Institut Veblen pour les réformes économiques

"Drone money" to put monetary policy back to the people

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With Emmanuel Carré**, Thomas Lebrun*** and Thomas Renault ****

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ABSTRACT

For more than ten years, monetary policy has been extraordinarily accommodating without achieving its objectives. Faced with this reality, central banks must innovate radically, using the potential offered by new technologies. This note proposes a new instrument inspired by 'helicopter money' and recent experiments in digital central bank currency: to pay each resident of the Eurozone between 120 to 140 euros of digital central bank currency, on an account opened for everyone at the European Central Bank.

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SYNTHESIS

For more than ten years, monetary policy has been extraordinarily accommodating without achieving its objectives. The case of the Euro zone clearly shows this; the many waves of monetary expansion led by the ECB after the 2007-08 crisis have not succeeded in realising the targeted inflation level, nor has it revived economic activity. Faced with this increasingly accepted reality, central banks need to innovate radically by tapping into the potential of technological innovation.

This note presents a proposal inspired by 'helicopter money' and current experiments in central bank digital currencies (CBDC): the 'drone money'. It **consists in paying every resident of the Eurozone between 120 and 140 Euros of CBDC, to a dedicated account at the ECB.** This form of distribution presents the least operational difficulties, as compared to an issue of digital cash or a direct transfer to the accounts of the beneficiaries. First, the experiment can be conducted over one year, and then continued as long as inflation stays below the two per cent target defined by the ECB. The sum would be distributed on a monthly basis without any prerequisites. Each person would be allowed to spend the money as they see fit. The corresponding central currency required to be issued would be approximately €480M annually, or €40M, to be at scale with the asset purchase programs carried out from 2015.

Freed from the problems of transmission channels that reduce the effectiveness of current monetary policy, 'drone money' would lead to an increase in aggregate consumption of at least 70% of the sum distributed and could bring about a multiplier effect of two to three times the amount of central currency issued. Consumption is likely to have a sufficiently direct effect on inflation, making it easier for the ECB to reach its 2 per cent target and in doing so, holding off the risk of deflation. Once the target is achieved, the distribution would stop. Compared to the unevenly distributed effects of the current monetary policy, those of the drone would benefit everyone; this would be a great breakthrough and would strengthen the legitimacy of the ECB.

The cost of this operation would be financed entirely by the central bank and would not cost taxpayer's money. However, it would imply a collective acceptance of the resulting balance sheet loss for the central bank. This is easily affordable and would not in any way hinder its activities.

Many objections have been raised to the proposal of helicopter money. To those challenging it, helicopter money should be closer to fiscal policy than monetary. It would encourage more consumption than investment without having any sustainable effect on growth. It would be mostly saved and should be set aside for specific policies targeting the poorest households. Additionally, it would also be inflationary, anti-ecological and a waste of money in an open economy, and so on. The note offers an overview of these counterarguments and responds to them.

The proposed instrument is a monetary one; it is not looking to replace budgetary action, the latter being the only way to stimulate directly productive investment. There is no need for this instrument to target low-income households for the purpose of efficiency - that is beyond the scope of the ECB. It would be enough to do them no harm! Of course, the drone's effects

will directly impact consumption, but by actively supporting demand it ultimately supports investment, without having to introduce other monetary measures aiming at lowering long term interest rates, such as asset purchases, to facilitate investment financing. Even if we assume that a third of the sum distributed would not be spent, that is well beyond the 13.3% average gross saving rate of the Eurozone, the stimulus generated would far exceed that of current monetary policy. There is no need to force or guide the expenditure with special purpose money or vouchers, especially because it will not prevent households from adjusting their savings from other sources of income. Moreover, this kind of financial paternalism will not help in restoring confidence. On the other hand, nothing would prevent envisioning a transfer of 'demurrage' (or 'melting') CBDC to prevent it from being saved. The drone would accelerate inflation and that is a good thing. Of course, such acceleration needs to be controlled, indexing the amount transferred to inflation can be a way to do it. This support to consumption will not hinder the ecological transition but will facilitate it instead, as it will make its economic effects more bearable for the lower classes. Taking inequalities into account must be the starting point for desirable and desired environmental policies.

At the end of her first Governing Council meeting on 12th December 2019, Christine Lagarde declared herself to be "neither a dove nor a hawk" but an "owl" for the wisdom that it embodies. The drone is an "owl" innovation, neither "dove" (since it would allow us to achieve the inflation target), nor "hawk" (since it would have a strong effect on growth), deserving consideration. This high-tech version of helicopter money would reconcile the central bank's need for technological adaptation and the necessity to put monetary policy back to the service of everyone. Of course, it does not exempt the ECB from reflecting on the effects of its polices. Because, even in a more efficient form, monetary policy will not be able to do everything!

Introduction

More than 10 years after the financial crisis took hold in 2007, the big central banks are still conducting a monetary policy that is extraordinarily accommodating, even though the economies of these countries are not doing very well. Just as a return to normality seemed to be looming, in the US, it is time for another wave of monetary easing in the face of economic downturn, which could be worsened by the trade war started by Donald Trump. As for the European Central Bank (ECB), if it was not time for a normalisation by the summer of 2019, a stabilisation is awaited. The slashing of growth projections in the Eurozone during this time drove Mario Draghi to push new measures before his departure in September 2019, notably relaunching asset purchases and targeted refinancing operations, while maintaining the rate of its main operations of refinancing at 0 and with it, lowering the rate on the deposit facility deeper into negative territory.

On both sides of the Atlantic, the easing measures put in place are hardly any different from those attempted since the crisis and one can therefore expect to face the same transmission problems. Especially in the Eurozone, where one of the favoured channels of transmission, banks, have been found to be particularly limited. This is perhaps due to the changes in the nature of banking activities in the past few decades; increasingly oriented towards the securities markets and less toward the financing of business investment, which the ECB did not account for early enough in conducting its monetary policy for managing the crisis. Therefore, this new monetary easing will likely produce the same effects on the real economy. That is to say, weak spill over effects, all the more in the Eurozone since monetary policy is not combined with fiscal policy. And the effects are probably badly distributed too, since the ECB decides its monetary policy while ignoring its potential redistributive effects. Despite from a problem of transmission, the ECB's post-crisis monetary policy also presents a serious problem of redistribution. In fact, it has benefitted to those that should have simply been transmitters of these effects - the banks and financial markets - and has also benefitted the final recipients (households, firms and the state) of these effects in a highly unequal way. **The poorest households, who have little to no real estate and financial assets and limited borrowing capacity, have gained nothing.**

At the same time, with the rise in digital technology, central banks have started to take note of technological innovation in the banking and financial sector, with the emergence of fintech, crypto assets, the invasion of GAFA (Google Apple Facebook Amazon) in the banking and financial services market through established partnerships (Google and Citigroup, Apple and Goldman Sachs…) or projects like Facebook's Libra. Central banks might rightly fear losing control over the circulation of money in the economy if these technological advancements lead to the advent of private cryptocurrencies that will slowly but surely occupy the money market and supplant the traditional currency of commercial banks.

It is time for central banks to innovate, not just marginally by reproducing unconventional measures from these past ten years but in a radical way, both in their instruments and in the technology they deploy. A radical innovation is necessary to breathe new life into monetary policy and perhaps also because central banks need to learn to master technologies behind cryptocurrencies, such as blockchain, that would otherwise overwhelm them.

How can central banks rapidly transform their monetary policy to strengthen its effects and do it in a way that is better distributed within the real economy? By moving beyond failing channels of transmission and the distribution of base money directly to households so they can spend it, instead of going through banks and financial markets. This idea is similar to 'helicopter money', a term invented by Milton Friedman in 1969[1], and famously brought back by Adair Turner in his 2016 book, *Between Debt and the Devil: Money, Credit and Fixing Global Finance*, and popularised by NGOs and associations like Positive Money, for example. The effect on consumption expenditure will be immediate and it will have a multiplier effect on Gross Domestic Product (GDP) far superior to that of current monetary policies.

Additionally, how can central banks make sure they are not left overwhelmed by technologies driving the development of cryptocurrencies? By creating and adopting a digital central currency.

Our proposition combines these two responses: a digital currency made by the central bank that and accelerates their technological adaptation and directly increases the purchasing power of households. In the rest of this note we refer to it as '**drone money**[2]', digital currency being to money what the drone is to a helicopter.

Drone money will be a **monetary** tool deployed to obtain a stronger and fairer transmission of monetary policy. **It is not intended for states or for commercial banks, but for those have least benefitted from monetary policy since the crisis, the citizens.**

It involves a payment of a hundred euros (120 or 140 in the scenarios we present) of central bank digital currency (CBDC) to each resident (15 years and above or by including children through the parent's accounts) of the Euro zone, **every month for a test year,** subject to inflation being below the 2% target of the ECB, on an account that is opened for each person at the central bank. This sum would be paid without any conditions, and everyone would be free to spend the money as they wish. The corresponding issue of central currency required is around 480 million Euros annually or 40 million Euros monthly, to be at scale with the issue of the asset purchase programs carried out from 2015. This will translate to an increase in consumption expenditure that would *a priori* exceed 70% of this amount and could potentially cause an additional increase in income through a multiplier effect. This would depend on the propensity of households to spend the sum, but can be reasonably estimated to be 2 to 3 times the amount of base money issued (based on estimates of current empirical studies). This growth in consumption expenditure would likely have a sufficiently direct effect on inflation, making it easier for the ECB to reach its 2 per cent target and in doing so, holding off the risk of deflation. Once the inflation target is achieved, the distribution would stop. The cost of this operation would be financed entirely by the central bank that would issue a debt to itself, as does any bank when they create money. In terms of accounting, unlike the asset purchase program of the central bank, there would be no collateral assets to record against this debt. This is not a problem for the central bank. Symbolically, the central bank could

1 "Let us suppose now that one day a helicopter flies over this community and drops an additional $1,000 in bills from the sky, which is, of course, hastily collected by members of the community" (Friedman, 1969).

2 The expression "money drone" was used by the French economist Guy Abeille starting in 2016 in an article published in La Tribune (" 'Helicopter money': an alternative proposal for revival, through real estate", April 24, 2016) to design a helicopter money mechanism backed by household real estate. We use the expression here to propose a different mechanism for helicopter money.

claim an invaluable asset: the recognition of its citizens! There is no market price for this, but it is invaluable in these times of strong social and political tension.

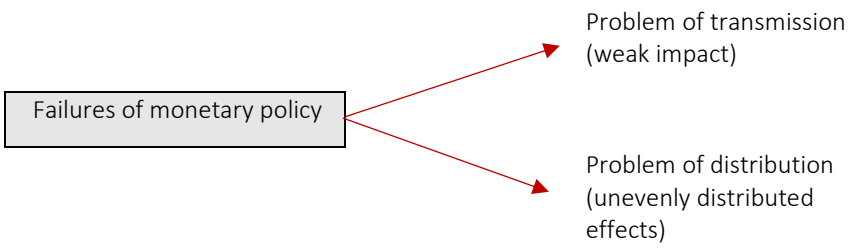
The rest of this paper is organised as follows. First, to justify the opportunity for such instrument, we examine the transmission problems and distribution effects of the monetary policy put in place after the financial crisis of 2007-08 in the euro zone (section 1). Then, we show how helicopter money responds to these dysfunctions. Next, we explain our proposition comprehensively, specifying the amounts proposed and the potential impact at the macroeconomic level (section 3). Finally, in the fourth and last part, we discuss the limitations and issues that drone money does not tackle. Our proposition seeks to be constructive and to the service of the mandate of the ECB.

