposes." ⁶

Now, the euro (digital or analog) or other means of payments are undoubtedly not a "public good" in the sense of economic theory, as they do not meet the criteria typically applied to such goods (see box), even if a portion of circulating euros is offered by a public institution (central bank). Once money comes into my possession (bank account, analog or digital wallet), the benefits are privatized, and others are excluded. Therefore, the D€ is not a public good, and one cannot derive free usage from it.

If it were a public good, all users, **including merchants**, should be exempt from charges. Additionally, money would need to be put into circulation for free ("helicopter money").

One could potentially argue that the provision of the euro as a supranational unit of account is a public good. The use (e.g., in pricing goods) would at least be non-rivalrous and non-excludable. However, the $D \in \mathbb{R}$ is not about a new unit of account but an additional payment system, which should be financed by user fees.

One might assume that Panetta⁷ and the ECB, in publications about the D \in , mean something different by "public good" than the term established in economic theory. Perhaps in the sense of: the D \in is a good issued by a public institution. However, this interpretation does not imply a doctrine for free usage; at most, it suggests fees covering costs (waiving a profit margin).

According to the ECB, the characteristic of the D€ as a public good is also conditioned by its *"natural evolution of cash in the digital sphere."* ⁹ Cash, after all, is also a public good, and therefore, its evolutionary development is consistent. Consequently, according to the

ECB, it is only consistent that the public good "cash" can also be used without fees.

However, cash transactions are not fee-free because of their presumed status as a public good but rather because, in their typical use, there is no intermediary involved who could charge a fee. Both parties (payer and payee) may only incur additional procurement and disposal costs, as well as risk and handling costs. Also, the planned unilateral burden on the merchant side, as envisioned in the digital variant, is absent in the case of cash. Once a service provider is involved (e.g., for authenticity verification), fees also apply to cash transactions.

The digital euro is undoubtedly not a "public good".

The comparison to cash, as the predecessor to the $D \in$, is flawed. The postulate of fee-free usage for consumers cannot be derived from this comparison.

In contrast to the ECB, the Commission largely refrains from using the term "public good" for the D€ in the draft of the D€ regulation. Only in the accompanying Impact Assessment Report⁹ does it adopt the ECB thesis: "...the basic payment services of the digital euro as public money would be offered for free to private individuals.

The reason is that the digital euro – like cash – would be a public good..." (p. 37).

Acceptance at face value

The Commission, referencing the ECB in the Impact Assessment Report, provides another argument for the fee-free usage by consumers:

"According to the ECB's report on a digital euro, the digital euro should be free of charge for basic use by private individuals. The reason for that is that if the digital euro is granted legal tender status, it would have to be accepted at face value." (p. 32-33).

Aside from the fact that this argument does not appear in the ECB's "Report on a digital euro" (October 2020), this argument would rather speak against the planned fee deduction on the acceptance side (merchants). This is because the payee, obligated to accept the D \in , should receive the full amount in euro without deduction to fulfill the legal tender obligation.

In Recital 42 of the D€ Regulation, the argument of the eroding effect of an acceptance fee for the legal tender re-emerges. The effect is accepted quasi systemically or out of necessity but is intended to be limited through the regulation of the merchant fee ("to be objectively justified and proportionate").

In another instance (Recital 40), the Commission emphasizes the free usage on the consumer side as a means to overcome the well-known "chicken and egg problem": "to ensure wide access to and use of the digital euro (...) natural persons (...) should not be charged for basic euro payment services."

A preliminary conclusion: The compensation model does not appear to be based on a systematic approach.

What is a public good?

In economic theory, a "public good" is understood to be a product whose consumption, unlike that of a "private good," is non-excludable. Additionally, when consuming these goods, there is no rivalry among users. The consumption by one person does not diminish the benefit for others. Both criteria (non-excludability and non-rivalry) must be met for the designation "public good."

Typical examples include national defense, dikes, and street lighting. Individual pricing for users is usually not possible or only with relatively high effort. Public goods are offered by the government without pricing ("free") for these reasons and are typically financed through tax revenue. The term, firmly established in economics worldwide, was coined in the 1950s by the American economist Richard A. Musgrave.

Price regulation according to Article 17

In the D€ system, merchants are, therefore, doubly burdened. They are the only ones obligated to accept the new means of payment, and they are the sole party responsible for covering the entire system costs (plus profit margin) of the involved PSPs (distributors and acquirers).

