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How cost efficient is the eurosystem?

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Abstract

The classical cost-saving argument for fiduciary media as suggested among others by Adam Smith and David Ricardo has been turned into an argument for an unbacked fiat money system by the early Milton Friedman. It holds that the production of commodity money, such as gold, is inefficient, as it ties up scarce resources in mining, minting, transportation and storage. These resources are diverted from more productive uses in other parts of the economy. Friedman estimated that the annual costs of a full-reserve gold standard would lie around 2.5% of GDP, which is arguably too high as he assumed full reserves on M2. Lawrence White later estimated the annual costs of a fractional-reserve gold standard to be 0.025% of GDP. Taking the latter estimate as a lower bound benchmark, it is shown in this case study that the annual operating expenses of the fiat standard of the euro area are in fact more than three times as high as White's estimate. But even when White's reserve ratio on M1 is substantially increased, the estimated costs of the gold standard and the actual operating expenses of the eurosystem remain in the same ballpark.

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1. Introduction

On a theoretical level there is an obvious and undeniable truth in the classical cost-saving argument against a full-reserve commodity standard: it requires fewer real resources to produce fiduciary media or unbacked fiat money. The resources that are saved in a fiat money system could be used in other lines of production and would make society wealthier overall. From this simple insight, however, it does not follow that any historical fiat standard, such as the US dollar since 1971, the euro, or the Japanese Yen, hold what they promise in terms of cost efficiency.

In this paper we look at the operating expenses of the eurosystem since its inception in 1998. This includes all the central banks that run and organize the fiat standard of the eurozone. Public-choice considerations suggest that these institutions, that are not subject to a strict profit and loss calculation, tend to become more costly and wasteful over time, within the boundaries set by bureaucratic control (Mises, 2008; Tullock, Seldon, & Brady, 2002). This theoretical insight can be put to test by means of historical case studies such as the one presented here.

The eurosystem provides a suitable example for this purpose. While the production of the euro, or any other fiat currency, and the implementation of monetary policy could in principle be organized at virtually zero costs, the actual organization and maintenance of the eurosystem involve very complex and costly processes of supervision, data gathering and analysis, theoretical and empirical research, as well as political decision making and communication to the public. Under a commodity standard the range of possible policy measures would be very limited and hence the whole process of monetary policy making would be less complex. To what extent the potential benefits in terms of cost efficiency are actually realized in practice, then remains an open empirical question.

We will first briefly review the classical cost-saving argument from the writings of Adam Smith and David Ricardo, to more recent contributions by Milton Friedman and Lawrence White. Next, the operating expenses of the eurosystem are analyzed and summed up over various central bank institutions that take part in the system. We show that its annual expenses, while remaining far below Friedman's estimated costs of a full-reserve gold standard, substantially exceed White's estimated costs of a fractional-reserve gold standard. The paper ends with some concluding remarks and an outlook on further research.

2. A brief review of the cost-saving argument

The classical cost-saving argument for fiduciary media goes back to such important thinkers in the history of economics as Adam Smith and David Ricardo. In the second book of the *Wealth of Nations*, Smith formulates the argument for the first time. If we were to replace an expensive money, at least partly by a cheap one, all other things equal, society would benefit:

> 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)

In this passage, Smith highlights the *flow* element of potential cost savings. Unbacked paper notes are easier to replace, transport and store than precious metal coins, and thus could generate

a permanent or ongoing benefit to society in terms of resources saved in the course of maintaining the monetary system.

There also is a *one-shot* benefit when a monetary system transits from a full-reserve commodity standard to a fractional-reserve commodity standard. The excess precious metal reserves could be sold abroad to enrich society. If the goods acquired in exchange are not merely consumed, but are put to productive use, the community could benefit from the transition in the long run (Smith, 2007 [1789], pp. 227-228).

David Ricardo later pushed the argument further in the *Principles of Political Economy and Taxation*. He came very close to recommending an outright fiat standard:

> The use of paper instead of gold, substitutes the cheapest in place of the most expensive medium, and enables the 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)

Ricardo was, however, aware of the potential problems of entirely untying money from precious metals. In practice, he did not recommend a fiat standard. He suggested that the government, that is, a central bank, should be in charge of the note issue instead of private banks, and he was an ardent supporter of what economists today would refer to as central bank independence. In his *Plan for the Establishment of a National Bank*, he sought to limit direct government finance through the printing press as he recognized its potential for corruption (Ricardo, 1824, p. 11).