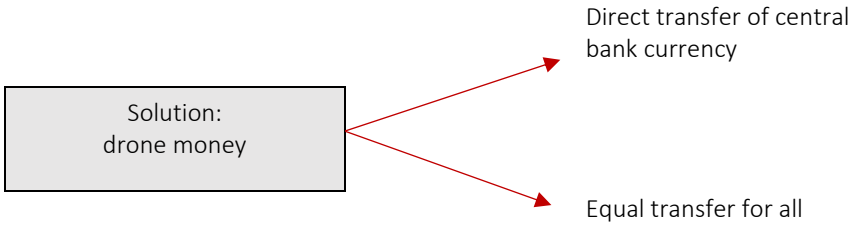
1. Unconventional monetary policies have a low and uneven impact on the economy

The monetary policy led by the ECB has been bearing alone the effort of the stimulus needed by the Eurozone after the financial crisis of 2007-2008. Other economic policies, fiscal policy for instance, have not been conducted to complement its effects. There is no question, therefore, of underestimating the magnitude of the task entrusted to the ECB or of the burden borne by the institution. Especially since no one can say what would have become of the banking and financial sectors, and the economies of the Eurozone countries, had the ECB not acted the way that it did. It must be acknowledged however, that the policy put in place faces two problems that seriously reduce its efficiency.

– One the one hand, a **problem of transmission**. The increase in the monetary base has not transmitted as well as expected to the money supply, and the increase in money supply in turn has not transmitted as well as expected to economic activity and inflation.

– The second is the **problem of distributional effects**. The effects of the monetary policy have not been equally divided. Everyone (lenders, borrowers, rentiers, workers, the unemployed, etc.) has not benefitted in an equal way. The ECB, like other central banks, may assert the neutrality of its actions, but the unconventional measures it adopted had winners and losers; and may have even worsened already large inequalities. In this first section, we will illustrate these two main flaws (problem of transmission and problem of distribution), which constitute two strong arguments in favour of drone money.





1.1. Weak transmission channels

In theory, an increase in the base money (central bank currency consisting of bank reserves and notes) is expected to cause a more than proportional increase in money supply (money in client deposit accounts in commercial banks + notes), inasmuch as the availability of central currency positively influences the ability of banks to lend to the economy, thus putting (more) money in circulation. This is the money multiplier theory. In practice however, this money multiplier does not – or no longer – seems to work.

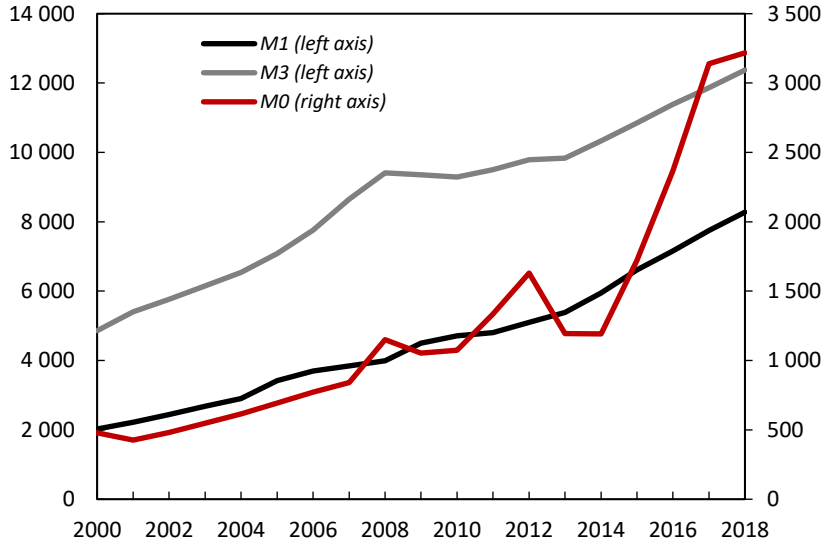
The ECB's data are enough to convince us of this. The monetary base (aggregate M0) effectively went from 842 million euros at the end of 2007, before the ECB decided to adjust its monetary policy, to 1631 million euros in 2012 just before the ECB decided to prematurely reduce it. That is practically double. Simultaneously, the money supply, in a strict sense (M1) went from 3840 to 5102 million euros, an increase of about one third. Therefore, no multiplier effect and on the contrary, a sort of loss instead, given that base money has increased three times more than the money supply in the strict sense, and seven times more in a broad sense (measured as aggregate M3) during this period.

To avoid any confusion at this stage, let us clarify that it is not their reserves at the central bank that (commercial) banks lend to the economy, but conversely, it is their loans to the economy that create new deposits, thus increasing the money supply and causing banks to need base money to carry out interbank transactions that accompany the circulation of money between bank accounts of agents. The availability of monetary base is, however supposed to positively influence credit supply and therefore money in circulation. And this is regardless of the idea that one supports of the relationship between base money and money supply. According to the money multiplier theory, base money determines money supply, therefore the latter is a multiple of the former. In the credit divisor theory, the base money becomes a division of the money supply determined by credit demand. Nonetheless, in this scenario too, the money supply is supposed to increase with the availability of base money. Banks respond all the more easily to credit demand as the access to monetary base is easy. However, in practice the broader availability of central bank money has not led to a proportional increase in money supply. Money supply has certainly increased but less than proportionally. Thus, current monetary policy defies both credit divisor and multiplier theories.

The first phase of adjustment that started in late 2008 ended in 2013. From the end of 2012 to the end of 2014, the base money of the Eurozone dropped (from 1631 to 1193 million euros), while the money supply (M1) continued to increase but at a slower pace (from 5102 to 5945 million euros). In 2015, the adjustment resumed with the ECB deciding to put into effect the asset purchase program, and the base money began to rise again. The increase in the base money was strong until 2018, almost 170%, against a 39% increase in M1 (and less than 20% for M3).

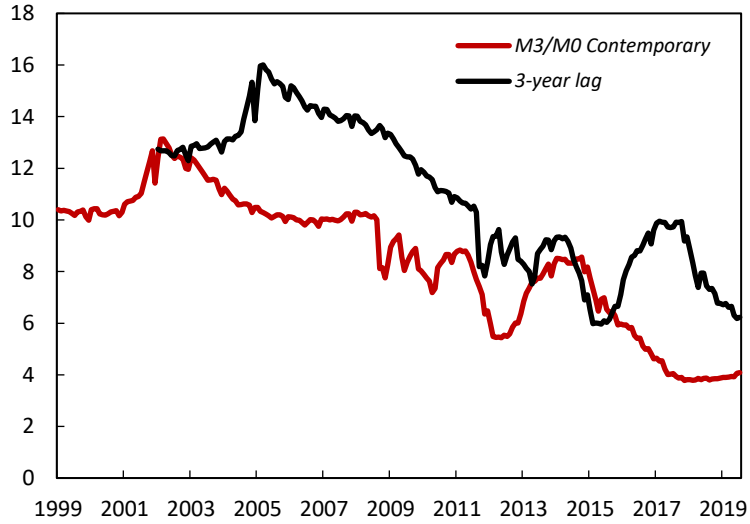
The increase in base money thus did not cause a proportional increase in purchasing power (by increasing the quantity of money in circulation). Globally, from late 2008 to late 2018, the base money almost tripled, the money supply in the strict sense (M1) a little more than doubled and in the broad sense (M3) increased a little more than 30% (Graph 1). As for the money multiplier, calculated like the ECB does, by simply linking the money supply to the base money, it appears to be declining, weak and unstable (Graph 2). This is one aspect of the weak transmission of the eurozone monetary policy to the economy during the course of 10 years of managing the crisis.

Graph 1. The monetary base grew much faster than the money supply



Interpretation: in billion Euros. The money supply is measured as the aggregate of M1 and M3, on the left vertical axis. The base money is measured as aggregate M0 on the horizontal axis.
Source: authors, based on ECB data.

Graph 2. The Relationship between base money and money supply has become weak and unstable



Interpretation: The ratio of money supply (M3) over base money (M0), shown here, is frequently used as an approximation of the money multiplier (Praet, 2016; ECB, 2017). M3 is linked to the M0 of the same year and the M3 lagged by 3 years. The three years lag allows to account for the delay in the transmission of monetary policy.
Source: authors, based on ECB data.

1.2. Small impact on the real economy

The second aspect has to do with the weak ripple effects of the increased money supply on the real economy. The increase in the money supply was certainly not at par with that of base money (which tripled between 2008 and 2018) but the order of magnitude was still 100% for M1 and 30% for M3. One would expect significant effects on inflation, investment and GDP growth. What did we see? The eurozone painstakingly got back to its 2008 real GDP per capita level (29,400 euros) only in 2016 (29,700 euros). The same for gross fixed capital formation (GFCF) which recovered its 2008 value only in 2016 for the Eurozone (as a whole), but not for individual countries (Spain, Portugal, Italy, Greece have not yet returned to their pre-crisis levels). As for inflation, in 2018 it was still well below its target of 2%. (OECD, 2018). At the end of 2019, inflation, as measured by the HICP index followed by the ECB, although on the rise was only at 1%.

The monetary policy put in place has without a doubt helped cushion the recessionary shock in the Eurozone (Blot and Hubert, 2018), but it has not had the expected stimulating effect. Moreover, as the International Monetary Fund (IMF) points out in its April 2019 report, it created bubbles by boosting the prices of real estate, bonds and other financial assets, which can burst at any time[3].

The rather disappointing performance of post-crisis monetary policy can be explained by its inability to stir consumption of productive investment. Consumption did not increase significantly because the base money issued went through banks and asset markets, which are less and less able to finance the real economy. In addition to being limited, the effects of this policy have also been unequally distributed.

1.3. Negative distributional effects

Central bankers are committed to the impartiality of their actions and want to work for the economy as a whole, without favouring type of sector or agent. When faced with criticism on the redistributive effects of their action, they have been defending the hypothesis, particularly since the QE in 2015, that nonconventional monetary policies (NCMPs) tends to reduce wealth and income inequality, perhaps not in the short term but surely over the long term (Mersch, 2014; Draghi, 2016). Indeed, since the NCMPs are supposed to reduce long-term interest rates, it would tend to lower the income of savers, therefore *a priori* of the wealthiest households. By reducing government bond yields, the NCMPs would also reduce income from life insurance or even complementary or contributory retirement pensions. From this point of view, the NCMPs would be rather unfavourable to the older or to the richer citizens.

It is not clear however that this reasoning holds for wealth inequality. The NCMPs can increase it for many reasons. Firstly, a drop in the interest rates stimulates credit, especially real estate and in doing so, supports real estate prices (Draghi, 2016). This therefore benefits landowners. Moreover, a drop in interest rates allows for an increase in the level of

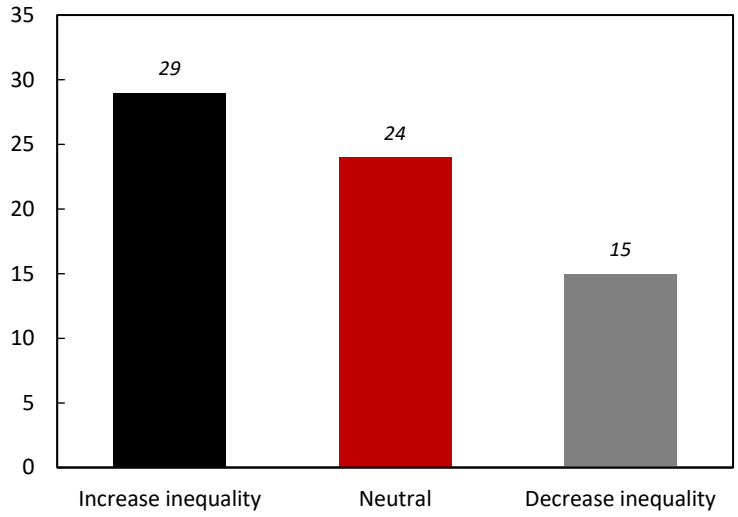
3 At the end of 2019, nearly a third of the world's well rated private and public bonds (investment grade) were at a negative rate, according to the Bloomberg Barclays Euro Aggregate indices.

borrowing and therefore an increase in wealth. Several high-income individuals saw this opportunity and turned from being savers to borrowers to increase their property assets. Therefore, a fall in interest rates, though *a priori* unfavourable to the wealthy households' income, ultimately became a source of wealth accumulation for them. In particular, the purchase of assets made as part of the unconventional monetary policies pushes up the price of bonds, making their holders richer. Finally, and contrary to the preferred hypothesis of central bankers, a reduction interest rates on loans does not necessarily benefit the less wealthy population.