Despite the pivotal role of merchants, the D€ Regulation refrains from providing a legal definition. Based on the logic of the regulation, one can assume that anyone who accepts D€ as the payee (whether compelled or voluntarily) and is not a natural person qualifies as a "merchant" under the regulation. This would mean that even public entities receiving payments from consumers (C2G), such as for tax payments, would be subject to fees.

To avoid "excessive fees" Merchant Service Charges (MSC) will be capped. Additionally, interchange fees (referred to as "inter-PSP fees" in the regulation) will also be limited. While the existence of an Inter-PSP Fee is not mandatory in the D€ system ("an inter-PSP fee may be needed to provide compensation for those payment service providers for the distribution costs" – Recital 45), how else could the distributor PSPs cover their costs?

It is unrealistic to expect them to cover their overall costs solely through additional services to private customers, which are not subject to the fee prohibition (e.g., a second payment instrument for the D€ account).

Therefore, one should assume the following structure, familiar from the card business: merchants pay an MSC to their acquirers for each D€ transaction, and acquirers pay the Inter-PSP Fee to the distributors. The MSC thus consists of the Inter-PSP Fee plus compensation for acquirer services. The Scheme Fee, common in card transactions, is absent because the Eurosystem, as the scheme owner, covers its costs directly or from seigniorage revenues.

Now, both fees (MSC and Inter-PSP Fee) are supposed to be capped at the same level for the Eurozone, which is illogical unless the acquirer margin is zero. Let's examine the wording of the relevant Article 17(2):

"Any merchant service charge or inter-PSP fee shall not exceed the lowest of the following two amounts:

(a) the relevant costs incurred by payment services providers for the provision of digital euro payments, including a reasonable margin of profit;

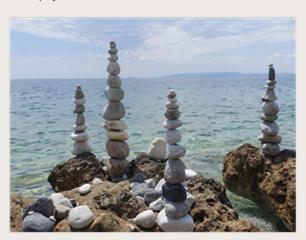
(b) fees or charges requested for comparable digital means of payment."

Given that, in this system, the MSC is definitionally higher than the Inter-PSP Fee, it would be sufficient to cap only the MSC. Additionally, for the Inter-PSP Fee, one could set the costs of the distributor side as a limit.¹¹

If only criterion (a) existed, the problem would be systematically solved at least to some extent. However, the requirement is that the fee level for "comparable digital means of payment" (b) is also relevant. The limit is determined by the lower amount of the two criteria.

According to Article 2(25), "comparable digital means of payment" are defined as: "digital means of payment, including debit card payment and instant payment at the point of interaction but excluding credit transfer and direct debit that are not initiated at the point of interaction."

Relevant would be, for example, the merchant fee for an instant payment offered by an acquirer as a payment method at the point of sale or in e-commerce. Such a payment method, as currently planned by EPI (European Payments Initiative) at the EU level, would be very close to the D€ system: account-based, smartphone as the carrier medium for the payment application, and instant payment.

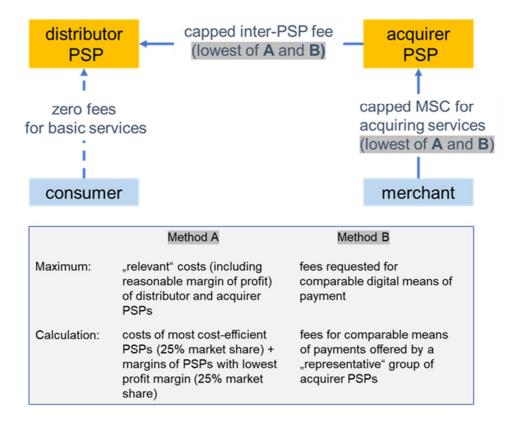


Squaring the circle

However, instant payments (SCT Inst) do not involve an interchange fee as a monetary compensation between both system sides. The costs on the payer side are covered by corresponding fees. Therefore, the merchant fee only covers the costs and profit margin of the acquirer. If this fee is to be the limit for the D€'s MSC, the question arises of how a fee at this level in the D€ system is supposed to cover the costs of both the acquirer and the distributor side.



Regulated prices according Art. 17 D€-Regulation



From a mathematical perspective, this would only be possible if the overall PSP system costs for both sides in the D€ were as low as the costs of a competing instant payment on the payee side—a completely unrealistic assumption.

