

The fiat money illusion: on the cost-efficiency of modern central banking

Karl-Friedrich Israel
Leipzig University
Institute for Economic Policy
karl-friedrich.israel@uni-leipzig.de

Abstract

There are at least two types of arguments for unbacked fiat money. One type elaborates on the alleged benefits of a flexible money stock that can be expanded for whatever reason deemed necessary, be it social, economic, or political. The other, more traditional argument is much more mundane. It stresses the potential benefits of an unbacked fiat money in terms of its production costs. While there is an undeniable grain of truth in the traditional cost-saving argument, actual fiat money regimes around the world are belying it. The Eurosystem, the Bank of England, the Bank of Japan and the Federal Reserve System all operate under relatively high costs. In fact, their operating expenses exceed the estimated costs of a generic fractional-reserve gold standard. Yet, even when the reserve ratio of the estimated gold standard is increased up to 100%, the operating expenses of these modern central bank systems remain in a similar range. Hence, the cost-saving argument is illusory in these cases. These results suggest that a return to a money that is at least partially backed by gold might be more efficient from the vantage point of the production costs of money. The Eurosystem and the Bank of Japan are particularly expensive institutions. Their annual operating expenses as a fraction of nominal GDP are more than five times as high as those of the Federal Reserve System and the Bank of England.

JEL Codes: E02, E50, E58, E59

Keywords: central bank, operating expenses, Eurosystem, Bank of Japan, Bank of England, Federal Reserve System, fiat standard, gold standard

I INTRODUCTION

Monetary policy has become more and more activist since it had been entirely freed from its golden fetters in the 1970s. The end of Bretton Woods marked the beginning of a global monetary system based on unbacked fiat money. The potential as well as the dangers of such a system have been widely discussed in the economics literature and they remain highly contested. Anything that would remotely resemble a consensus seems entirely out of reach.

For many economists a flexible and politically managed money stock contains in it an essential part of the solution to major macroeconomic problems, such as low growth, unemployment and the business cycle. For others it is one of the root causes of these phenomena. For them, financial market instability, systemic risk and growing macroeconomic fluctuations are in large measure due to monetary policy interventions that would never be possible in a system based on the principle of sound money of classical political economy (Mises, 1953, ch. 21).

Economic history provides numerous examples of the dangers of excessive monetary intervention. This might be the reason why for the longest time in the history of economic thought the argument for, first of all, fiduciary elements in the money supply, and then ultimately a completely unbacked fiat money standard, was not framed in the context of its potential for monetary policy interventions. The downside was far too obvious. Political control over a flexible money stock would sooner or later corrupt the system. Advocates of inflationary policies were thus seen as cranks. The traditional economic argument was not about economic policies at all. It was much more mundane.

Traditionally, economists have referred to the costs of production as the main reason why the money stock should be to some extent freed from its precious metal base. A substantial part of the factors of production that would be devoted to gold mining, refinement and transportation could then be used for other and more productive purposes and enrich society as a whole. As far as this argument goes, it contains of course an undeniable truth. However, it is by no means an *a priori* necessity that any given fiat money regime actually operates cost-efficiently. Quite to the contrary, there are good reasons to believe that public or semi-public institutions that do not only enjoy political independence, but also, in a very important sense, financial or budgetary independence, become increasingly wasteful and inefficient.

One of the most interesting examples in this regard is the European Central Bank (ECB) whose operating expenses have grown since its inception in 1998 at an average annual rate of more than 9%. Since 2012 alone the average annual growth rate has been above 12 % (Israel, 2019). This is partly due to the fact that the ECB is a relatively young institution and that the eurozone expanded several times during that period. One could suspect that the Eurosystem as a whole is exceptionally inefficient as all member states of the monetary union keep their own national central banks in place. But that is not the case. In this study we look at the operating expenses of four central banks or central bank systems: the Federal Reserve System, the Bank of England, the Bank of Japan and the Eurosystem. It is shown that the operating expenses of all four of them lie above the lower bound benchmark for the estimated costs of a generic gold standard derived from Friedman (1960), White (1999) and Garrison (1985).

However, before we enter into this empirical analysis of the operating expenses of modern central bank systems, the study is motivated by a brief historical overview of the traditional cost-saving argument from the classic writers to even some prominent members of the Austrian school as well as modern standard economic textbooks in the following section.¹

¹ This overview is an extension and elaboration of the one presented in Israel (2019).

II FROM THE CLASSICS TO THE AUSTRIANS TO THE MODERN STANDARD TEXTBOOK

The roots of the cost-saving argument lead us far back into the history of economic thought. It was initially not conceived as an argument for a fully unbacked money, but merely as one for a certain volume of fiduciary media. In other words, it was an argument for fractional-reserve banking.

Adam Smith hinted at the advantages of paper notes over commodity money in the second chapter of the second book of the *Wealth of Nations*. The first lesson to be learned from his well-known analysis is of course that the quantity of money circulating within a community is as such not part of the community's revenue. Yet, by replacing an expensive money by a cheaper one, the community's net revenue could be increased:

The substitution of paper in the room of gold and silver money, replaces a very expensive instrument of commerce with one much less costly, and sometimes equally convenient. Circulation comes to be carried on by a new wheel, which it costs less both to erect and to maintain than the old one. (Smith, 2007 [1789], p. 226)

There is thus a permanent or flow element of cost saving from replacing precious metal coins by paper notes, because the notes are cheaper to maintain and replace after wear and tear from ongoing circulation.

Moreover, a one-shot gain could be obtained. Smith argued that a much smaller quantity of precious metals than the quantity of paper notes in circulation, that is, a fractional reserve, would suffice to cover occasional demands for redemption. Hence, reserves in excess of the quantity needed, in Smith's example a fifth or 20% of the volume of paper notes, could be exchanged for goods and services from abroad. This would increase the net revenue of the community.