In the 20th century, the cost-saving argument for fiduciary media was picked up for example by Ludwig von Mises. According to him unbacked fiduciary media prevented a drastic increase in the purchasing power of money in the course of the industrial revolution and freed up factors of production that would otherwise have been used in gold mining and refinement (Mises, 1953, pp. 298-299). In his later works, Mises relativized these alleged benefits (Mises, 1998, ch. XX).[1] Regardless of whether or not Mises was ultimately against fiduciary media and hence fractional-reserve banking, he clearly advocated a free banking system based on a gold standard in order to protect the economy from excesses in money production.

Milton Friedman, on the other hand, advocated a full-blown fiat standard and by implication the existence of a central bank (Friedman, 1960). A central bank would be necessary to control and most importantly restrict money production. An unbacked fiat currency can only serve its purpose when it is produced monopolistically, and its supply remains limited. This "natural" monopoly should lie in the government's hands (Friedman, 1953, p. 216).[2] Indeed, under a fiat standard the potential cost savings are at their maximum. This was Friedman's main argument against a commodity standard, even when combined with fractional-reserve banking.[3]

White (1999, pp. 42-48) provides a concise summary of Friedman's estimate of the annual flow resource costs of a full-reserve gold standard. Friedman decomposed the ratio $\Delta G/Y$, where ΔG

[1] An ongoing debate has emerged around these seemingly contradictory positions by Mises. For a recent contribution to its clarification, see White (2014).

[2] Later in his career, Milton Friedman came to emphasize the downsides of the existence of central bank monopolies in fiat money production (Friedman & Schwartz, 1986).

[3] Indeed, it might be worth emphasizing again that Friedman's optimal monetary policy, the k-percent rule, could be implemented simply by means of a powerful computer, and thus would potentially cause only very low operating expenses.

denotes the nominal value in the change of the gold stock and Y denotes annual nominal GDP, into three subcomponents:

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

where M corresponds to the money stock M_2 that Friedman assumes to be fully backed by gold. Hence, any increase in the money stock, ΔM, equals an increase in the gold stock, ΔG, so that $\Delta G/\Delta M = 1$. The other two components are then replaced by their empirical or normative counterparts. Friedman argued that the money stock has to grow at around 4% per year in order to ensure price stability, that is, zero price inflation (Friedman, 1960; Friedman & Schwartz, 1963), and thus $\Delta M/M = 0.04$.[4] The ratio between the money stock and nominal GDP was empirically relatively stable. He estimated it to lie around 0.625. The flow resource costs of a 100%-reserve gold standard would thus be 2.5% of annual GDP:

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

White (1999) considers this an exaggeration, especially if we assume an advanced free banking system, which in White's eyes would not impose legal reserve requirements. In a case where only 2% of money in the broader sense (M_2) are backed by gold, the annual costs of the gold standard would fall to merely 0.05% of GDP ($0.02 \times 0.04 \times 0.625$) as White points out.[5] Moreover, the growth rate of the velocity of money in circulation had increased since Friedman's work, so that an annual growth rate of 2% of the money stock would have sufficed to ensure price stability. The annual costs of such a fractional-reserve gold standard would thus correspond to merely 0.025% of GDP ($0.02 \times 0.02 \times 0.625$). As an afterthought White (1999, p. 48) adds that the costs could be reduced even below 0.01% of GDP when full-bodied gold coins in circulation are replaced by fractionally backed token coins.

It is also worth noting, that the zero price inflation criterion that is underlying both Friedman's and White's estimates is questionable at least if one envisions a market-driven money production. In such a system the elasticity of gold supply would not be perfect as Garrison (1985) pointed out. This implies that part of real output growth would be accommodated by benign price deflation or growth deflation instead of an expansion of the gold stock. Under the classical gold standard there was indeed growth deflation (Bagus, 2015; Borio & Filardo, 2004; Salerno, 2003). So, if one were to assume an equilibrium rate of negative price inflation, say -1%, the estimated costs would fall by another 50% to somewhere below 0.005% of GDP.