The concerns about the redistributive effects of unconventional monetary policy (NCMP) are recent, but studies measuring their impact, mostly on income and wealth inequality and some looking at its differential effects based on gender, age or ethnicity (see annex) are multiplying (Colciago et al, 2019).

Few of them conclude that unconventional monetary policies reduce inequality. Out of the 68 results from 45 studies that we reviewed, only 15 conclude that inequality decreases, 24 conclude that unconventional measures do not decrease inequality and 29 conclude an increase in inequality (of wealth, income or gender) (Graph 3).

Graph 3: Unconventional monetary policy and inequality (results of the studies on the distributional impact of NCMPs)



Interpretation: 68 results from the 45 articles collected across different geographical areas – Eurozone, United States, Japan, United Kingdom. Out of the 68 results collected, 29 conclude that "NCMPs increase inequality", 24 find that "NCMPs have no effect on inequality" and 15 that "NCMPs decrease inequality". Source: authors.

Note that the studies that conclude NCMPs reduce inequality mostly relate to the Eurozone, but then again these come mostly from central banks' research departments. The studies on American data tend to show that NCMPs have increased inequality and even more so in the case of studies on Japan and the United Kingdom.

Unsurprisingly, these studies do not come to the same conclusions based on if they focus on income inequality or wealth inequality (see annex). Conclusions differ on income inequality,

but converge on wealth inequality, as most of these studies show a neutral to negative impact. This is not surprising given that the NCMPs increase asset prices, whether financial (stocks, bonds) or real estate ones.

By widening inequality, the NCMPs can have a serious political cost (Duarte and Schnabl, 2018), lead to radicalisation of preferences, and in doing so, favour extreme voting or direct demonstrations of discontent on behalf of the working class that is suffering from such rising inequalities. Of course, this can be offset by redistributive policies (Yoshino et al., 2018): higher tax on high incomes (compensating for the wealth effect from the NCMPs), an increase in public spending and return to work polices for the poor through skills development and training… these actions would be all the more feasible as NCMPs reduce the cost of public debt by lowering long term interest rates. In the Eurozone however, these policies have not been carried out. Nothing has been done to compensate for the impact of NCMPs on inequality.

2. Helicopter money would have a stronger, better distributed impact

A change of instruments is necessary and possible. The 'drone money' that we propose would a priori have a stronger effect because it is more direct, free from the transmission channels through which its effects were lost or diluted. It would have a direct and positive impact on the consumption of all households, since it is distributed to everyone.

2.1. What is helicopter money?

Milton Friedman is the first economist to have used the idea of 'helicopter money': "Let us suppose now that one day a helicopter flies over this community and drops an additional $1,000 in bills from the sky, which is, of course, hastily collected by members of the community. Let us suppose further that everyone is convinced that this is a unique event which will never be repeated…" Milton Friedman (1969).

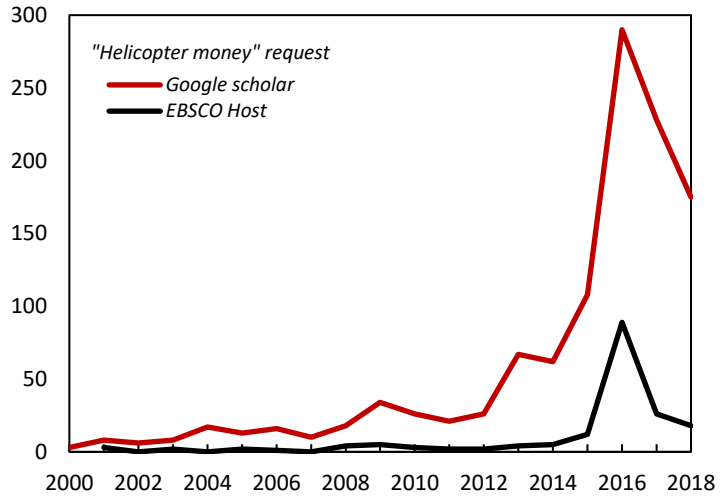
His intention was not to describe how to directly distribute money without conditions to members of a community per se. For him it was but pure abstraction. Recall that to Milton Friedman, inflation is always a pure monetary phenomenon. In his so called 'quantitative' approach to money, inflation stabilization requires a control of the amount of money in circulation. If inflation persists, it is because there is too much money in circulation and its quantity must be reduced. Conversely, if inflation becomes too weak, it is because there is not enough money available and more must be put into circulation. For Friedman, the helicopter was therefore only one way to visually represent the monetary action that was necessary in case of deflation: pour an additional amount of money into the economy.

The concept remained in the world of ideas without ever being part of the toolbox of policymakers and central bankers. But since the financial crisis and more importantly due to the failure of conventional and unconventional monetary policies to revive growth and inflation in Europe, the concept of helicopter money resurfaced in the public discourse and academic discussions. The number of research articles dedicated to the subject, listed by Google Scholar or EBSCO, has grown considerably since then, with a peak in 2016, likely

coinciding with the publication of the book by Adair Turner, Chairman of the Financial Services Authority, which was the authority in charge of monitoring the banking and financial sector in the United Kingdom until 2013 before the banking supervision functions were transferred to the Bank of England (Graph 4).

For the past few years, several macroeconomists have discussed the concept, notably the new Keynesians (Caballero, 2010; Woodford, 2013; Buiter, 2014; Bernanke, 2016; Cecchetti and Schoenholtz, 2016; Muellbauer, 2016). Helicopter money is the subject of publications in leading academic journals, like the Journal of Monetary Economics (Gali, 2019), Journal of Economic Perspectives (Rogoff, 2017), Review of Economic Studies (Caballero and Fahri, 2018), Economic Modelling (Di Giorgio and Traficante, 2018), Applied Economics (Von Rooij and De Haan, 2019), Journal of Economic Surveys (Lombardi et al., 2017), Intereconomics (Belke, 2018), Economics Letters (Cukierman, 2017). Central banks also dedicate publications and working papers to it, especially the Fed (English et al., 2017). And central bankers, in particular Yves Mersch or Mario Draghi at the ECB, have given it some minutes in their addresses, though certainly with a lot of scepticism.

Graph 4. The concept of helicopter money, a subject of increasing interest



Interpretation: number of articles associated with the search "Helicopter Money".
Source: authors, from Google and EBSCO.

Helicopter money is a direct distribution of central bank money to households, that could, in theory, be temporary or permanent. Some see it as the equivalent of a fiscal stimulus financed by issuing money (Bernanke, 2002; Gali, 2019).

It is through its mode of financing that the monetary drone distinguishes itself from traditional budgetary or fiscal policy; instead of being financed by public debt, the stimulus is financed by money creation and more precisely an issuance of base money. But why choose monetary financing rather than a fiscal one? According to recent work by Gali (2019), the multiplier associated by a stimulus that is money-financed is much stronger than a stimulus that is debt-financed. This effect is particularly strong when the economy is not in a situation where the interest rates are at the zero lower bound but stays significant even with low interest rates. Buiter (2014) shows similar results, showing that it is always possible to

stimulate aggregate demand with helicopter money, even in a liquidity trap situation. According to the latter, deflation is a policy choice, and at no moment is it a phenomenon that policy makers cannot control. In a period of crisis, instead of lowering key rates to 0 – or even lower – and then using unconventional monetary policy to lower long-term rates hoping for a stimulation of aggregate demand through the credit channel, the helicopter money solution appears more efficient.

Helicopter money is also different from quantitative easing in that it could have been implemented in the Eurozone between 2015 and late 2018, then re-launched starting November 2019. As part of the quantitative easing, the ECB effectively purchases debt securities, in large part member states' sovereign debt, which some authors liken to a budgetary transfer by the Central bank. Even so, ECB purchases are made on the secondary market and not on the primary market, and therefore do not directly consist in monetary financing of the states. Moreover, and this is what largely differentiates QE from a helicopter money distribution; when the ECB holds sovereign debt as part of an asset purchase program, it does not usually lead to a balance sheet loss, except in the rare case of a default by the issuer. The debts are held, replaced by others when they are due and, in general, generate profits to central bank, which is paid back to the national central banks and then to the states. And when the program comes to an end and the central bank resells the bonds it holds or does not replace those that are maturing, base money can decrease again. In the case of helicopter money, the increase in base money is irreversible in the sense that there is no reimbursement or resale that will destroy the central bank money initially issued.

2.2. How to distribute it?

If we take Milton Friedman's metaphor, a first solution would be that a helicopter releases bank notes. Clearly, no one can think this a serious solution; it would have all the problems that we are trying to avoid – a lack of fairness, a lack of efficiency, no ecological consideration…

For most authors, a distribution of helicopter money would necessitate cooperation and coordination between the central bank and the state (Buiter, 2014). The solution discussed most often involves the treasury, since it has the bank account information of citizens and as in case of a standard fiscal remission (tax remission for example), it can easily credit the account of an individual of its country. From a technical standpoint, the corresponding implementation would then be as follows: the treasury (the state) makes a payment to all the eligible households. It finances this distribution by selling bonds to the central bank and the latter cancels the corresponding debt, indeed creating a transfer financed by the central bank without any increase in public debt, as in the case of Buiter (2014[4]). Ultimately, this scenario is a fiscal stimulus financed by issuing central bank currency without condition.

However, in the case of the eurozone, this implementation by the treasury poses two major problems. For one, the ECB or the Eurosystem is not associated with one state but nineteen. This implies increased difficulties in coordination and cooperation. Second, current legal

[4] In the Buiter (2014) scenario, the central bank can also run the debt perpetually. This does not necessarily have any impact if the profits of the central bank are returned to the Treasury. There are other options, like zero-coupon perpetual bonds issued by the government.

provisions prohibit the direct purchase of sovereign bonds by the ECB on the primary market (Article 123 in the Treaty of Lisbon). It is therefore better to avoid the intermediation by the treasuries of the member states.

Without the intermediation of the treasury, the central bank would issue a claim to itself to directly finance this distribution. This is the very principle of money creation. According to Muellbauer (2014), there is nothing to prevent the ECB to use its electoral registry where 90% of Europeans are registered to directly identify the households of the eurozone eligible for this measure.

Nevertheless, the mode of distribution has yet to be chosen. Three can be envisaged a priori, each with its own technical problems:

- An issue of CBDC, which would be a new payment instrument introduced as legal. A type of digital cash usable through an electronic wallet[5];
- A transfer of base money to an account opened for each beneficiary at the central bank, accessible through a dedicated, downloadable application and transferable to a bank account;
- A direct transfer to the bank accounts of beneficiaries

The first two options amount to a **digital central bank currency** and comprise of a major monetary innovation in the eurozone, for which the costs and benefits will surely have to be weighed. The third solution, that of a direct central bank currency transfer to the accounts of beneficiaries, does not really involve an innovation, but is nonetheless technically complex. In any case, the European initiative to provide each European citizen, should they so wish, an electronic[6] identity, along with a means of authentication (password, a digital certificate for example) could be useful.

2.3. Preliminary identification of beneficiaries and comparison of the modes of transfer

Before the transfer, it will be necessary to identify each beneficiary, the following process is possible: citizens provide a proof of identity provided by their country to the central bank (identity card, passport, electronic identity) and have remote access to an dedicated exchange interface that would allow multiple uses depending on the mode of distribution chosen. The means of authentication must therefore be secured. The current standard consists of combining multiple elements of authentication: password, verification with a code

[5] It would be compatible with the article 128 of the Treaty on the Functioning of the European Union: "The European Central Bank shall have the exclusive right to authorise the issue of euro banknotes within the Union. The European Central Bank and the national central banks may issue such notes. The banknotes issued by the European Central Bank and the national central banks shall be the only such notes to have the status of legal tender within the Union."