Indeed, Smith pointed out that it would be important that the additional revenue was invested and not merely consumed, so that "it promotes industry; and though it increases the consumption of the society, it provides a permanent fund for supporting that consumption" (Smith, 2007 [1789], p. 228). It must again be noted that Smith did not advocate an entirely unbacked money. He merely highlighted the potential benefits from reducing the amount of precious metals held as reserves for redemption.²

The argument was later made more explicit and pushed further in the writings of David Ricardo. In his *Principles of Political Economy and Taxation* we find the following passage:

A currency is in its most perfect state when it consists wholly of paper money, but of paper money of an equal value with the gold which it professes to represent. The use of paper instead of gold, substitutes the cheapest in place of the most expensive medium, and enables the

² As Smith (2007 [1789], p. 227) explained:

By this operation, therefore, twenty thousand pounds in gold and silver perform all the functions which a hundred thousand could otherwise have performed. The same exchanges may be made, the same quantity of consumable goods may be circulated and distributed to their proper consumers, by means of his promissory notes, to the value of a hundred thousand pounds, as by an equal value of gold and silver money. Eighty thousand pounds of gold and silver, therefore, can, in this manner, be spared from the circulation of the country; and if different operations of the same kind should, at the same time, be carried on by many different banks and bankers, the whole circulation may thus be conducted with a fifth part only of the gold and silver which would otherwise have been requisite.

country, without loss to any individual, to exchange all the gold which it before used for this purpose, for raw materials, utensils, and food; by the use of which, both its wealth and its enjoyments are increased. (Ricardo, 1821, pp. 262-263)

The above reflection, however, is merely theoretical. Like Smith, Ricardo did not openly advocate the abolition of convertibility of paper notes into coin and bullion, although there is a certain tension in his writings. On the one hand, he deemed it absolutely necessary to keep redeemability of paper notes into specie in place as a check against potential abuses of the note issuing privilege. Yet, on the other hand, he would allow, within certain limits, for a fluctuating market rate at which notes could be redeemed, bringing his scheme in some sense very close to a fiat standard.³

Ricardo discussed in some detail the relative advantages of granting the legal privilege of note issue to either banks or the government. He argued that society as a whole would be as well off in one case as in the other, given that the note issue follows the dictates of prudence. Yet, if the government was to issue the notes directly, the public would be relieved of interest payments accruing from banks extending loans to finance government expenses. Banks in turn would no longer receive the respective interest payments. Ricardo saw precisely this as an argument for leaving the responsibility for issuing paper notes in the hands of government.⁴

This line of argumentation was followed up in more detail in Ricardo's posthumously published *Plan for Establishment of a National Bank*. The author was aware of the dangers of a legal monopoly privilege and strongly advocated what would today be referred to as central bank independence with strict limitations on direct government finance:

There would, I confess, be great danger of this, if Government - that is to say, the ministers - were themselves to be entrusted with the power of issuing paper money. But I propose to place this trust in the hands of Commissioners, not removable from their official situation but by a vote of one or both Houses of Parliament. I propose also to prevent all intercourse between these Commissioners and ministers, by forbidding every species of money transaction between them. The Commissioners should never, on any pretence, lend money to

³ See Ricardo (1824), where his monetary reform plan is laid out. According to this plan, new notes would usually come into circulation in exchange for either old notes or precious metals. Point 12 of his plan states that: "The Commissioners in London shall be obliged to buy any quantity of gold of standard fineness, and exceeding one hundred ounces in weight, that may be offered them, at a price not less than £3: 17s. 6d. per oz." (pp. 18-19). This leaves of course open the possibility for a substantially higher exchange rate and relative devaluation of paper notes.

⁴ He provided the following example of financing government expenditures in the two alternative ways to illustrate his point:

Suppose that a million of money should be required to fit out an expedition. If the State issued a million of paper, and displaced a million of coin, the expedition would be fitted out without any charge to the people; but if a Bank issued a million of paper, and lent it to Government at 7 per cent, thereby displacing a million of coin, the country would be charged with a continual tax of £70,000 per annum: the people would pay the tax, the Bank would receive it, and the society would in either case be as wealthy as before; the expedition would have been really fitted out by the improvement of our system, by rendering capital of the value of a million productive in the form of commodities, instead of letting it remain unproductive in the form of coin; but the advantage would always be in favour of the issuers of paper; and as the State represents the people, the people would have saved the tax, if they, and not the Bank, had issued this million. (Ricardo, 1821, p. 263)

Government, nor be in the slightest degree under its controul or influence. Over Commissioners so entirely independent of them, the ministers would have much less power than they now possess over the Bank Directors. (Ricardo, 1824, pp. 11)⁵

The cost-saving argument for unbacked paper substitutes or fiduciary media has also found its way into the writings of economists of the 20th century. Somewhat surprisingly, it was taken up, for example, by Ludwig von Mises. According to Mises (1953, pp. 298-299), fractional reserve banking historically prevented a stronger increase in the exchange value of money in the course of technological progress and the extension of the monetary economy. As a result, less capital and labor was directed towards the mining of gold for monetary purposes and was instead available for other productive enterprises.⁶ In his later writings, Mises rejected the alleged benefits of fiduciary media altogether, arguing that they are always causing symptoms of the business cycle, whenever issued (Mises, 1998, ch. XX).

Indeed, regardless of the question of fractional-reserve banking, Mises was no proponent of central banking. He thought a free banking system under a gold standard to be more reliable in checking abuses of excessive note issue. In that regard he was more in line with the teachings of Smith rather than Ricardo.

Moreover, Mises was not the only adherent to the Austrian School, who took up the cost-saving argument. Both Carl Menger and Friedrich von Wieser, two eminent predecessors of Mises in the field of monetary economics, referred in some form or another to the cost-saving argument. Menger (1970 [1909], p. 112) pointed out, in the third edition of a largely neglected encyclopedia entry on money, that central bank issued paper money substitutes may free up some of the precious metal otherwise used in circulation. It could be either exported or used for other productive purposes. After Menger's death it was Wieser who wrote the entry on money for the fourth edition of the *Handwörterbuch der Staatswissenschaften*. Wieser (1926, pp. 689ff.), too, emphasized the economizing effect on the monetary good that credit money and unbacked paper notes may have, while of course not failing to mention the detrimental effects of an excessive note issue. Similar considerations can be found in his *Social Economics* (Wieser, 1927, pp. 258ff.).

That even some adherents to the Austrian School have picked this argument up underlines its importance in the history of economic thought. After all the Austrians are associated, more than any other branch of modern economics, with advocacy of either sound commodity money or competition in the provision of money. It seems needless to say that other economists have used the same argument less cautiously than the Austrians.

In fact, today, the cost-saving argument is mentioned as a matter of course, often only in passing, when the advantages of our modern monetary system are discussed. Samuelson and Nordhaus (2009, p. 459), for example, write in the 19th edition of their celebrated textbook *Economics*: "But metallic money has shortcomings because scarce resources are required to dig it out of the ground."

Krugman and Wells (2015, pp. 856-7) make a direct reference to Adam Smith's famous metaphor for paper money as being a "waggon-way through the air." According to them, the "big advantage of

⁵ Indeed, here seems to be another tension in Ricardo's writings as the previously mentioned advantage of leaving the note issue in the hands of the government was the interest-free finance of government expenditures, that is, direct government finance.