However, there are other reasons to believe that even White's more moderate value of 0.025% of GDP is too optimistic an estimate of the flow resource costs of a generic gold standard. We will thus keep it only as a lower bound. For all intents and purposes the assumption that only 2% of the broad money stock M_2 would be backed by gold seems excessively low, even in the

[4] 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).

[5] The reserve ratio of Scottish banks in the first half of the 19th century before the free banking period ended with the Peel Act of 1845 was in fact around 2% (White, 1984), occasionally even lower. 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 about 2% of M_2 would be backed by gold in this version of the gold standard.

absence of legal reserve requirements, although such cases historically existed. The actual costs are thus likely to be higher.

In contrast, Friedman's original estimate is far too high as he surprisingly assumed full reserves on the broad money stock M_2. As White points out, advocates of full-reserve banking usually recommend 100% reserves on the narrow money stock M_1. 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 as benchmark, we would obtain a gold to M_2 ratio of about 0.3, and accordingly a flow-resource cost estimate of 0.375% of GDP ($0.3 \times 0.02 \times 0.625$). We take this value as an upper bound.[6]

White (1999, p. 49) took our lower bound value of 0.025% GDP and proceeded by estimating the deadweight loss of price inflation. He concluded 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." However, he assumes that the costs of managing a fiat money as such are negligible. And again, in principle, that could be true. Whether it actually is, needs to be investigated empirically. Almost 50 years of historical experience in the modern fiat money system are at our disposal. In the following, we will focus exclusively on the euro, from its inception until today.

3. The operating expenses of the eurosystem

The common currency project in the eurozone provides a suitable case study for our purposes. The euro was introduced as an accounting currency on the first of January 1999, three years before it was issued as a physical currency and obtained exclusive legal tender status. The European Central Bank (ECB) was founded in June 1998. Hence, the ECB's annual financial statement for that year only covers seven calendar months. From 1999 onwards, the annual financial statements cover entire calendar years.

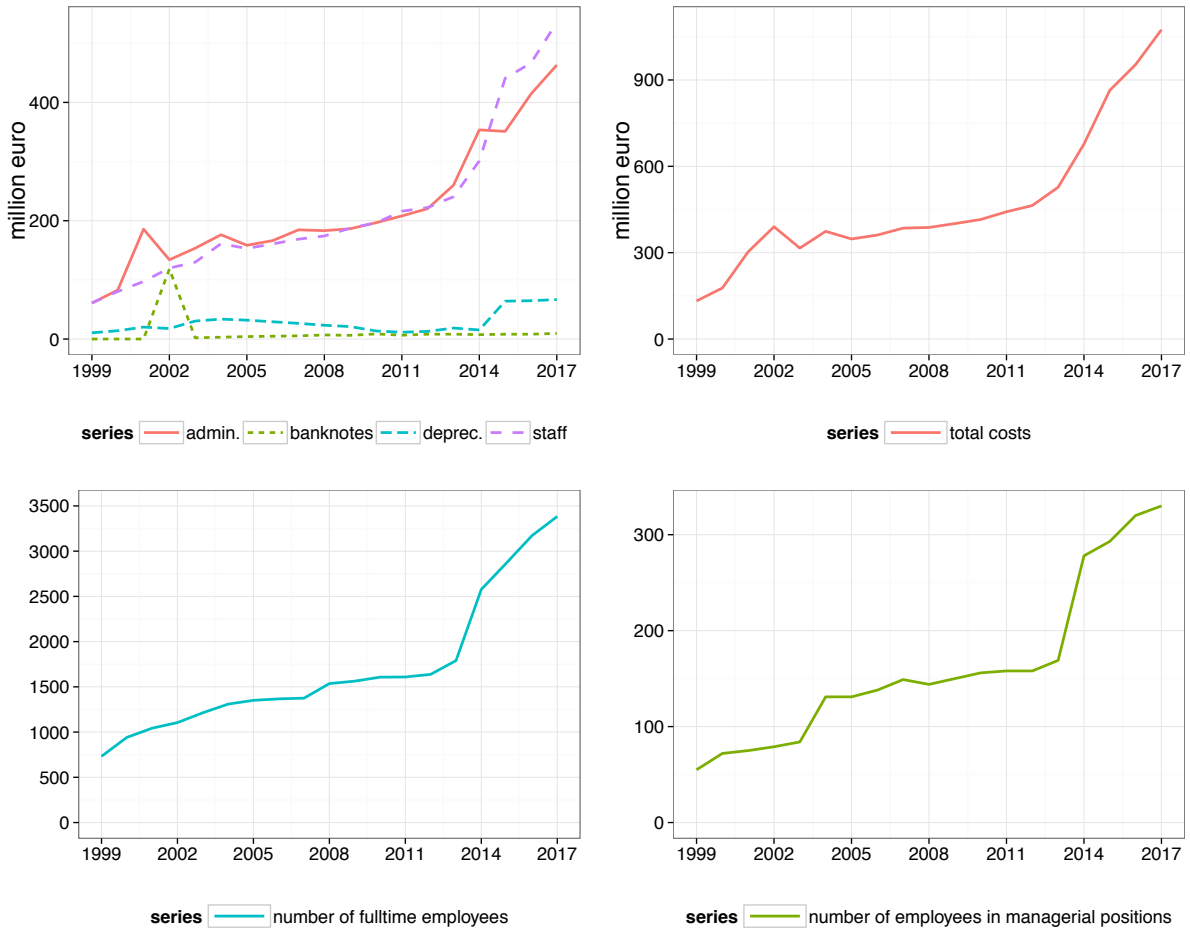
Initially, there were three items of expenditure in the ECB's profit and loss accounts as summarized in Table 1. Staff and administrative costs have remained the most important items until today. Depreciation of tangible and intangible assets have been rather low and increased by a factor of four, from €15.3 million to €64.0 million, only in 2015, when the new headquarters of the ECB in Frankfurt, Germany, were inaugurated and henceforth depreciated.