[6] The European regulation on electronic identification and trust services for electronic transactions, eIDAS, entered into force on July 1, 2016. It provides the terms for the implementation of an electronic identity at the European level.

sent by SMS, confirmation of a transaction in a mobile application or another validation system.

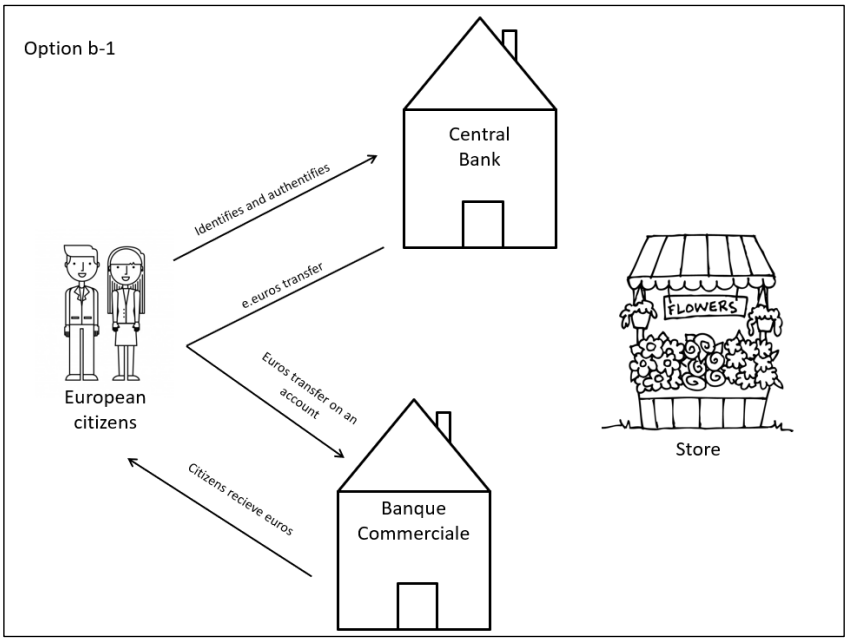
In the emission of CBDC in the form of e-euros (option a) scenario, each citizen would be assigned a username and a confidential code[7]. This would allow for the e-euros to be in an electronic wallet, accessible via a card or a mobile application on which the transaction statement can be accessed as and when transactions are carried out. The e-euros would co-exist, at least at first, with cash. Even if we are to assume that a replacement could take place, a transition to digital currency would take time as some agent cannot use or afford new technologies (Raskin and Yermack, 2018).

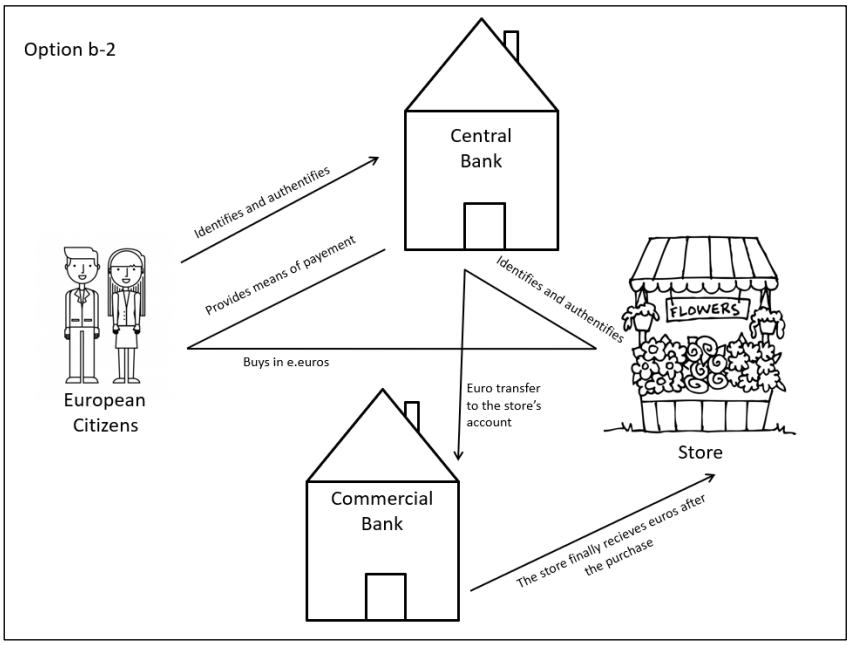
This first option *a priori* presents operational difficulties. Payments in e-euros would have to be adapted to all payment sizes and would have to be accepted by a very large number of stores, including small businesses. This entails setting up a payment network like Visa or Mastercard, which is costly and time-consuming. This could, however, draw EU-wide on past similar innovations such as 'Instant Payments' (realtime electronic transfers, implemented in France since the end of 2018[8]). However, this solution could be expensive as it requires the management of a second bank account for its users and the maintenance of a whole payment system: fixing eventual malfunctions, renewing and maintaining the supply of e-euros, dealing with incidents (losses or theft in particular), resolving payment disputes, etc. This will be possible only if the central bank acquires the corresponding organizational and human resources.

In the emission of CBDC transferred to citizen's accounts at the central bank scenario (option b), two types of transfers are possible. CBDC can be directly sent to beneficiaries (option b-1) or after they make a purchase (option b-2).

[7] For online payment with a credit card, the userID is the card number and its validity date. The confidential code associated is the code at the back of the card. For an online payment on commercial sites like PayPal or Paylib, the userID is usually an email address, and the secret code is the associated password. For a conventional cryptocurrency, the userID is the wallet number. The associated secret code is the private pin used by the asymmetric encryption algorithm.

[8] Instant payments, or the TARGET Instant Payment Settlement (TIPS) platform is a European initiative that supports innovation in payment solutions. This platform makes it possible to reduce transfer times to less than ten seconds and allows for tokenisation.



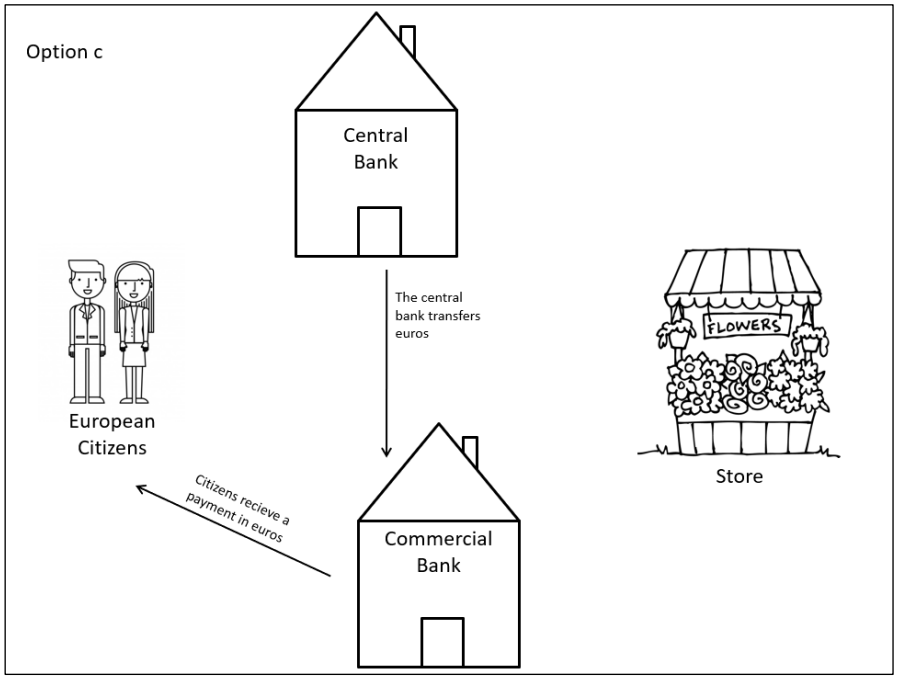


In option b-1, the beneficiary can directly transfer CBDC to his own bank account through an online service. Distribution costs would be minimized, but the sum issued could not be 'melting' (diminishing over time to incentivize consumption, a feature of many local currencies).

In option b-2, the CBDC would be used to make purchases. The sum would not be transferred to citizens but to retail stores, after a transaction. Then, businesses can trade CBDC for euros

at the ECB. This would enable the emission of 'melting' money and maximize the instrument's impact on consumption.

Finally, a direct transfer to the beneficiaries' bank accounts (option c) would not require any specific action from citizens. This seemingly simple option runs into many difficulties. For instance, it can be difficult to ensure that each beneficiary receives only one transfer per month, as many individuals hold multiple bank accounts. Only a few member states, such as France[9], have records tracking their citizens' bank accounts, and a European-wide cooperation on this issue may be difficult. One just needs to look at how much tax cooperation between member states is a tedious process.



In the end, the digital central bank currency options – a and b seem more practical, with **an advantage for option b** in terms of deployment costs.

2.4. The possibility of a central bank digital currency

The initial discussions about CBDC did not mention helicopter money and focused on the future of currency and monetary policy. In our proposal, the CBDC cannot be viewed as classic cryptocurrency. As Bordo and Levin (2017) explain, it would be introduced as legal tender and have a fixed nominal value.

How do we define it more precisely? The taxonomy proposed by Bech and Garatt (2017) classifies currencies based on four criteria: the issuer (the central bank or another issuer), the form of the currency (digital or otherwise), access or use (universal or otherwise) and the mode of transfer (centralized or decentralized). The first three criteria do not pose any difficulties: a CBDC is, by definition, base money in digital form (replacing all or part of

[9] FICOBA file

traditional fiat currency) accessible to all. The transfer method depends on the option chosen: the e-euros scenario (option a) is decentralized, whereas the transfer from the central bank scenario (option b) is centralized.

Let us give more details on the transfer method proposed by each scenario.

In option a, e-euros can be distributed through a Distributed Ledger Technology, as is the case for bitcoin, for example. There would be a public system, more or less decentralized depending on how transactions are verified. The most decentralized option would be a CBDC in the form of 'digital tokens' of e-euros that can be exchanged between firms and individuals, with each transaction being verified through a blockchain system (Shrirai, 2019). However, there exist alternative distributed registry systems that are not public, also called permissioned systems, that are semi-centralized, managed by an institution. In the case of CBDC taking the form of e-euros, we would rather consider this type of a system: as the central bank is an institution of 'hierarchical trust' (Aglietta, 2016), there is no need for a decentralized verification system to inspire confidence. Moreover, the use of a public registry would pose unnecessary privacy issues, such as the right to rectification (*a posteriori* payment modification) and to erasure (revocable payments[10]).

The 'account-based' scenario, option b, would be *a priori* simpler. Each individual uses his dedicated account at the central bank, which validates every transaction. Such a framework would imply, as highlighted by Bordo and Levin (2017), legal guarantees to protect the privacy of users, like the protection of personal data obtained by governments. The verification of transactions can be carried out as it is currently done for credit cards and can, in some cases include additional systems of authentication: SMS code verification for example for another system of validation. Technological evolution has considerably reduced the costs (book-keeping costs, ATM costs…) that justified central banks not accepting deposits from agents (Winkler, 2015). In case of a centralized system, the storage costs of digital currency would be practically zero (as opposed to a decentralized system) and the money could be directly accessible to the depositors through a mobile phone. This centralized mode of transfer would nevertheless entail administrative costs for the ECB that should not be overlooked, but the implementation of a well-defined legal and technical framework, seems entirely possible to implement given the state of new technologies (Bech and Garatt, 2017).

Recent experiments with CBDCs tend to take the form of digital cash or tokens in a centralized system managed, by the central bank. As of now, these are few in number and are not all successful.