⁶ A whole debate has emerged out of these statements by Mises on whether or not he was a proponent of fractional-reserve banking. See White (2014), for an interesting back and forth between some of the contenders.

commodity-backed money over simple commodity money, like gold and silver coins, was that it tied up fewer valuable resources.” Banks would have “to keep only enough [reserves] to satisfy demands for redemption of its notes.” And only a couple of paragraphs later they rhetorically ask: “why make any use at all of gold and silver in the monetary system, even to back paper money?” And the answer the student gets is that we do not actually use it anymore in our modern monetary system, because an unbacked fiat money “is even more of a ‘waggon-way through the air’ – creating it doesn’t use up any real resources beyond the paper it’s printed on.”

While this could of course be true, in principle, it might not actually be the case in practice. How much more cost-efficient are fiat-money-producing central banks really? In order to properly evaluate the actual cost savings from fiat money, we have to estimate the resource costs of a gold standard. Only with such an estimate would we have a suitable benchmark for comparison when we look at the actual operating expenses of modern central bank systems.

III A BENCHMARK FOR COMPARISON

Such an estimate of the costs of the gold standard as a percentage of GDP was provided by Milton Friedman who probably is the modern economist who has reinvigorated the cost-saving argument most forcefully. He has pushed it to the point of explicitly advocating a complete fiat standard (Friedman, 1960), which implies the necessity of a central bank as the very institution that controls the quantity of at money.⁷

White (1999, pp. 42-48) concisely summarizes Friedman's influential estimate of the flow resource costs of the gold standard (Friedman, 1953, ch. 7; 1960; Friedman and Schwartz, 1963). He explains that Friedman decomposed the estimation of the ratio $\Delta G/Y$, where ΔG is the nominal value of the change in the gold stock from one year to the next and Y denotes annual nominal GDP, into three parts:

$$\frac{\Delta G}{Y} = \frac{\Delta G}{\Delta M} \frac{\Delta M}{M} \frac{M}{Y},$$

In the above equation, M corresponds to the money stock M_2 . Each of the three ratios was then replaced by its respective empirical, or indeed normative, counterpart. Friedman assumed somewhat surprisingly a 100%-reserve standard on M_2 , and hence $\Delta G/\Delta M$ would have to be equal to 1, that is to say, every increase in M_2 would be fully backed by an increase in the gold stock. This of course

⁷ As Friedman (1953, p. 216) explained:

The introduction of fiat elements into the monetary stock immediately raises the question, who is to create the fiat currency and control its issuance? Fiat currency is practically costless, whereas commodity currency is not. Under competition there will be a tendency for each kind to be produced up to the point at which its value equals its costs. This sets definite limits to the quantity of a commodity currency; it means indefinite increase in the quantity of a fiat currency and indefinite decrease in its value. There is no stable competitive equilibrium except when the fiat currency declines so much in value that it becomes a commodity currency, the commodity being the paper and services used in producing the currency. Competition is therefore inappropriate for determining the amount of a fiat currency. The production of fiat currency is, as it were, a natural monopoly, which explains why a measure of control has typically been exercised by government, why the privilege of issuing currency has been fought for so vigorously, and why proponents of a private competitive order, like Henry Simons, have held the view - which I share - that the creation of fiat currency should be a government monopoly.

exaggerates even the suggestions of the most ardent supporters of a full-reserve gold standard, who typically are in favor of 100% reserves on the smaller monetary aggregate M_1 (Rothbard, 2011, ch. 41). Friedman's estimate is thus likely to be too high.

As suggested by Friedman (1960) the money stock would have to grow by about 4% to ensure price stability and hence $\Delta M/M$ was set equal to 0.04.⁸ Lastly, the ratio between the money stock M_2 and nominal GDP was estimated to lie around 0.625. Hence, plugging in these values one obtains

$$\frac{\Delta G}{Y} = 1 \times 0.04 \times 0.625 = 0.025.$$

Friedman thus estimated that a 100%-gold-reserve standard on the M_2 money stock with an annual expansion of the money stock that ensures price stability (zero price inflation) would lead to resource costs of 2.5% of GDP each year for acquiring the necessary amount of gold. This would be the amount potentially saved each year under a well-managed fiat standard.⁹

White (1999, p. 46), too, argues that this "calculation gives a huge overestimate of the resource costs of a gold standard with an advanced banking system in the absence of legal reserve requirements." Indeed, a central characteristic of an advanced banking system in White's sense would be the lack of legal reserve requirements. He points out that with a reserve ratio of about 2% instead of 100% the estimate would turn out to be 0.05% of GDP ($0.02 \times 0.04 \times 0.625$).¹⁰ White further suggests a downward adjustment of the growth rate of the money stock to 2%. A lower growth rate would have sufficed to ensure price stability, since velocity had increased since Friedman's work had been published. The estimate would thus fall further to 0.025% of GDP ($0.02 \times 0.02 \times 0.625$).¹¹ Moreover, White (1999, p. 48) adds that the costs could be reduced even below 0.01% of GDP when full-bodied gold coins in circulation were to be replaced by fractionally backed token coins.¹²

There are of course reasons to believe that White's estimate may be downward biased due to the extremely low reserve ratio he assumed. Yet, there is also at least one important respect in which it might still be too high an estimate. As Garrison (1985) points out the price elasticity of the gold supply in a free-market setting would not be perfect. Hence, if we assume a market-driven production of gold

⁸ Friedman used the dynamic version of the equation of exchange which equates the sum of the annual growth rates of money and velocity to the sum of the growth rates of the price level and real output ($\Delta M/M + \Delta V/V = \Delta P/P + \Delta y/y$). Hence, assuming a real output growth of 3% and velocity growth of -1% (i.e. velocity slows down), the money stock has to grow at 4% to ensure price stability (i.e. zero price inflation).

⁹ It is interesting to note that Friedman himself became more critical about the relative benefits of fiat money later in his career emphasizing additional resource costs of a fiat standard that emerge, for example, from hedging against increased future price uncertainty (Friedman and Schwartz, 1986). This, however, one might argue, is not a necessary cost element of a fiat standard. It comes into play only under a poorly managed fiat standard.

¹⁰ An actual reserve ratio of close to 2%, occasionally even less, prevailed, for example, during the free banking period in Scotland in the first half of the 19th century prior to the Peel's Act of 1845 (White, 1984).

¹¹ The last ratio of the money stock to GDP had not changed systematically according to White.