Therefore, it can be assumed that the limit according to option (b) will, in practice, be lower than the limit according to option (a), and therefore, the MSC of a comparable payment system will serve as the limit for the D \in . The consequence, however, is a wholly inadequate compensation for the costs of the distributor side.

If option (b) has to be eliminated as an unsuitable compensation method for this reason, an MSC according to the remaining option (a) would indeed lead to a solid financing of PSP costs on both market sides, but the merchant would face significantly higher fees than with comparable digital payment methods.

Both outcomes are politically undesirable and unenforceable. The compensation model is a flawed construction, trying to square the circle.

Would 0.2% be sufficient as the Inter-PSP Fee?

Now, with a bit of creativity, one could interpret method (b) in a way that considers values for both the MSC and

the Inter-PSP Fee from comparable payment methods. For comparison, only systems with an Interchange Fee model can be taken into account, such as a debit card, explicitly mentioned as a benchmark. The Inter-PSP Fee for the D \in would then be limited to the IF-Cap for debit card transactions according to the IFR (2015), set at 0.2%. The merchant pays a maximum MSC for a D \in transaction equal to that of a debit card, and the distributor receives 0.2% for compensation. Would that be sufficient?

The PSP costs of the D€ system are still a black box. In the Impact Assessment Report, the Commission has to navigate in the dark and, as a temporary measure, uses its own estimated costs for Instant Payments.¹²

Therefore, assumptions are still necessary. The distributor has to offer the private customer another type of current account and, in addition, a payment instrument (smartphone app). Both products are supposed to have novel, technically sophisticated features (e.g., waterfall mechanism, app with separate on- and offline functions). As experience shows, introducing sophisticated new products to customers raises many questions. Hence, the costs also include the effort for customer service

The compensation model is a flawed construction.

Let's assume, for simplicity, that the PSP costs are roughly identical to the costs of a traditional current account + debit card. In comparison to the traditional product, the distributor has to forgo customer fees for the D€ account. Also, the D€ naturally lacks the indirect income from money creation ("deposit seigniorage").

On the other hand, the distributor saves on scheme fees (debit card) and on clearing and settlement costs, which are covered by the Eurosystem for the D \in . Therefore, it remains open whether the 0.2% Inter-PSP Fee would be sufficient for compensation.

Fee-Free Transactions

For the distributor's business model, it should be noted that for certain D€ transactions, no Inter-PSP Fee can be charged. According to the ECB's announcement, the new system is expected to initially handle only C2C and ecommerce payments at the beginning. Both sides of the market may have to bear the costs for C2C transactions, as there are no MSC or Inter-PSP Fees involved.

When payments at the physical POS are added in a later phase, the question arises as to how the Inter-PSP Fee should flow to the respective distributor for offline payments. The privacy concept for offline payments dictates that no transaction-related data be captured at any point in the system. Therefore, the acquirer cannot know which payer used the D \in at its merchant or which distributor is entitled to the due Inter-PSP Fee.

How to solve this issue? Compromises on the privacy concept for offline payments? Forfeiture of the compensation fee? Or the construction of a fund solution where the due Inter-PSP Fees for offline payments are deposited, and the distributor is compensated based on the reloads of the offline wallet? There have been no statements on this issue so far.

The compensation model and its codification in Art. 17 of the D€ Regulation leave many questions unanswered in addition to the lack of feasibility. We will discuss some of them here.

Who determines the limits for the MSC and the Inter-PSP Fees?

Article 17 assigns a significant role to the ECB as the pricing authority. According to Article 17(4), PSPs are required to provide the ECB with all necessary data (potentially with an audit report) for limit calculation, including internal costs, profit margins, and fees of comparable payment methods (only for acquirers). The ECB is also tasked with establishing the methodology for the limits (Article 17(5)).

The limit for costs should be based on the costs of a group of the most cost-efficient PSPs in the Eurozone, representing 25% of the total volume of D€ put into circulation in that year. For acquirer PSPs, a similar 25% criterion would need to be developed, such as 25% of the payment volume generated at merchants (which seems to be overlooked in Article 17(5a)).

I suspect that, at least on the distributors' side, a 100% survey is needed to determine which PSPs work particularly cost-effectively and collectively represent 25% of the annual distribution volume. On the distributors' side,

there are no price indicators that would serve as an indication of cost efficiency.

While these groups of PSPs can serve as a benchmark for cost efficiency, it is questionable whether they also operate with the lowest profit margin. To determine the benchmark of the "lowest profit margin", Article 17(5b) specifies that a new 25% group should be identified within all involved PSPs for each market side.