Table 1: Operating expenses of the ECB in 1998 and 1999

	1999	1998
Staff costs	61,022,091	29,744,540
Administrative costs	60,748,855	30,229,686
Depreciation of tangible and intangible assets	10,468,901	8,076,017
TOTAL	132,239,847	68,050,243

[6] There are of course various ways in which to tweak this estimate further. As a very careful anonymous reviewer of an earlier draft of this paper pointed out, the M_2 velocity level has slowed down again from 2.135 (Q1 1999) to 1.455 (Q3 2018) over the past 20 years. Hence, the growth rate of velocity for the past 20 years has been even lower than the one Friedman assumed (about -1.4% instead of -1%). Using the more recent trend, the equilibrium growth rate of the money stock would have to be more than doubled. On the other hand, average real output growth has been lower than 3% over that same period. It was about 2.2% in the US and even lower in the euro area. Moreover, Garrison's (1985) argument that the equilibrium rate of price inflation would be negative cannot be brushed aside lightly. Weighing these opposing considerations, however, lies outside the scope of this paper.

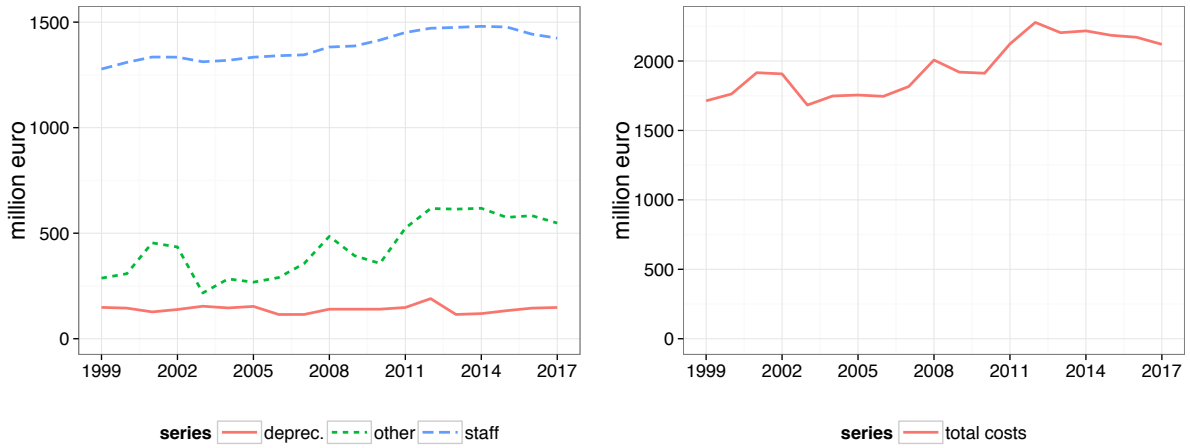
Figure 1: Operating expenses and number of employees of the ECB from 1999 to 2017