¹² White (1999, pp. 46-47) invoked other empirical ratios from the US in the 1990s, such as that coins were about 8% of currency (circulating banknotes and coins), currency about 51% of M_1 , and M_1 about 32% of M_2 . Assuming that all coins are full-bodied gold coins, he thus showed that with a 2% reserve ratio on notes and demand deposits, as in Scotland back in the days, overall about 2% of M_2 would be backed by gold in this version of the gold standard. This ratio could be further reduced with fractional-reserve token coins.

money, the equilibrium price inflation rate would be negative as the result of real economic growth. The effect of technological progress and economic growth would translate partly into a quantity effect, i.e. an expansion of the gold stock, and partly into a price effect, i.e. an increase of the exchange value of gold *vis-à-vis* other goods, or in other words, a reduction of the general price level. Hence, in a genuinely free monetary system based on gold, there would not be zero price inflation as Friedman and White assumed. There would be benign growth deflation as was observed, for example, during the period of the classical gold standard (Bagus, 2015; Borio and Filardo, 2004; Salerno, 2003). So, with an annual price inflation rate of, let us say, -1%, the estimated resource costs of the gold standard would further decrease to 0.005% of GDP.

It seems clear that this number can only serve as a rather optimistic lower-bound estimate of the annual costs of a gold standard. Gradually increasing the reserve ratio would also increase our estimate. If we were to follow Rothbard's (2011, ch. 41) recommendation of full reserves on M_1 , the estimate would, however, still be much lower than Friedman's original number.

Over the past 20 years, M_1 has on average been about 22% of M_2 . At the time of White's estimate it was closer to a third. Hence, taking full reserves on M_1 , we would obtain a gold to M_2 ratio of about 0.3, and accordingly a flow-resource cost estimate of 0.1875% of GDP ($0.3 \times 0.01 \times 0.625$). Allowing for possible shifts in the money-to-GDP ratio, the real growth rate as well as the velocity of money, we are rounding up to 0.2% of GDP and take this value as an upper-bound benchmark for comparison.¹³ This leaves us with an estimated range of 0.005% to 0.2% of GDP.

White himself proceeded to calculate the deadweight loss of increased price inflation. Assuming that his estimated annual resource costs of 0.025% of GDP for the gold standard could be avoided entirely if gold was to be replaced by a fiat money, he concludes that a "country where fiat money is managed so as to keep inflation below 4 percent can do without a gold standard; but a high-inflation country would be better off with gold" (White, 1999, p. 49).

These estimates are arguably arbitrary and could be tweaked in either direction, but it is important to note that they implicitly assume the costs of fiat money production to remain negligible over time. In the following section we will challenge this assumption by looking at the actual operating expenses of the Eurosystem, the Bank of England, the Bank of Japan and the Federal Reserve System. Their annual operating expenses will be compared with the above range of estimated resource costs of a generic gold standard (0.005% - 0.2% of GDP).

IV THE OPERATING EXPENSES OF MODERN CENTRAL BANKING

As a matter of principle, it is indisputable that fiat money could be much more cheaply produced than gold or any other commodity money. Yet, it is by no means a necessity. Sure enough, a Friedmanite k -percent rule with respect to some monetary aggregate could be implemented by a powerful computer network, a printing press, and some, relatively small, supervisory board. The costs of production would reduce to an annual electricity bill, expenses for ink, cotton (not actually paper) and some other materials needed for banknote and coin production, computer maintenance expenses, salaries for the board members, as well as some other minor expenses, such as maybe an annual board meeting in a pleasant and stimulating environment in order to vigilantly supervise the constant growth rate. The overall costs of production of money could be truly negligible.

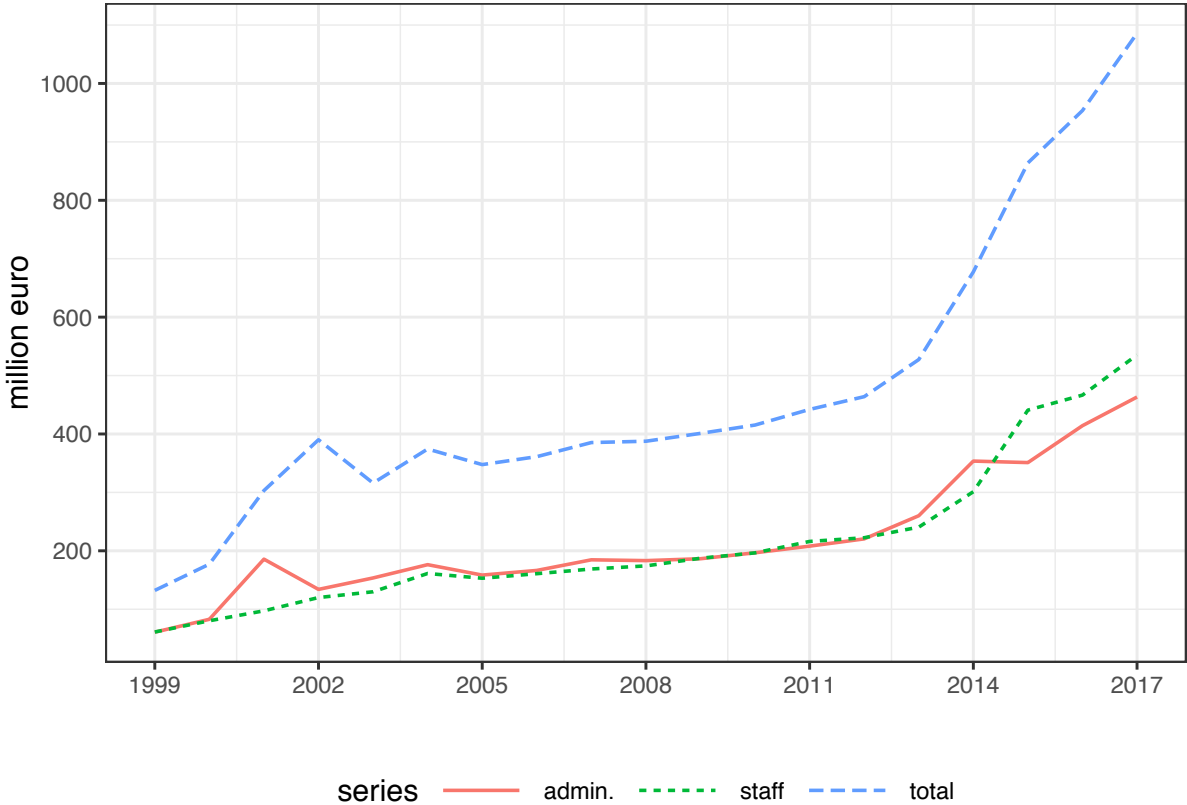
¹³ In fact, as pointed out in Israel (2019, fn. 6) the velocity of money has slowed down again since the time of White's publication, which would increase the estimate. However, real economic growth has decreased, too, which has an offsetting effect. By rounding up our value, we allow for a buffer.