It is assumed that the ECB will conduct this exercise regularly. At least the results of its monitoring are expected to be regularly published. A detailed set of rules is also required to establish how the relevant costs of PSPs are uniformly systematized and recorded. For example, should the KYC costs of a distributor be split equally if a new customer wants to open both a conventional current account and a D€ account? This presents a massive additional task for the ECB.

Ensuring that the relevant limits and zero prices are adhered to by PSPs is the responsibility of national competent authorities, as stated in Recital 43.

Now, however, the most critical question in the D€ Regulation remains unanswered. Who actually sets the limits based on the calculations conducted by the ECB? Who decides which calculation method (a or b) is applied? The ECB, the Commission, the EBA, the European Parliament? And: for how long will the limits be established? When will adjustments be made?

A gigantic additional task awaits the ECB as a price calculation authority

A few days before the publication of the Regulation on June 28, 2023, a "leaked" non-final version of the draft was circulating. A comparison between the leaked version and the final version shows that there were significant adjustments to Article 17 right up to the last minute. In the non-final version, at least the ECB was still supposed to set the limits. It was also still undecided

whether the limits should be only *"indicative"* or *"mandatory."*

Who determines the Inter-PSP Fee?

The experience in the European four-party card business indicates that the regulated limit for the Interchange Fee (debit card: 0.2%, credit card: 0.3%) is generally adopted by the schemes as the default IF. There are only a few exceptions in national markets, such as the highly concentrated Dutch market, where a few acquirers and issuers have negotiated bilateral IFs. Since not every Greek distributor will negotiate an Inter-PSP Fee with every Belgian acquirer, some authority should set the "Default Inter-PSP Fee" for the Eurozone. The scheme owner would be ideally suited for this, namely the ECB. This yet-to-be-clarified question of competence should be addressed in the D€ Regulation.

Which costs are relevant for the limits?

According to Article 17 (2a), the "relevant costs" of the involved PSPs are to be considered for the calculation of limits. There are no indications of which costs can be considered relevant. It can be assumed that at least the ongoing costs are relevant, but what about the certainly significant one-time costs? The D€ Regulation is silent on this matter.

In a footnote in the 4th Progress Report (July 2023), the ECB states that "only operational costs have been considered for compensation. Initial investment costs will be considered separately." The Commission should have also addressed this issue.

The question also arises for the necessary adaptation costs of the POS terminals to process D€ payments. These one-time costs are estimated by the Commission in the Impact Assessment Report to be somewhere between 0.5 and 1 billion euros based on ECB estimates. 14 It is also questionable whether the additional costs for an extra device in the terminal to store offlineused D€ are included. Depending on the business model, terminal adaptation costs fall on the merchant or the acquirer if the terminal is rented.

Freedom in fee structuring?

How should the limit for MSC and Inter-PSP Fee be designed? Is it a limit in euros per transaction or an advalorem amount? Does the answer depend on the cost structure of the PSPs? Does the limit apply to each transaction, or must the limit be adhered to on average per acquirer? Does the acquirer still have the option to offer a flat fee, such as X euros as a "blended fee" for up to 500 transactions per month?

Price limits based on estimates at the system's launch

With the D€, all participants are entering uncharted territory. At the start, only the one-time investment costs will be known at best. The ongoing costs will have to be estimated. The limits at the system's launch will thus be based on estimated values. Depending on the significance of economies of scale, certain (mid-term?) expected volumes will need to be used.

It means that the legal requirements for calculating the limits according to method (a) cannot be met in the initial phase of the system. Only method (b) – fees of comparable digital payment methods as a benchmark – can be applied.

A corresponding sensible special rule for the initial phase (limits based on cost estimates), which was included in the pre-version, was removed at the last minute. Courage to leave gaps?

Enthusiasm is limited

It would be quite naive to assume that merchants would not notice that they are the sole cost bearer in the compensation model.

The German Retail Association (HDE) responded promptly on the day of the publication of the D€ Regulation on June 28, 2023, with a statement 15 rejecting an Inter-PSP Fee to finance the distributor side. Both market sides should cover their costs through respective fees. If consumers were to be spared, the costs on this market side would need to be addressed through "government funding".

EuroCommerce advocates for an MSC "close to zero" in an open letter dated November 24, 2023, to the co-legislators. It should be structured as a per-transaction fee (no ad-valorem fee) with a waiver of a fee for low-value transactions. The distributor side is intended to cover its costs through fees for Value Added Services for D€ holders.