A fourth item of expenditure was added in 2002, when euro banknotes and coins were introduced. Costs for banknote and coin production and distribution peaked at €118.4 million in 2002 and have remained below €9.0 million annually ever since. The development of all four items as well as total costs over time is plotted in Figure 1. Overall operating expenses of the ECB were at €132.2 million in 1999 and rose to €1085.8 million in 2017, that is, on average by 12.3% per year. The bulk of the costs is due to increases in staff and somewhat nontransparent administrative expenses. Over the same time span, the number of fulltime employees rose from 732 to 3384, among which there are today 330 in managerial positions.

This trend is of course to some extent justified as the currency union has grown over time. Moreover, one might expect that along with some of the political authority of the previously independent central banks that were integrated into the eurosystem, at least a part of the costs was transferred to the ECB as well. A look at the annual financial statements of other important central banks that take part in the eurosystem, however, reveals that their operating expenses have not necessarily decreased.

Figure 2: Operating expenses of the Banque de France from 1999 to 2017



Figures 2 to 4 show the operating expenses of the big three national banks of the eurosystem: the *Banque de France*, the German *Bundesbank* and the *Banca d'Italia*. There was a slight downward trend in overall expenses only for the latter. Annual expenses of the German Bundesbank remained more or less constant, around €1500.0 million with two upward outliers in 2001/2002 and 2016, while the Banque de France exhibits a slight upward trend over time. Its expenses increased from €1713.2 million in 1999 to €2120.0 million in 2017.

The ECB and the national central banks of France, Germany and Italy are the four biggest institutions of the eurosystem. Their annual expenses are plotted together and summed up in Figure 5. From 1999 to 2017, their total expenses increased by 21%, from €5,505.6 million to €6,657.3 million. The ECB, as the youngest among those institutions, exhibits the strongest growth in operating expenses. In 2001, the year right before the introduction of the euro as a physical currency and as exclusive legal tender of the union, total expenses of these four institutions reached their maximum at €7210.9 million. These numbers do not yet capture all of the expenses of the central banking system of the common currency area. Among its founding members were the national central banks of eight other European countries.