Modern central bank monetary policy is, however, conducted very differently. It does not follow any simple and strict rule, but implements, especially in recent years, unconventional policy interventions and discretionary adjustments. Their effects are studied empirically and theoretically by numerous expert groups who are directly or indirectly on the payroll of central banks.¹⁴ Modern monetary policy is based on relatively costly data gathering and processing and requires very close and careful supervision of various macroeconomic developments both on the domestic and the international level. The overall operating expenses ultimately turn out to be much higher than one might have expected.

The Eurosystem

As pointed out in the introduction to this paper, the case of the European Central Bank is of particular interest, since it is a young and still rather dynamic public policy institution, which lends itself perfectly to illustrating some central public-choice considerations.

Figure 1: Annual operating expenses of the European Central Bank 1999-2017



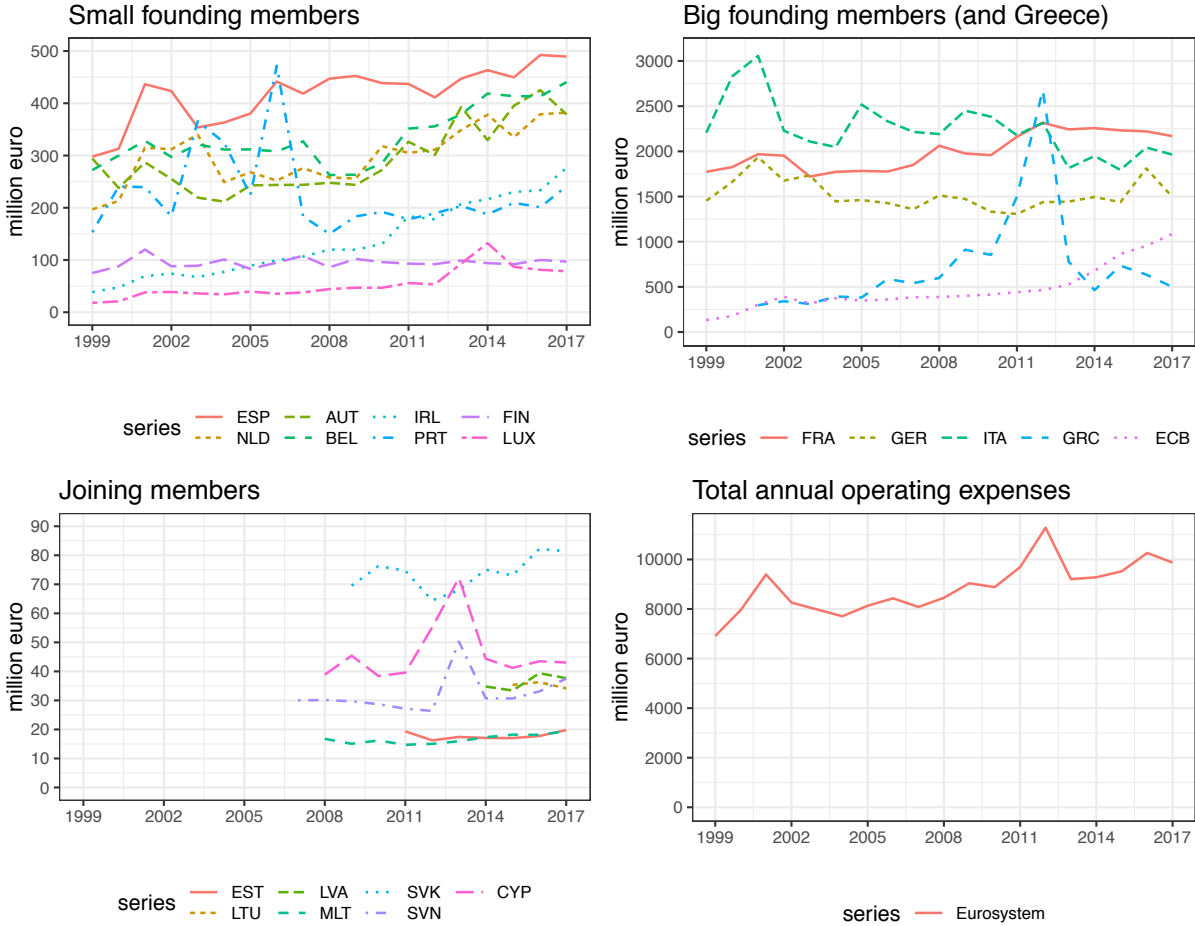
Sources: Annual Reports of the ECB from 1999 to 2017

The economic theory of bureaucracy as developed by Niskanen (1971), for example, suggests that bureaucratic institutions that are not subject to strict profit-and-loss accounting like conventional businesses tend become less cost-efficient over time. Primary concerns for such institutions are the maximization of their own budgets in order to increase their power, their prestige or the career opportunities of their employees within the boundaries set by bureaucratic management.

¹⁴ In fact, for the US, White (2005, p. 325) estimates that “some 74 percent of the articles on monetary policy published by US-based economists in US-edited journals appear in Fed- published journals or are co-authored by Fed staff economists.”

Figure 1 contains the development of the total annual operating expenses as reported in the annual financial statements of the ECB since 1999. Total operating expenses have reached about €1,085 million in 2017. The figure also includes the time series for the two most important items of expenditure, namely, staff costs and administrative expenses, which amounted to €535 and €463 million during the same year, respectively.¹⁵ Overall the full-time staff of the ECB has increased from 732 in 1999 to 3,384 in 2017. While this is justified to some extent by the expansion of the eurozone over this time period, it must also be recognized that all the national central banks of the member states are still working within the union, and they have not actually reduced their own expenses as political authority was transferred to the ECB in Frankfurt.

Figure 2: Annual operating expenses of the Eurosystem 1999-2017



Sources: Annual Reports of the ECB and the respective national central banks of the eurosystem from 1999 to 2017

In order to account for the operating expenses of the entire Eurosystem, we have to look at 20 institutions: 19 national central banks as well as the ECB. Figure 2 contains their individual annual expenses as well as the overall sum. The plot takes account of the changing composition of the Eurosystem over time.¹⁶

¹⁵ For a more detailed discussion of all items of expenditure, see Israel (2019).