Even Bundesbank President Joachim Nagel recently highlighted this revenue source for distributors. This source of income would be underestimated by the banking industry. Nagel now sees many new business ideas in this income source. However, no specific proposals have been reported.

The ECB currently expects that "transaction costs for merchants would probably be lower with digital euro than with other private payment solutions." ¹⁷ As explained earlier, this expectation cannot be justified by the proposed compensation model unless distributors' costs remain at least partially uncovered.

As a way out of the dilemma, subsidizing the distributor side by the Eurosystem remains an option. This option was still brought into the discussion by the ECB in October 2020:

"At this stage, it cannot be ruled out that the Eurosystem might even have to subsidise the services offered by these providers in order to ensure that the holders of digital euro do not have to bear any costs, by analogy, again, with the distribution of banknotes." 18

If one wants to adhere to the principle of fee-free transactions for consumers, this option will need to be seriously considered.



Footnotes

- See European Commission document Com(2023) 369 final dated June 28, 2023.
- 2 See ECB, Compensation Model for the Digital Euro, February 22, 2023.
- 3 On the retail customer side, the distributor PSP, however, has the option to offer the traditional current account along with the D€ account as a bundled package and charge, for example, a monthly flat fee for this package (See Recital 40). In this case, the price must be identical to an account package that does not include the D€. In any case, the distributor must offer the D€-only account (without a traditional current account) free of charge.
- 4 It is quite conceivable that the ECB assumes that traditional current accounts with basic functionalities for retail customers are often offered at no cost in the EU, and therefore, it also demands a free-of-charge digital euro account. "If consumers had to pay for the basic services, it would also put the digital euro at a disadvantage to some existing digital means of payments." (Panetta (2023), footnote 20). As far as can be seen, there are no reasonably current comparative market analyses regarding the average fees for a "standard" current bank account in the EU, despite the legally required fee transparency resulting from the Payment Account Directive (PAD 2014/92/EU). The Italian central bank last quantified the average account fees (excluding interest) for Italian consumers at €77 p.a. in 2015. See Banca d'Italia Note di stabilità finanziaria e vigilanza, No. 8, April 2017
- 5 For example: Fabio Panetta, A Digital Euro for the Digital Era, Introductory Statement at the ECON Committee of the European Parliament on October 12, 2020
- 6 Fabio Panetta, A digital euro: widely available and easy to use, Introductory statement at the Committee on Economic and Monetary Affairs of the European Parliament on April 24, 2023
- At least in the case of economist Fabio Panetta, it can be assumed that he uses the term "public good" in a economic theory context, as he often employs the term in this sense. See, for instance, his discussions on "European public goods" in: Investing in Europe's future: The case for a rethink, Speech at Istituto per gli Studi di Politica Internazionale (ISPI), November 11, 2022
- 8 ECB, Compensation model for the digital euro, February 22, 2023, p. 4
- 9 European Commission, Document SWD(2023) 233 final dated June 28, 2023
- 10 The only defined fee in Article 2 (24) is the "Merchant Service Charge" (MSC), which is generally characterized as the recipient's fee. However, if the recipient is a natural person (e.g., in C2C and G2C payments), the acquiring PSP must provide its services free of charge.
- 11 The Commission mistakenly assumes in Recital 45 that the Inter-PSP Fee should encompass both the costs of the distributor and the costs of the acquirer: "The inter-PSP fee should provide sufficient compensation for the distribution costs of both the distributing and acquiring payment service providers, including a reasonable margin of profit."
- 12 See Impact Assessment Report, p. 134
- 13 ECB, Progress on the investigation phase of a digital euro fourth report, July 14, 2023, Footnote 16, p. 5
- 14 See European Commission, Impact Assessment Report, June 28, 2023, p. 133.
- 15 HDE Press Release "HDE sieht Erfolgsmodell im digitalen Euro, auch ohne Akzeptanzpflicht" dated June 28, 2023
- 16 See "Debatte um digitalen Euro" in Die Presse on November 27, 2023, p. 8. Also, see: https://www.wiwo.de/unternehmen/banken/digitalwaehrung-nagel-banken-unterschaetzen-neue-geschaeftsmoeglichkeiten-beim-digitalen-euro/29523196.html
- 17 ECB, A stocktake on the digital euro, October 18, 2023, p. 9
- 18 ECB, Report on a digital euro, October 2, 2020, p. 19

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