In Ecuador for example, the first country to have experimented this type of initiative in 2014, the project had to be abandoned due to a lack of users. In this regard, it must be noted that the 'drone money' would immediately reach the critical mass of users necessary to establish and sustain the use of the CBDC. The Swedish Riksbanken, the oldest central bank has been testing a project of 'ekrona' since 2017, an electronic version of the Swedish krona, in a backdrop of a diminishing use of cash (Skingsley, 2016). Some countries currently have a

[10] See French Senate Report No. 584, "The technological challenges of blockchains". Available on http://www.senat.fr/rap/r17-584/r17-5841.pdf

CBDC in circulation – Venezuela (petro), the Marshall Islands (SOV), Tunisia (e-dinar) and Cambodia.

The experience of Venezuela has been a failure (Herrera, Anchustegui and Hunter, 2018); Cambodia's is more promising. Since July 2019, this country been issuing central bank digital currency (project Bakong, based on blockchain technology), accessible to individuals in the form of a mobile wallet made available by the National Bank of Cambodia or through distributers (similar to payment service providers). Tokenized Riels[11] are issued by the National Bank of Cambodia against a deposit, at par with the 'classic' Riel; the system would similarly support transactions in dollar, although the condition for issuing tokenized dollars have not been set out. The wallet can be used with retail stores as well as in a peer-to-peer mode between individuals. Transactions rely mainly on the reading of QR codes. This experiment can be potentially replicated for a central bank digital currency intended for use directly by individuals.

2.5. What are the expected effects?

Transferring CBDC to citizens is an unprecedented project. At best, we can predict its effects based on different theoretical and empirical works that assess the impact of sufficiently similar initiatives.

'Drone money' has two main features: a distribution to everyone and without conditions, comparable to a fiscal stimulus that does not impact public budget; it is financed by an issue of central bank currency, increasing base money. Like any other stimulus, it would lead to an increase in aggregate demand: one part of this increase would come from the distribution itself, the other part from a multiplier effect (an increase in expenditure increases revenues which then increase expenditure and so on). The increase in base money resulting from this mode of financing would directly impact the money supply, as this is a means of payment readily available, irrespective of the mode of distribution (e-euros, account at the central bank, bank account). This is the big advantage of helicopter money. It allows for a change in base money that is instantly transmitted to the money supply, unlike current monetary policies. Under the assumption of an increase in aggregate spending following the distribution of CBDC, the increase in money supply will very likely increase inflation. If the relationship between money supply and inflation has substantially weakened in the past few decades, it is precisely because a large part of the monetary holdings was used for financial transactions rather than spending. 'Drone money' goes beyond this obstacle and can help the ECB to reach its 2% inflation target. Of course, an increase beyond the 2% target would become a problem and be detrimental to the purchasing power of households. The nominal capacity they would gain on the one hand via helicopter money would be offset by the reduced real capacity that the inflation will induce. The solution to control inflation would be to link the amount of CBDC distributed to the inflation target: the sum would decrease as it gets closer, becoming a new stabilization instrument for the ECB.

[11] The riel is the official currency of Cambodia.

2.6. Overcoming intellectual and legal obstacles

The main problem to overcome in implementing 'drone money' at the European scale is not technical but intellectual. The Governing Council of the ECB can consider helicopter money only if it is fully convinced that such a distribution fits well with its goals and is indeed monetary policy. The reluctance is huge at the moment. Mario Draghi expressed this at a press conference in September 2019, just before he left the presidency of the ECB: "Giving money to people in whatever form is a fiscal policy task, not a monetary policy task". For the ECB vice-president, Vitor Constâncio too, "the original idea of helicopter money refers to direct financing of public expenditure. This is not an option for us. This is not on the table. The consensus is still far from favorable on this new instrument type but given the amount of thinking accumulating on the subject, it might evolve."

As at the time of the ECB's unconventional measures' implementation, current reluctant to policy innovation is linked to legal barriers, potential or presumed. What are these obstacles?

Article 127 (1) of the Treaty on the Functioning of the European Union defines the main objective of the Eurosystem as follows: "The primary objective of the European System of Central Banks […] shall be to maintain price stability". There are some concerns that the helicopter will accelerate inflation. As we will explain later, drone money will gradually increase inflation, but in order to reach the ECB's target. The fundamental goals of the Eurosystem are defined in Article 127(2), of the Treaty on the Functioning of the European Union. It consists of:

- defining and implementing the monetary policy of the Union,
- to conduct foreign-exchange operations consistent with the provisions of Article 219,
- to hold and manage the official foreign reserves of the Member States,
- to promote the smooth operation of payment systems.

Of course, helicopter money is not explicitly mentioned, but it precisely falls within the fundamental mission of the Eurosystem to define monetary policy and therefore the instruments that it considers useful. Hence drone money can be part of it (as well as other instruments that favour or do not serve the ecological transition). There are no major legal obstacles, no flagrant incompatibility between the Treaty and its implementation. Furthermore, if there are any more subtle ones, there is no doubt that the obstacles would quickly be overcome in the case of a new financial crisis, that would further reduce leeway to continue current monetary policies. A massive action would require innovation, a new 'whatever it takes!'.

3. Our proposal: a central bank digital money 'drone drop' to everyone without conditions

The ‘drone money’ that we are proposing would pay all citizens of the eurozone (either including children or not) a sum of central bank digital currency (CBDC) without consideration, conditions, or reimbursement.

3.1. Scenarios

To define our baseline scenario, let us start from a known order of magnitude in terms of a central bank money issuance, the one that the ECB announced in January 2015 to launch its asset purchase programme[12]: Monthly purchases of 60 billion, i.e. 60 billion euros of central bank money each month, 720 billion over one year. Since then, the programme has been increased and then decreased, becoming dormant at the end of 2018 and then relaunched in November 2019 at a rate of 20 billion per month. We will justify it on the assumption that the current asset purchases of 20 billion are maintained and that there is therefore, compared to the start of the 2015 programme, 40 billion per month of central bank money that could be issued under the monetary drone drop programme that we are proposing. If this 40 billion was paid directly to the citizens of the eurozone – the principle of ‘drone money’ – it would be distributed between about 340 million people (including children) or 290 million adults aged 15 and over (Table 1).

This would represent a distribution of approximately 120 euros per person per month in the first case or 140 euros per person per month in the second case. On this basis, we are using **a monthly transfer via a drone drop of 140 euros** per person aged 15 and over as the baseline scenario (scenario 3 in table 2), which can be adjusted (scenario 2 is calibrated to 120 euros per person per month including children to correspond to a monthly central bank money issuance of 40 billion, and scenario 1 is calibrated to 70 euros per adult per month to correspond to a monthly central bank issuance of half as much).

12 It is the order of magnitude that is of interest here and only the order of magnitude.

Table 1. Key figures for the eurozone, France and Germany

	Eurozone	France	Germany
Population	339,130,817	67,028,048	83,019,213
Proportion of under-15s in the population (%)	15.1	18.1	13.5
Population aged 15 years +	287,922,064	54,895,971	71,811,619
Nominal GDP (in billions of euros)	11,500	2,350	3,350
M3 money supply (in billions of euros)	12,960	2,470	3,180

Note: "15 years and above" is the threshold used to define people of labour force entry age.
Source: Eurostat, ECB.

This distribution of 140 euros per month per eurozone citizen over 15 years of age could be done for a test year. The duration of the scheme could then be adjusted according to its effects, particularly its effects on inflation.

Table 2. Scenarios

	Scenario 1	Scenario 2	Scenario 3
	70 euros for those aged 15 years and above	120 euros for everyone	140 euros for those aged 15 years and above
Eurozone			
– Monthly issuance	20	40	40
– Annual issuance	240	480	480
– Annual issuance/GDP	2.1%	4.2%	4.2%
– Annual issuance/M3	1.9%	3.7%	3.7%
France (in billions of euros)			
– Monthly issuance	4	8	8
– Annual issuance	48	96	96
– Annual issuance/GDP	2.0%	4.0%	4.0%
– Annual issuance/M3	1.9%	3.9%	3.9%
Germany			

– Monthly issuance	5	10	10
– Annual issuance	60	120	120
– Annual issuance/GDP	1.8%	3.6%	3.6%
– Annual issuance/M3	1.9%	3.8%	3.8%

Note: issuances are expressed in billions of euros. Values and percentages are rounded.
Source: Authors based on Eurostat and ECB.

3.2. Should children be included or not?

In our baseline scenario (Scenario 3, Table 2), each person (aged 15 years and above) would receive 140 euros of central bank digital money every month for one year in their central bank digital currency account administered by the ECB. A family of two adults would thus receive 280 euros per month. If the scheme included children (scenario 2) and a family of four would receive 4 x 120 = 480 euros per month (transfers to the children would be made to the parents' account).

In both cases, the corresponding issuance of base money for the eurozone would be 40 billion per month, or around EUR 480 billion over the year, which represents just over 4.2% of GDP and around 3.7% of M3.

Whether or not to include children is debatable, from an economic perspective, obviously, but also, and perhaps more so, from a symbolic perspective. In our scenarios, the transfer including children is calibrated at 120 euros to correspond to the same monthly issuance of central bank money (40 billion euros). From an economic perspective, a transfer that includes children would potentially be more "cost-effective", as households with children are likely to spend more. From a symbolic perspective, including children in the scheme would reinforce the universality and neutrality of the scheme: it would be truly inclusive. It would also be a mark of consideration for the younger generations and their future. However, including children in the scheme would inevitably make it more cumbersome to administer. Not so much from the point of view of updating the register of beneficiaries (adding births would mobilise the same source of information, for example each country's civil registry, as for counting deaths), but rather in terms of identifying the beneficiary (to which parent should the transfer be paid, especially in the event of separation?). This is therefore the option, ideally, would be best, but which in practice would present the most difficulties.

3.3. Points of comparison

Are the amounts involved realistic? They have been defined to be so, since we have based our calibration of this distribution on the amounts of previous central bank money issuances. By way of comparison, the ECB's monetary base increased by EUR 2,025 billion between the end of 2014, before it announced its asset purchase programme (APP), and 2018, which represented an increase of EUR 506 billion per year in the monetary base, representing 4.6% of GDP, which is still higher than the scenario we envisage (annual transfer of EUR 480 billion). Then, during the period of the asset purchase programme, which began in March 2015, the monthly amounts went up to 80 billion from April 2016 to March 2017 (twice the amount we are envisaging). They were reduced to 60 billion from April 2017 to December

2017, then 30 billion from January to September 2018, and finally 15 billion in the last quarter of 2018. Since the relaunch of the asset purchase programme in November 2019, they amount to EUR 20 billion. We do not propose replacing the 20 billion euros of monthly asset purchases, as these could instead be shifted to green assets.[13] We propose distributing an additional 40 billion euros per month directly to households (scenarios 2 and 3), or at least the same amount as the current asset purchase programme (20 billion euros), which, in terms of the order of magnitude of a central bank money issuance, would be nothing new. Moreover, the amounts envisaged for the transfer remain below those of the US fiscal stimulus package implemented in 2008, amounting to USD 787 billion, or 5.5% of GDP.

The distribution envisaged is higher than that suggested by Muellbauer (2014), in his "QE for People", which considers a one-off payment of 500 euros per citizen, estimated at a central bank money issuance of 137 billion euros, or 1.2% of the eurozone's GDP. In his proposal for a "monetary dividend", Oliveau (2019) suggests a variable amount per country, which would total between 200 and 400 billion euros per year, or between 1.8% and 3.6% of the eurozone's GDP (Table 3).