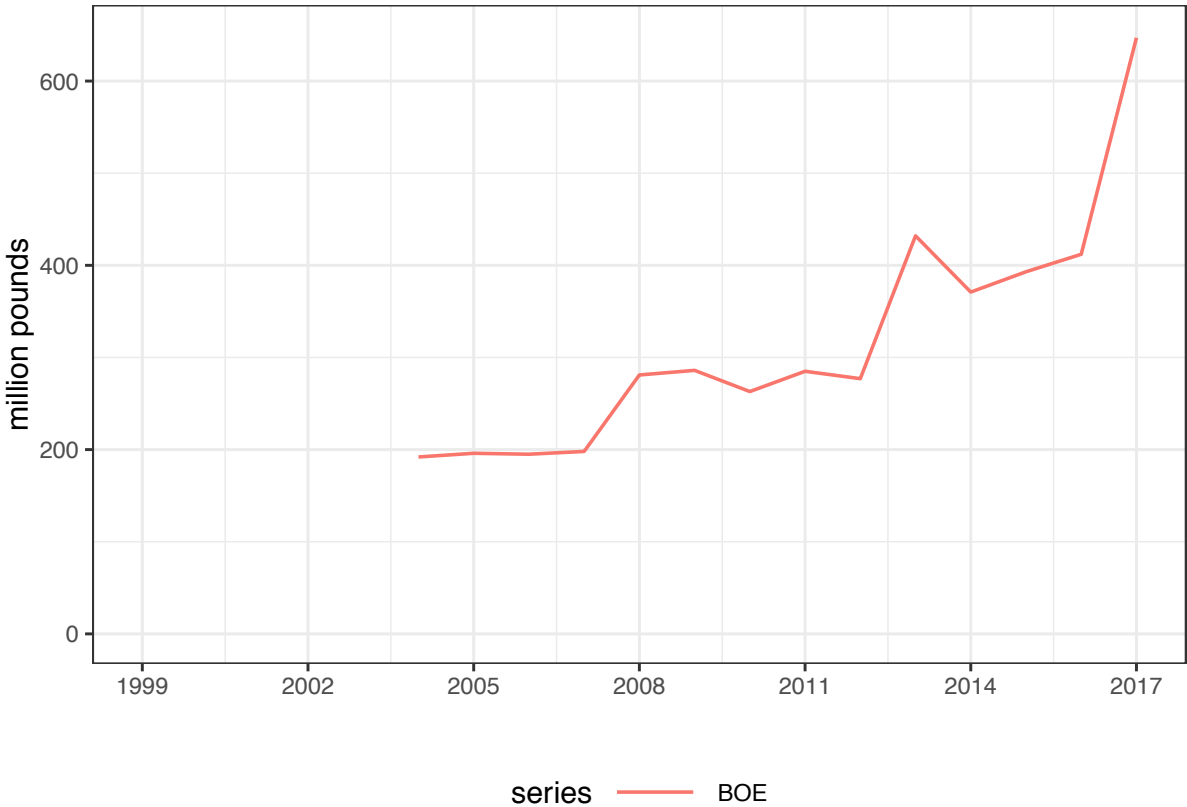
¹⁶ The initial 12 founding members of the monetary union at the time the euro was introduced as a cash currency and became the exclusive legal tender in 2002 were Belgium, France, Germany, Ireland, Italy, Luxembourg, Netherlands, Greece, Spain, Portugal, Austria and Finland. Slovenia entered in 2007. Cyprus and Malta followed

The Eurosystem’s total annual operating expenses amounted to € 10,260 and € 9,874 million in 2016 and 2017, respectively, which corresponds to 0.095% and 0.088% of the eurozone’s GDP. The actual operating expenses of the Eurosystem are thus well above our lower-bound estimate for the resource costs of a generic gold standard (0.005% of GDP).¹⁷

The Bank of England

The next currency area we consider is the one of the British pound. The institutional structure in this case is much less complicated than the Eurosystem and there are good reasons to believe that it is more cost-efficient. There is only one central bank that controls the issue of the base money stock, namely, the Bank of England based in London.

Figure 3: Annual operating expenses of the Bank of England 2004-2017



Sources: Annual Reports of the Bank of England from 2004 to 2017

Figure 3 captures the development of the overall operating expenses of the Bank of England between 2004 and 2017. They amounted to £412 and £647 million in 2016 and 2017, or accordingly to 0.021% and 0.032% of the United Kingdom’s annual GDP. While this is merely a third of the relative costs of

in 2008 and Slovakia in 2009. Estonia adopted the euro in 2011, and finally, Latvia and Lithuania followed in 2014 and 2015, respectively.

¹⁷ For a more detailed discussion of the particular features that are shown in Figure 2, such as the peak for the Central Bank of Greece in 2012, see again Israel (2019).

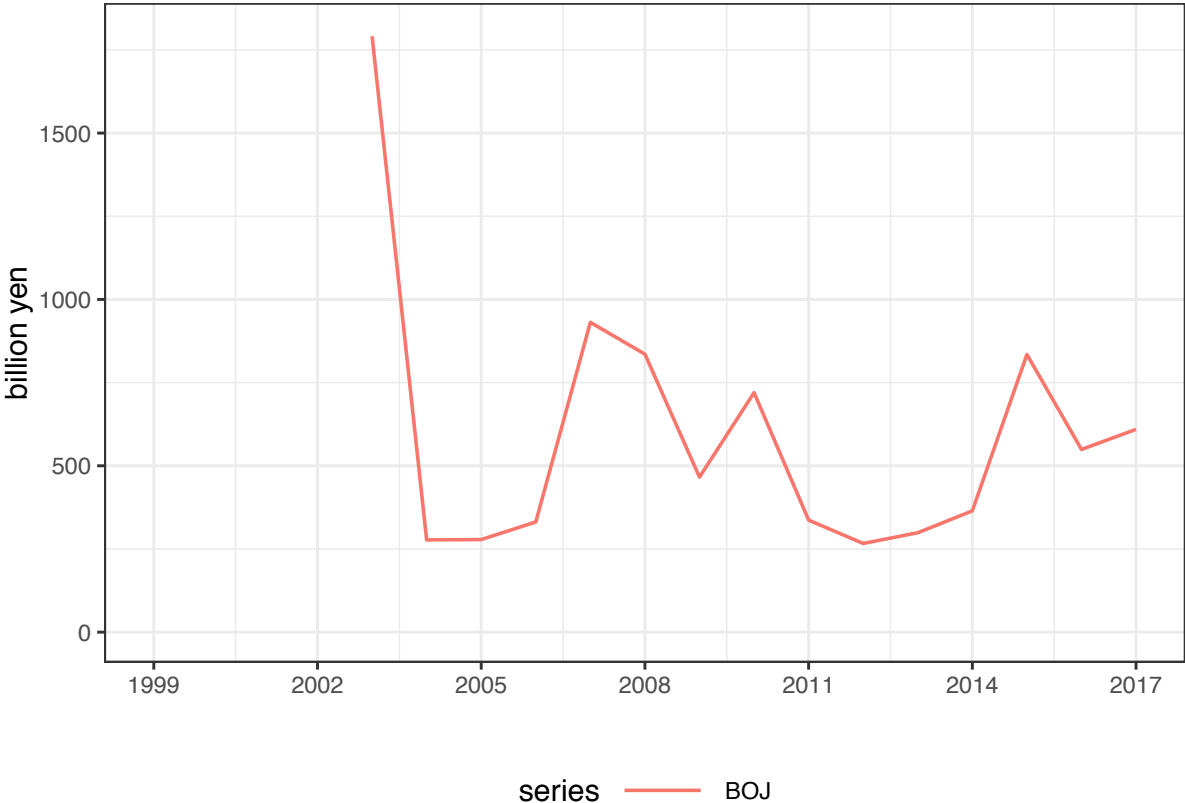
the Eurosystem, it is still higher than our lower-bound benchmark. For 2017 at least, it is also higher than White’s original estimate.

Over the entire period the annual operating expenses of the Bank of England show a strong upward trend, not unlike the trend we have seen for the ECB. In fact, they have increased by more than a factor of 3, or more precisely, by an average annual rate of 9.8%. This trend is undoubtedly linked to the most recent financial crisis. The first strong increase occurred between 2007 and 2008. As early as 2004, the annual operating expenses were only 0.015% of GDP, which is still three times as high as the lower-bound benchmark.

The Bank of Japan

The third currency area considered in this study is the one of Japan. Just as in the previous case, there is only one institution to consider here, i.e. the Bank of Japan. Its operating expenses are shown in Figure 4.

Figure 4: Annual operating expenses of the Bank of Japan 2003-2017



Sources: Annual Reports of the Bank of Japan from 2003 to 2017

There is no clear trend visible in this case. What stands out is the extremely high value for 2003 when the expenses amounted to ¥1,790 billion, which corresponds to a staggering 0.34% of Japan’s annual GDP for that year. This is even 70% higher than our upper-bound estimate for the resource costs of a gold standard, which is 0.2% of GDP. For the rest of the period the expenses fluctuated between ¥277 billion in 2005 and ¥931 billion in 2007, which corresponds to values between 0.05% and 0.18% of annual GDP. These values are below the upper bound, but still well in between our two benchmark estimates. Although there is only one single central bank in control of the base money supply of

Japanese yen, it is in terms of its relative operating expenses even more costly than the central bank system of the eurozone.

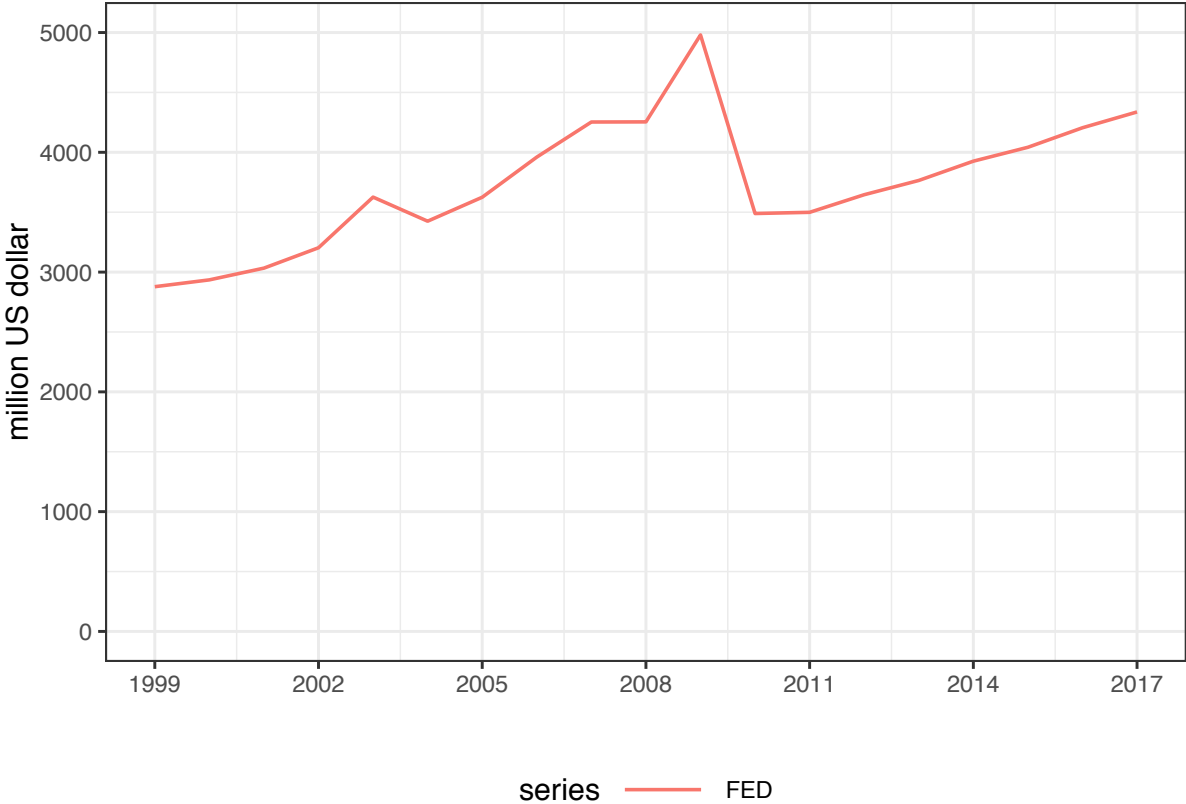
The Federal Reserve System

Finally, we look at another system of multiple central banks that manages the US dollar, the most important fiat currency in the world, namely, the Federal Reserve (FED).

The FED consists of 12 regional banks that are located throughout the United States: Boston, New York City, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St Louis, Minneapolis, Kansas City, Dallas and San Francisco. Fortunately, the FED publishes combined financial statements, including an overall profit and loss account, for all these banks every year.

Figure 5 contains the overall annual operating expenses of the FED. They are in absolute terms less than half the operating expenses of the Eurosystem, although the United States are larger in terms of GDP. There is an upward trend in the time series and a peak in 2009 at \$4,980 million. For that year the total expenses of the FED corresponded to 0.034% of GDP, which is only a tenth of the maximum value for the Bank of Japan in 2003. The lowest value for the FED occurred in 2015 with 0.022% of GDP, which is less than half the minimum value for Japan (0.053% in 2012).