Table 3. Comparison of the drone drop with Muellbauer's QE4People (2014) and Oliveau's monetary dividend (2019)

	Amount (in euros)	Overall amount (in billions of euros/year)	As a % of GDP
Drone Drop	Between 70 and 140 (per person per month)	Between 240 and 480	Between 2.1 and 4.2
"QE for People (Muellbauer, 2014)	500 (one-off payment)	137	1.2
"Monetary dividend" (Oliveau, 2019)	50 to 100 (per person per month)	Between 200 and 400	between 1.8 and 3.6

Source: *authors.*

For a country like France, the distribution we envisage would represent a transfer of about 8 billion euros per month, or about 96 billion per year, representing about 4% of GDP. This would be equivalent to an increase of more than 3% in the median French wage (half of employees in France receive less than 1,800 euros). This annual transfer, which, it should be remembered, would not impact public finances, would thus represent more than 5 times the amount of the measures taken in response to the yellow jackets crisis (€17 billion) and more than 4 times the amount of Sarkozy's recovery plan of December 2008 (€22 billion, i.e. 1% of GDP). While this scheme has neither a social nor a fiscal objective, it would undoubtedly

13 On the possible ways of the 'greening' of the ECB's asset purchase programmes, see Veblen, "Aligning Monetary Policy with the EU's Climate Targets", Wojtek Kalinowski & Stanislas Jourdan, March 2019.

contribute to strengthening public support for the Central Bank's monetary policy action, precisely because its effects would be distributed among all, and would thus strengthen the institution's democratic legitimacy provided that all the eurozone countries recognise the desirability of the scheme to help the ECB reach its inflation target.

3.4. Implementation of the scheme

If we take 480 billion per year as the order of magnitude in our baseline scenario (**scenario 3** in Table 1), the scheme envisaged should *a priori* function as follows.

- The ECB issues 40 billion per month of central bank digital money.
- Each month, this sum is transferred to all eligible persons via a dematerialised account with the Central Bank (transfer **option b** seems the most operational to us), i.e. 140 euros per person of available, non-refundable credit.
- These sums are spent: i.e. a potential spend of 40 billion euros per month, probably a little less and with possible time lags, but a significant proportion (around 50% to 70%, see below) of the initial issuance can be expected to end up as household consumption expenditure.
- Expenditures are revenues for businesses, and overall income increases accordingly, resulting in expenditures that constitute income, etc.: this is the multiplier effect, the magnitude of which is fairly well evidenced by the results of many empirical studies. In annual terms, the potential spending of 50% to 70% of the EUR 480 billion could ultimately result (see next section) in an increase in overall income of around 2 to 3 times this spending if the order of magnitude provided by recent empirical studies is achieved, i.e. slightly more than 4 percentage points of GDP (Table 4).
- Increases in spending and overall income increase GDP growth and the rate of inflation. The ECB monitors the trajectory of GDP and inflation, reports on developments observed and warns individuals that, once its inflation target has been reached, the transfers will cease. This money transfer is not intended to be permanent but to improve the effectiveness of monetary policy, i.e. its ability to better achieve its inflation and growth objectives.

Table 4. Potential impact of scenario 3 according to propensity to consume

Total annual issuance	480	480	480
Propensity to consume	0.3	0.5	0.7
Multiplier effect	2	2	2
Total impact in billions of euros	288	480	672
Impact in percentage points of GDP	2.5	4.2	5.8

*Note: the multiplier effect (x 2) is determined on the basis of the average result of recent empirical studies (*see below*).*
Source: authors based on Eurostat and ECB.

3.5. Potential effect on inflation

Contrary to the monetarist view of inflation, in a latent context of secular stagnation as described by Larry Summers (2014, 2015) and low rates, it is not enough for the quantity of money in circulation to increase in order to observe a proportional increase in consumer prices (measured in the eurozone by the HICP – Harmonised Index of Consumer Prices). As noted earlier, the narrow money supply (M1) grew by 100% between 2008 and 2018, and the broad money supply (M3) grew by 30%, without inflation reaching its target of just under 2%. While the deviation from the inflation target was small, in average monthly frequency, from the introduction of the euro in 1999 until the start of the crisis in July 2007, it was then, until November 2019, 1 percentage point or more above or below the target for more than half of the time, i.e. a considerable deviation. From the launch of quantitative easing in March 2015 until November 2019, the average deviation from the target was one percentage point below the target (Graph 5).

Graph 5. Inflation (HICP) in eurozone and deviation from target

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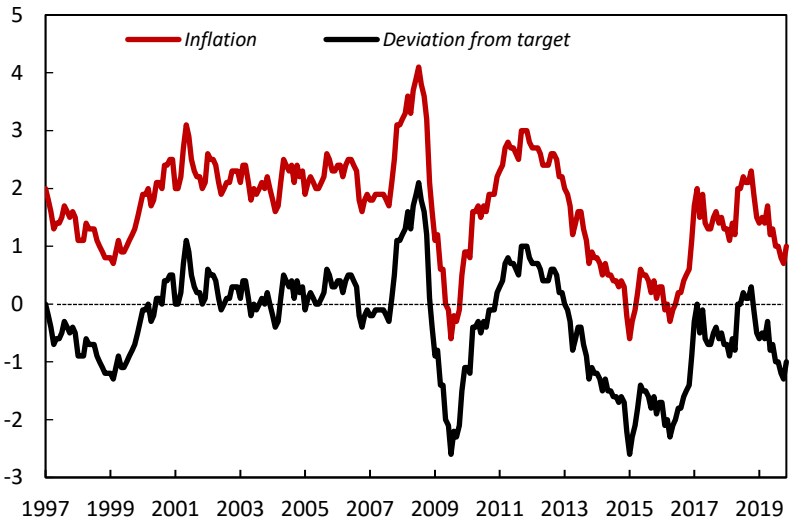

Note: The deviation from target inflation is given in percentage points.
Source: Authors, ECB data.

Of course, if the measure of inflation was not the HICP and included asset prices, it would be different, as property and securities prices were driven significantly upwards by the ECB's asset purchases. It is far from clear, however, whether this broadening of the measure of inflation to include the prices of volatile and cyclical assets is appropriate. Moreover, the explanation for the low level of inflation lies not only in the way inflation is measured. It also represents, firstly, the fact that inflation is not an exclusively monetary phenomenon and that it has become structurally lower with globalisation, demographic ageing and wage moderation, in a context of financialised capitalism in which the sharing of added value tends to evolve to the detriment of wages. And, secondly, the fact that much of the money created by banks was in the form of housing loans, rather than in the form of loans to companies. This in turn significantly affects the transmission mechanism between monetary policy and inflation. In this situation, it is real estate purchases that increase thanks to the loans, and therefore real estate prices, rather than business investment, production, wages, demand, the prices of the goods they sell and, ultimately, after a fairly long delay, the prices of goods and services.

Without calling into question the current measure or ignoring the structural factors of inflation, drone money proposing should nevertheless *a priori* have a more direct effect on consumer prices, precisely because it targets household consumption expenditure. The sums paid would be spent by households on goods and services whose prices are those measured by the HICP. Low-income households, which are also those with the highest propensity to spend the money at their disposal, are likely to concentrate their spending on food and energy. These two components of the HICP will therefore *a priori* increase the most rapidly. It is not as simple as determining *a priori* the amount by which inflation will increase as a result of the drone drop.

In his proposal for a monetary dividend, Oliveau (2019) estimates an increase in inflation of between 0.5 and 1 percentage point corresponding to the annual central bank money issuance he was proposing, and which is quite close to ours (400 billion euros in Oliveau's upper range, 488 billion euros in our proposal). In terms of the central money issued, the calibration of the two proposals is fairly close, but Oliveau's thinking is based on a very quantitativist approach (inflation as an exclusively monetary phenomenon) that differs greatly from ours (which includes the effects of globalization and structural factors). It is therefore logical to expect a lower and slower effect on inflation. It is not certain, for example, that one year of drone money will be enough to regain the missing inflation point in the eurozone so that the ECB can reach its target. It will *a priori* take several years (two or even three).

In other words, because we do not believe that inflation can be reduced to a monetary phenomenon, the effect that the drone drop will have on inflation will *a priori* be gradual, which will allay the fears of those who see this type of scheme as a danger to inflation and will also enable the ECB to tailor its communications as best possible to prepare for the discontinuation of the transfer once the inflation target has been reached.

3.6. Expected multiplier effect

In terms of the effects on activity, the scheme envisaged would be *a priori* equivalent to a tax cut (without cost to public finances). Its multiplier effect would therefore be of the same order as the tax multipliers estimated in a large number of empirical studies from which a clear consensus is now emerging: tax multipliers are high – estimated at between 2 and 3 (Ramey, 2019). To put it plainly, a transfer of 100 (via a tax cut) ultimately results in an increase in overall income of between 200 and 300.

This is the case for VAT, the reduction of which leads to a strong stimulation of aggregate demand, as shown in the study by Riera-Crichton *et al.* (2016) covering 14 OECD countries, including France: a one-point reduction in VAT leads to a 3.7% increase in GDP after one year. This is also the case for property tax, which affects about 50% of households, thus partly covering those with a relatively high marginal propensity to consume (Geerolf and Grjebine, 2018).

The results of these studies also make it possible to compare the effect on activity of a reduction in income tax with that of a reduction in corporation tax. The effect on investment is almost twice as great when the tax policy targets income tax rather than corporation tax (Mertens and Ravn, 2013).

These studies also show that the highest multiplier effects are obtained with schemes that target the disposable income of agents with a high marginal propensity to consume - i.e. agents that consume a large proportion of their income. The study by Zidar (2019), which assesses the impact of an income tax reduction, typifies this result: the multiplier is equal to 0 for the 10% of households with the highest income, versus 7 for the other 90%!

In February 2008, in response to the recession that began in December 2007, the US government adopted a fiscal stimulus package (Economic Stimulus Act of 2008), the impact of which was examined in Parker *et al.* (2013) and Broda and Parker (2014). Part of the plan was a $100 billion direct demand support program (Economic Stimulus Payments). Each individual

received between $300 and $600 and each couple between $600 and $1,200. For each household, 300 euros was added per child eligible for the "Child Tax Credit" program. The sums were paid by electronic transfers to bank accounts. Households spent between 12% and 30% of the transfer on non-durable goods in the following three months and a significant proportion on durable goods (cars in particular), leading to a spending rate of between 50% and 90% of the sum received. Parker *et al.* (2013) estimated the resulting increase in income from households in the second quarter of 2008 at between 3.6% and 4.5%, and 1.0% in the third quarter.

What can we infer about our proposal? That we can expect the drone money transfer to be spent fairly widely and rapidly and that it will create an increase in overall income that is two to three times greater than the central bank money issuance. We are using the low range (x 2) while maintaining that the multiplier effect will *a priori* be high, for two reasons. The first is well documented in empirical work: the multiplier effect is highest during recessions and when rates are at their lowest point (Auerbach and Gorodnichenko, 2012). The second reason is that the proposed scheme relates directly to households and their propensity to consume. In this respect, the multiplier effect will be all the greater as households have a strong propensity to consume the sums made available to them.

But should the multiplier effect be maximised by targeting the poorest households with the highest propensity to consume? *A priori* not, because the scheme we are proposing is neither a fiscal instrument nor a social action instrument, but a monetary instrument. Of course, if adopted, it will support household purchasing power, thereby helping to ease social tensions and restore some confidence in the work of our institutions. However, these are not the direct objectives of drone money, but the collateral benefits of a monetary policy made more effective by the drone, because it is conducted in the everyone's interest.

Furthermore, the multiplier effect need not be too fast. On the contrary, it would be better for the effects to be gradual and regular, so that the central bank can follow its inflation path with sufficient time to communicate to all households and businesses, so that they can adjust their expectations and are not surprised by the discontinuation of the scheme.