Figure 5 Annual operating expenses of the Federal Reserve System 1999-2017



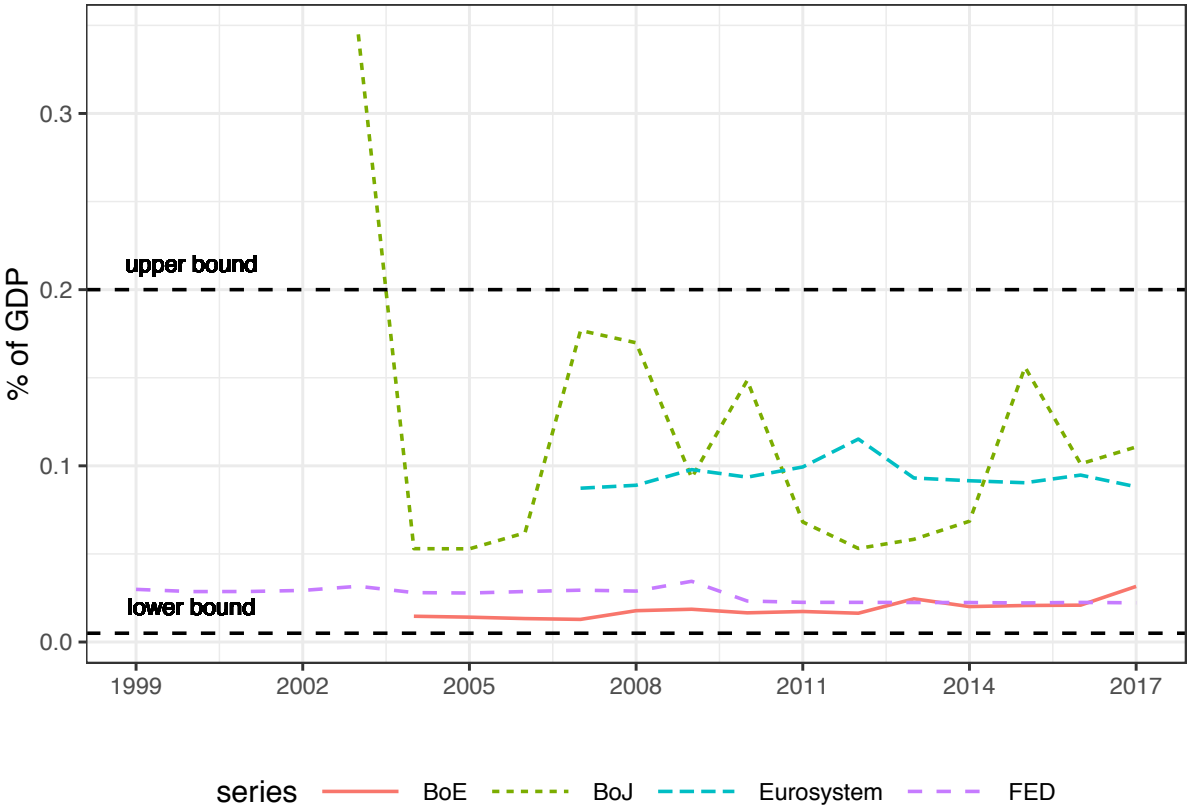
Sources: Annual Reports of the Federal Reserve System from 1999 to 2017

Over the past two years, the FED is the most cost-efficient among the four examples considered in this study. However, also in this case the annual operating expenses as a percentage of GDP do not lie below the range taken as a benchmark for comparison. In fact, we could increase the lower bound by a factor of four and there would still be no observation below it in the case of the FED.

V CONCLUSION

The central banks considered in this study all operate under relatively high costs from the perspective of traditional business accounting. The assumption that the introduction of an unbacked fiat money would lead to annual cost savings that are virtually equivalent to the annual resource costs of an alternative gold standard, which implicitly underlies both Friedman’s and White’s analysis, is thus illusory. It turns out that in every case considered here the operating expenses of the fiat money issuers are actually even higher than the estimated costs of a generic gold standard, if only in the first place one with a relatively low reserve ratio. According to our estimates, the expenses of the FED and the Bank of England in recent years correspond to the costs of a fractional-reserve gold standard with about 20% reserves on M_1 . However, the cases of the Eurosystem and the Bank of Japan stand out. They are in relative (as well as absolute) terms much more expensive. On average, their operating expenses are equivalent to the estimated costs of a gold standard with more than 50% reserves on the money stock M_1 .

Figure 6: Annual operating expenses of the Eurosystem, the Bank of England, the Bank of Japan and the Federal Reserve System as percentages of nominal GDP 1999-2017 with the lower and upper bound of the estimated costs of a generic gold standard



Sources: Annual Reports of the respective central banks; GDP data from FRED Economic Data St Louis Fed (Japan and US), Eurostat (eurozone), Office for National Statistics (UK)

The relative annual operating expenses as percentages of the respective annual GDP for all four central banks or central bank systems are plotted in Figure 6 along with the lower and upper bound estimates of the resource costs of a generic gold standard (0.005% - 0.2% of GDP). In 2003, we observe for Japan the only instance when the operating expenses exceed even the upper bound. In all other instances

the observed values lie within the range of the estimated costs of a gold standard. The Bank of Japan also shows the highest fluctuations throughout the period under consideration.

The cost savings from unbacked fiat money in all these cases are thus well below expectations. In fact, these examples undermine the traditional cost-saving argument for fiat money as presented by eminent economists throughout the history of economic thought as well as in modern textbooks. These results show that from the vantage point of conventional business accounting a return to gold as an anchor of the money stock is economically feasible. This conclusion does not even take into account the potential benefits of greater economic and financial stability and less moral hazard that would arise from ending the political control of the base money supply.

The cost-saving argument is indeed further undermined by the fact that actual gold mining has not decreased since the Nixon Shock of 1971. In fact, according to the United States Geological Survey world mine production of gold has more than doubled since the 1970s and reached its peak in 2016 with more than 3,000 metric tons. While some of this increase might simply be due to technological progress, it suggests that also under fiat money a substantial amount of resources remains dedicated to gold production. These resources are not actually saved. Central banks as well as private individuals continue to demand and hold gold as a hedge against inflation.

Political steps towards a return to gold seem very unlikely at the moment, since political authorities cling to the almost inexhaustible possibilities of monetary policy under fiat money. With a gold standard, monetary policy would be severely restricted, because in such a system the central bank would not be able to expand the base money supply at will. However, this restriction would be desirable, because it would force actors in the real economy and the national governments of the countries involved to implement structural changes necessary for a return to a sustainable economic growth path, such as the reduction of public and private credit finance. At present, these structural adjustments are prevented by an ultra-loose monetary policy.

Another advantage of the gold standard cannot be denied. A large part of personnel and administrative costs could be reduced, as the process of monetary policy and analysis would be much less complex. Hence, it would potentially be more transparent for the general public. The real resources, most notably human capital in the form of PhD economists, that are currently tied up in various central banks could then undoubtedly be used for more productive purposes in other parts of the economy to enrich society as a whole.

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