Should expenditure be forced by creating an alternative system of time-limited vouchers, again to achieve the greatest possible multiplier effect? In addition to the greater implementation challenges as it would be a more cumbersome alternative, this would be a bad idea for at least two reasons. The first is that the sums distributed will constitute only a fairly small proportion, on average, of household income. While a household receiving 100 of from the drone might be required to spend 100, there is nothing to stop it from spending less of its other income and saving more. It would therefore be pointless to force expenditure, as it will be impossible to control all the effects induced. The second reason is of a different order, that of respect for each person's right to manage the money they have at their disposal as they see fit and not to dictate what to do with it, in this case how they will spend it. While it may be useful to set the date of the transfer to ensure that it corresponds to a relevant time from the point of view of household budget management, it would be highly inappropriate to make the drone drop a form of financial paternalism, dictating to households when and how to spend the sum received. A spending obligation or, even more so, a spending guideline would either way feed the prejudice that poor or lower income

households manage their money badly (Colombi, 2015 and 2020; Perrin-Heredia, 2011), while at the same time obliging them to spend it, which would add paradox to disrespect.

Once again, the scheme we are proposing is a **monetary instrument** put in place to make the transmission of monetary policy stronger and fairer. It does not in any way replace, nor should it supplant, the **social, fiscal and environmental actions required to reduce inequalities, provide the zone with the instruments needed to manage the differences within it, and achieve the necessary ecological transition**.

4. Discussion of the issues that drone money will inevitably raise

As Borio *et al.* (2016) reminded us, in relation to both economic and helicopter money, there are no free meals. Helicopter money is definitely not a magic wand. It raises a large number of issues and objections that we propose to discuss in this final section. **The thirteen points below are questions to which we can provide answers.**

4.1. Isn't the monetary drone drop more a matter for fiscal policy than for monetary policy?

To those who claim that helicopter money is a transfer payment belonging to fiscal policy rather than monetary policy, the response is that, in the specific case of the eurozone, the constraints associated with the convergence criteria (government deficit below 3%) make it problematic if not totally impracticable to finance such a transfer through debt. Putting helicopter money in the fiscal instruments section is a way of condemning it to non-existence. Helicopter money will be a monetary instrument or will not be. There is no chance, in the eurozone and in the absence of a fiscal union, of seeing it happen in the form of a fiscal instrument.

The monetary drone drop that we are proposing is in no way intended to replace fiscal action, which is the only kind capable of directly activating the drivers of productive investment.

4.2. Should the amount of the payment be adjusted to the standard of living of citizens within the eurozone and between countries?

This question is similar to the previous one. The drone money is not a fiscal instrument. Neither at the eurozone level nor at the level of individual countries. The best the Central Bank can do in this area is to regain the neutrality it claims but does not have when it pursues a policy whose effects are unevenly distributed. Drone money would be a great step forward in this respect by allowing effects to be distributed among all. This should significantly enhance the legitimacy of the monetary institution. On the other hand, the ECB would be going far beyond its prerogatives if it sought to identify certain categories of agent, household and income on which to focus the effects of its monetary policy. This is indeed outside the scope of monetary policy and falls within the scope of income redistribution through the fiscal and tax policies of governments. Since, moreover, marginal propensity to consume is highest

among the lowest income households, a transfer of an equal amount for all would have a higher macroeconomic return for them than for more affluent households. It is not necessary to target lower income households to increase the effectiveness of the scheme, just not to put them at a disadvantage!

As to whether the drone drop should be adjusted according to the average standard of living in each Member State of the area, and as such transfer more to a German citizen than to a Greek citizen, this is the same as the previous question, transposed to the scale of the whole eurozone. And, therefore, the same answer should be given: that such an adjustment would not be the responsibility of the ECB, but of the eurozone States, or even of a eurozone Treasury Minister. Moreover, although the amounts transferred do not represent large proportions of income, their adjustment to the unequal standards of living within the eurozone could encourage migratory movements that Europe has shown it finds difficult to manage.

4.3. The drone money would boost consumption but little to no investment

Yes, drone money is directly geared towards driving consumption and will only have indirect effects, via its multiplier effect, on corporate investment. However, we must remember that demand is the main determinant of investment, according to empirical studies. Anything that supports demand therefore supports investment. It is therefore reasonable to expect that the multiplier effect of the drone money will benefit investment more than the reduction of interest rates over the past ten years under non-conventional monetary policy (NCMP). The resulting increase in effective demand and the easing of social tensions to which it could contribute are very favourable factors for corporate investment.

However, a direct stimulus to investment would require a fiscal action plan defined for the eurozone, based on a significant budget and the issue of eurobonds to provide the resources without taking responsibility away from the States.

Nor would the drone drop mean we could dispense with other monetary measures aimed at facilitating the financing of investment through asset purchases and their effect on long-term rates.

4.4. Wouldn't too much of the money distributed be saved?

The average saving rate (gross saving divided by gross disposable income of households) in the eurozone is 13.3%. It is on the rise and varies significantly from country to country. It is therefore expected that the transfer payments made via the drone drop will not be spent in full. Spending will be at best 13.3% less on average than the amount distributed and likely somewhat less than that.

If we take as a point of comparison, as Oliveau (2019) does, the tax cuts in the United States in 2001 and 2008, about one-third of the amounts distributed were saved by American households. The drone drop would likely produce the same return. As such, about 70% of the transfers made would actually be spent and would increase consumption expenditure. On this point we share Oliveau's opinion (2019), who points out that this is not a major problem for two reasons. The first is that savings eventually find their way back into the circular flow of

income. The second is that this still leaves a return well above that of the QE conducted from 2015 to 2018 or *a fortiori* the ECB's monetary policy. The increase in central bank money of just over EUR 2 trillion between 2008 and 2018 fell far short of a EUR 1.4 trillion increase in household consumption expenditure: during this period, consumption expenditure in the eurozone increased by EUR 286 billion.

As we have stated, we do not believe that it would be helpful to force spending by organising the scheme in the form of vouchers, as this would not prevent households from increasing savings from their other sources of income and, above all, it would constitute a form of financial paternalism that runs contrary to the confidence that needs to be restored. Let's trust every citizen to buy what they need. In order to obtain the consent of each citizen and to assess the degree of confidence in the scheme, it is conceivable that each citizen would have to answer "yes" or "no" to the question "Do you want to receive the drone money?" every month during the test year. Those who do not feel they need it or do not approve of the scheme will thus have the opportunity to express it.

Without paternalism, but in order to maximise the usefulness of the scheme, it would be advisable, on the other hand, to ensure that the date of the monthly transfer corresponds to a relevant time (the 15th of the month) when households will appreciate that their budget constraint eases a little and will be most inclined to spend the sum received. It is also possible, without making the system more cumbersome, to make the central bank digital money 'melting', i.e. to apply a negative rate that brings it back to 0 after a certain period (one month, one quarter, six months, etc.).

4.5. Why index the distribution of drone money to the inflation target?

Drone money is a monetary instrument that should make the ECB's monetary policy more effective. The ECB's mandate is a hierarchical one, which gives prime importance to price stability. Of course, this mandate could be discussed, but what is important for us here is to show that if the ECB wants to deliver on its mandate, it is not using the right instruments to do so. By directly increasing household consumption expenditure, the drone drop would have a stronger effect on inflation. As such it could become a more effective instrument for steering inflation, even if the ECB's target has to be redefined. In order for this steering to work, however, the drone transfer needs to be indexed to changes in inflation, so that the transfer is reduced as the ECB moves closer to its 2% target. Once the target is reached, the transfer stops. Households must be able to anticipate, based on communications from the Central Bank, the date on which the transfer will end. This indexation removes the fear of an inflationary drift and is a powerful credibility lever for the Central Bank, since it will thus be able to achieve the target that it is no longer achieving with its current instruments. As soon as inflation falls below its target, the drone would be reactivated. The ECB is also responsible for redefining the appropriate level of its inflation target where necessary.

4.6. Is the drone drop anti-ecological?

It is not an environmental instrument, and the increase in household consumption that it aims to produce can be seen as an impediment to the necessary reorientation of our growth model. Less energy-intensive production, fewer greenhouse gas emissions and more

responsible consumption are certainly necessary to achieve the ecological transition. That said, advocates of a profound change of model through the implementation of a *green new deal* highlight the need to reconcile ecological transition and social justice. As the yellow jackets crisis in France illustrated, we cannot subject households to the measures required for ecological transition, such as a carbon tax, if, at the same time, we fail to take into account the economic and social difficulties that a large proportion of these households face and if the economic policies implemented fail to remedy inequalities, or worse, increase them. As we have shown, NCMPs have significant redistributive effects that a large number of studies are now evaluating and which, overall, do not contribute to a reduction in wealth inequalities. In this respect, the monetary drone would be a fairer instrument of monetary policy as it would benefit all households, particularly those that would be greatly helped by a transfer of EUR 70 or 140 per person. By improving the fate of these households and by better disseminating the effects of monetary policy, the monetary drone drop would contribute to easing social tensions and create a context in which the necessary ecological measures would be better accepted.

The monetary drone drop would in no way prevent the greening of monetary policy, which could take place in parallel by maintaining a programme of green asset purchases and making bank refinancing conditional on the greening of their balance sheets.

4.7. As a CBDC, is drone money likely to destabilize the banking sector?

The implementation of the drone drop that we envisage involves the ECB opening an account on its books for every citizen of the eurozone. This account would be used to transfer monthly amounts of CBDC. Only the ECB would be able to credit these accounts, and their holders would only be able to spend the available funds, not to make deposits. The CBDC is therefore unlikely to weaken the deposit base of commercial banks. On the contrary, we might even hope that the ripple effects induced by the drone will accelerate the speed of money circulation and stimulate corporate productive investment, so commercial bank deposits might increase as drone transfers take place.

The monetary drone drop is Central Bank currency, which is fundamentally different from the debt money created by commercial banks. The monetary innovations of recent years (cryptocurrencies, complementary currencies, etc.) have considerably renewed the thinking and discussions on money and its creation. To some extent, these innovations express a mistrust of traditional money. And this mistrust is not confined to a few small solidarity economy associations wishing to express other values through their creation of complementary money. It was also expressed a few years ago by the Sovereign Money Initiative in Switzerland, where, in late 2015, it was planned to submit the proposal to remove the banks' power to create money to a referendum (a question that was not ultimately included in the referendum of February 2016). Critics of debt money usually denounce its mode of creation and thus its source, without highlighting its destination, which is perhaps a more important problem. Put another way, the problem with debt money may be more about its consideration than its source. Indeed, the main consideration of debt money today is credit intended for the purchase of real estate and financial assets and not for productive investment in the real economy, or purchases of securities by financial institutions leading to

the creation of money that then circulates in the financial sphere rather than in the real sphere. This basically relates to the banks' business model, which is no longer oriented towards corporate financing and no longer contributes as much as it should to investment. Replacing commercial bank debt money with central bank debt money is not enough to redirect the banks' business model towards productive investment in the real economy.

The CBDC we propose is intended to circulate in the real economy as it will be spent by households making purchases of non-financial goods and services. It therefore differs from commercial bank debt money not only in terms of its source but also in terms of its destination.

In any case, the proposed scheme is not intended to replace the debt money of commercial banks. Other versions of CBDC exist and are similar to the "Chicago Plan" proposed in 1933, in which the currency in circulation would be 100% Central Bank money. Such schemes would be profoundly disruptive to the banking sector by removing the banks' power to create money. These are a far cry from what we are proposing here. We are proposing an extension of the Central Bank's toolbox, not a complete rethink of the money creation process. Of course, the CBDC would constitute a new form of money and a new component of the money supply. At best, however, it would replace the "currency in circulation" component of M1.

4.8. Is it necessary to geographically limit the spending of the drone money so that its distribution does not miss its stimulus target?

The monetary drone drop is neither a fiscal instrument, nor an instrument of social policy, nor a solidarity instrument, as complementary currencies can be. It would not be within the ECB's field to define areas for the use of the sums transferred. Precisely because it is not a substitute for a complementary currency that can be used in a given region, there is every reason to believe that these important initiatives for the vitalisation of the territories should continue. As an example, the drone could be coupled with monetary innovations, such as those presented by Jérôme Blanc and Baptiste Perrissin Fabert (2016), aimed at leading the ecological transition across territories using local monetary circuits.

4.9. Does the drone allow for the inclusion of all households, including those without bank accounts?

Yes, as the transfer would not be made via a traditional bank account but via a CBDC account opened for each citizen with the Central Bank. This implementation, which would have been inconceivable just a few years ago, is now possible due to the development of electronic technologies. This is the most inclusive implementation possible and will also prevent banks from passing on to their customers the costs that might have been incurred by using the banks to credit beneficiaries' accounts.

4.10. Doesn't the monetary drone drop risk undermining social protection?

By making monetary policy fairer, or at least being more equal in its effects, drone money is a much more positive instrument for social justice than current monetary policy. However, it is not an instrument of social protection and is therefore not intended to replace it. States would be ill-advised to take advantage of a monetary policy shift that promotes social justice to reduce their own contribution to social justice by cutting back on social assistance and social protection.

4.11. Isn’t it a problem for the Central Bank not to be able to record a debt on its balance sheet in consideration for the transfer made?

Unlike the purchase of assets or a loan to banks, the ECB will not have any debts to enter on the assets side of its balance sheet against central bank money issued and transferred to citizens by the drone. The Central Bank will therefore absorb a loss... from itself. Is this more serious than buying devalued securities and damaging the value of its balance sheet in the context of *qualitative easing* (replacement of high-quality securities with poor quality ones)? The absence of a counterpart in the Central Bank's assets, as also pointed out by Oliveau (2019) in his monetary dividend proposal, is not a problem for a central bank. A central bank can continue to operate with a loss. In addition, not being able to record a value against this transfer will prevent it from inflating its balance sheet. In this respect, the ‘bloating’ of central bank balance sheets due to NCMPs is potentially a more serious problem as it reflects the large amount of liquidity poured into securities markets and the resulting risk of bubbles.

4.12. Since this does not create bubbles, does it replace macroprudential instruments?

The monetary drone drop has the specific feature of circulating central bank money in the real economy by increasing consumer spending. Of course, there is nothing to prevent *a priori* a household from using the money available to them to buy shares and financial products. In addition to the fact that the amounts distributed will not enable anyone to buy much, the distribution of these amounts to all households ensures that the sums will be used mainly to purchase non-financial goods and services. Unlike non-conventional measures, drone drops will therefore, *a priori*, have little direct effect on asset prices and will not contribute to the risk of a bubble. This does not, of course, make it an instrument for preventing financial crises. It would be dangerous to use this as a pretext to reduce progress on the macroprudential policies needed to prevent financial imbalances in economies subject to long financial cycles.

4.13. Won't international openness reduce the expected stimulus effect?

The question remains as to how globalisation affects the expected multiplier effect. In other words, what is the effect of a stimulus, whether monetary or fiscal, in economies open to the

rest of the world? Karras (2014) points out that more open economies benefit more from stimulus packages in the rest of the world. On the other hand, the tax multiplier of the countries initiating the stimulus is lower. In a globalised environment, income multipliers are therefore generally reduced. Does this compromise the effectiveness of the proposed scheme? No, insofar as the drone money would concern the eurozone, which as a whole is much less open than its component countries considered in isolation. It is therefore to be hoped that any "leak", associated with international openness, resulting from any measure resembling a stimulus (monetary or fiscal) carried out at European level would be of limited size.

CONCLUSION

The drone drop is a *high-tech* version of helicopter money, reconciling the Central Bank's need for technological adaptation with the need to make monetary policy work for all. This direct transfer of central bank money to each citizen of the eurozone, amounting to EUR 140 per month paid into a Central Bank account for a test year, would allow a fairly rapid increase in household consumption expenditure, of around 70% of the sums transferred, with the result that overall income would increase by around 2 to 3 times the expenditure made (multiplier effect). It would monetary policy instrument free of transmission difficulties and fairer, in that its effects would be distributed to all households.

It is not a fiscal instrument, and the transfer would not be adjusted to the income levels of the recipients. The expenditure would be neither mandatory nor guided. We believe that respect for each individual's right to dispose of the sums paid is much more conducive to the restoration of confidence and public support for the ECB's action than a paternalistic approach, which in any case, even if it were only a “nudge”, would not be within the institution's remit. On the other hand, the central bank digital currency transferred by the drone could be ‘melting currency’, to encourage its rapid use.

Stimulating consumption, while it may seem far removed from a thorough review of our consumption behaviours in pursuit of a system of sustainable growth, would go further than current monetary policy in support of social justice, without which there will not be sufficient adherence to the provisions necessary for the ecological transition. This does not prevent or exempt the ECB from greening its monetary policy by reserving its current asset purchase programme, which was relaunched in November 2019, for green labelled securities.

The transfer would be conditional on changes in inflation and would cease once the inflation target is reached. It would therefore be a monetary instrument that serves the mandate of monetary stability entrusted to the ECB.

The ECB is going to have to negotiate the technological turnaround very quickly in order not to lose control over the circulation of money and make those who consider monetary policy to be on its last legs eat their words. The drone drop would be a powerful lever for its development. At the press conference following its first Governing Council meeting on 12 December 2019, Christine Lagarde declared (in reference to the nicknames given to the preferences of the central bankers, some of whom prioritise price stability (hawks), and others the objective of growth (doves): "I am neither a dove nor a hawk, my ambition is to be

an owl, which is often associated with wisdom. "The drone drop would be an "owl" innovation, neither too "dove" (since it would allow the inflation target to be achieved) nor too "hawk" (since it would have a strong impact on growth), and therefore worthy of consideration.

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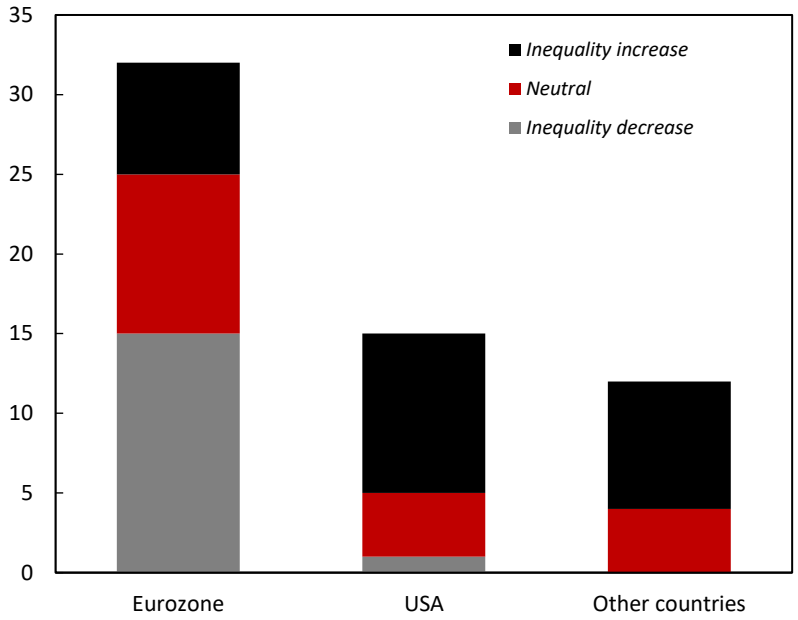
Annex
Distributive effects of unconventional monetary policies

This annex is meant to go deeper into the literature about the impact on inequalities of central bank asset purchases. Although the field is recent there is a growing number of empirical studies on that matter (Colciago *et al*., 2019), assessing the impact on wealth and income inequalities, in relation to gender, age and race.

In these studies, the expected effects are not clear: on the one hand, rich households benefit from lower credit costs, as their risk profile is low, and increases in asset prices which expand their wealth, composed of real estate and financial assets. On the other hand, low real interest rates impact their savings, life insurance and pensions. The impact on firms is unequal as well: the more financially strong can borrow at very low rates ; those who can use real estate and financial assets as collateral benefit from the surge in asset prices, which reduce their profile risk and further increases credit supply to them.

Among the 45 studies we collected, 29 find that NCMPs have increased inequalities between households (income, wealth, gender) and 24 find that they did not contribute to inequality reduction (see graph. 3). As we said earlier, only a minority conclude to a decrease in inequalities. 40 studies focus on a specific zone or country. Results vary between the eurozone, the US or other countries (such as the UK or Japan, where the longest NCMPs experiment has been conducted since 2001). Studies on the eurozone mainly conclude to a reduction in inequalities but are made by central banks' research departments, introducing a possible bias in the literature. Inequality increases are mostly found in the US and, more starkly, in the UK or Japan (see graph A1).

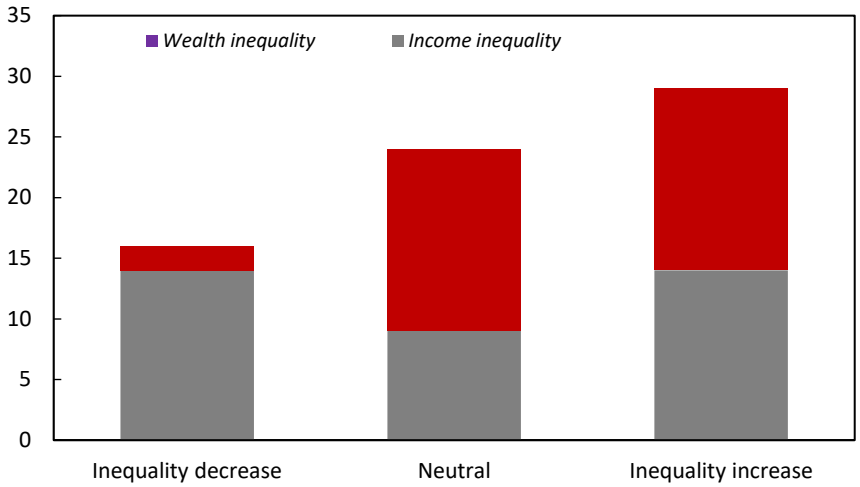
Graph A1. Breakdown of study results by geographical area



Interpretation: N = 40 articles. The number of studies is lower than in Chart 3 because a number of studies are not dedicated to a specific geographic area.
Source: authors.

Conclusions differ greatly depending on whether the studies focus on income inequality or wealth inequality (graph A2). The impact of NCMPs on income inequalities are debated, whereas most studies conclude they have increased wealth inequality or did not contribute to their reduction. The main mechanism identified is the surge in asset prices, may it be direct (asset purchases carried out by the central bank) or indirect, as NCMPs cause a reallocation of portfolios from bonds to stocks, increasing their price. These gains on stock prices are all the more important as stocks are liquid (more than real estate). This means that gains from NCMPs are faster and stronger for shareholders (mostly rich households) than gains from a decline in unemployment, which benefit to the working class (De Luigi *et al*., 2019). Hence asset purchases benefit more to capital (capital gains included) than labor, and more to the savers than the workers. Of course, the latter is less disadvantaged than the unemployed, as NCMPs increase more working hours than they create jobs (Blot *et al*. 2017). This is all the more important as, in times of crisis and uncertainty, employers prefer work intensification than hiring.

Graph A2. Breakdown of study results by type of inequality (income/wealth)



Interpretation: N = 45 articles.
Source: authors.

Some studies assess the impact of NCMPs on inequality depending on the agent's age: the fall in interest rates make credit more affordable only for those who already have access to it. A majority of the youngest citizens, who have difficulties to borrow, do not benefit from this measure. In the same way, those who already had a loan before asset purchases have decreased their interest rates through renegotiation, something the youngest potentially couldn't do. In a nutshell, credit cost reduction only benefited to the safer, oldest households, increasing inequality between generations (Ruth, 2017).

Wealth effects caused by NCMPs can strengthen gender and racial biases, as shown by some studies. According to Young (2018), owners of financial assets directly or indirectly impacted by the QE are mostly male, thus this policy has a less important impact on women. In the same way, white people are more advantaged by these policies than other categories (Rhys-Williams, 2019).

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