Figure 3: Operating expenses of the German Bundesbank from 1999 to 2017

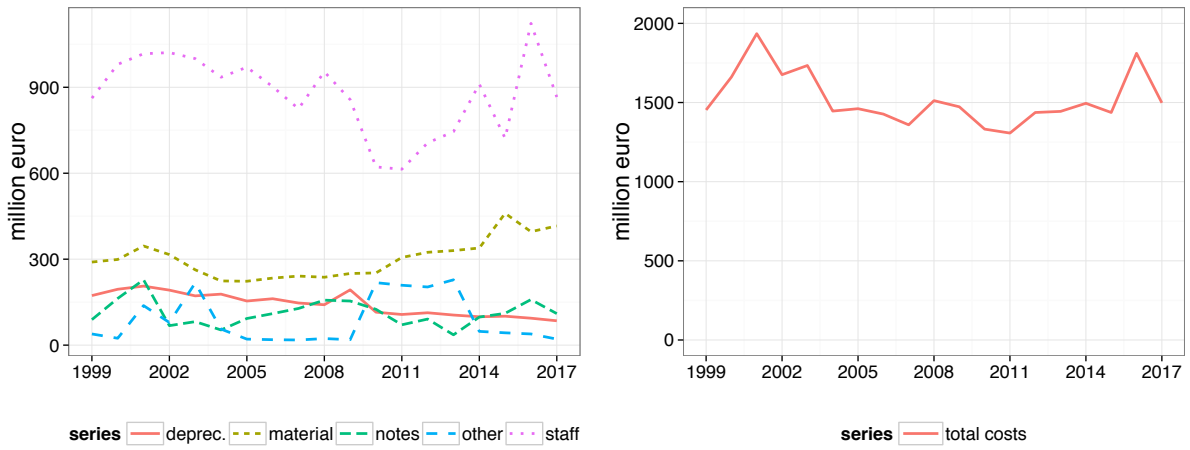


Figure 4: Operating expenses of the Banca d'Italia from 1999 to 2017

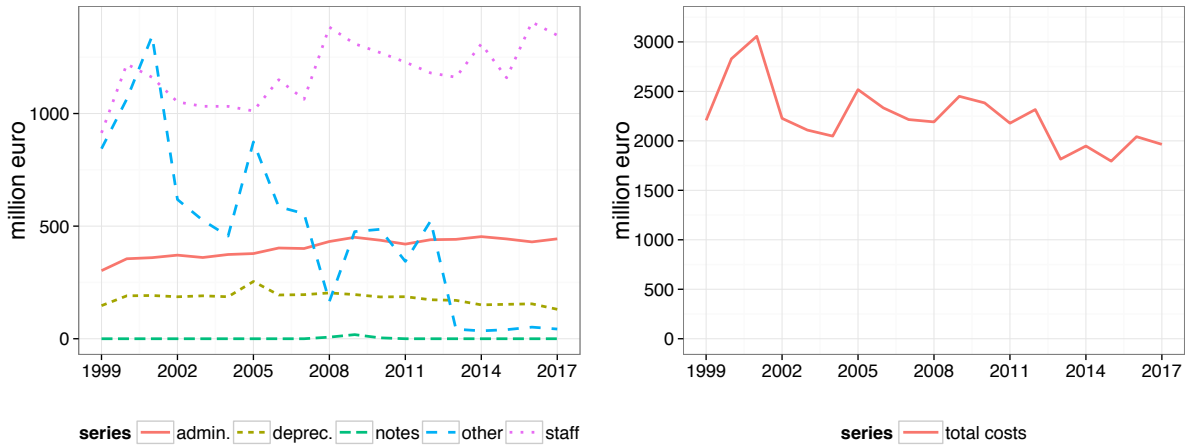
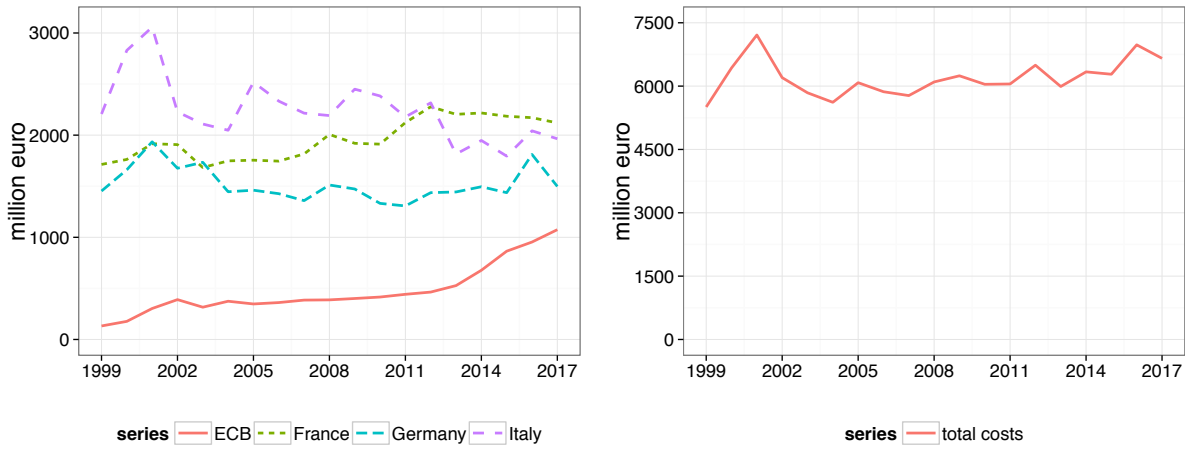
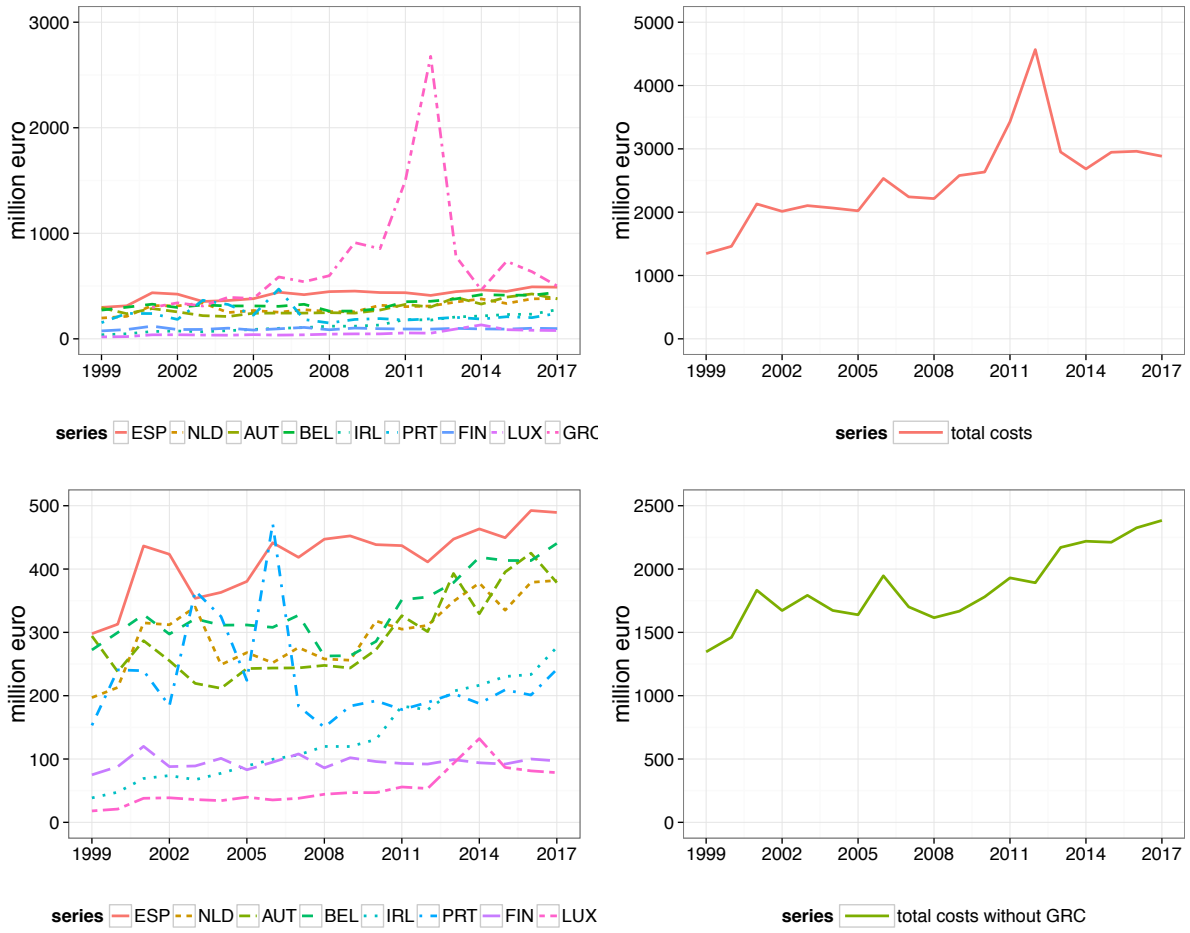


Figure 5: Operating expenses of the big four central banks of the eurosystem from 1999 to 2017



The national banks of Spain, the Netherlands, Austria, Belgium, Ireland, Portugal, Finland, Luxemburg and Greece took part in the system from the beginning. In 1999, their annual operating expenses ranged from €18.0 million for the central bank of Luxemburg to €297.9 million for the Bank of Spain. They summed up to €1,346.1 million, which is less than any of the expenses of the central banks of France, Germany or Italy alone. In recent years the Bank of Greece has become the biggest among the smaller members of the eurosystem in terms of operating expenses. In 2017, they amounted to €499.9 million. The sum over all eight institutions in 2017 was €2,883.8, which is substantially higher than the expenses of any of the bigger central banks. Hence, the total costs of the smaller institutions have disproportionately increased by about 4.3% per year.

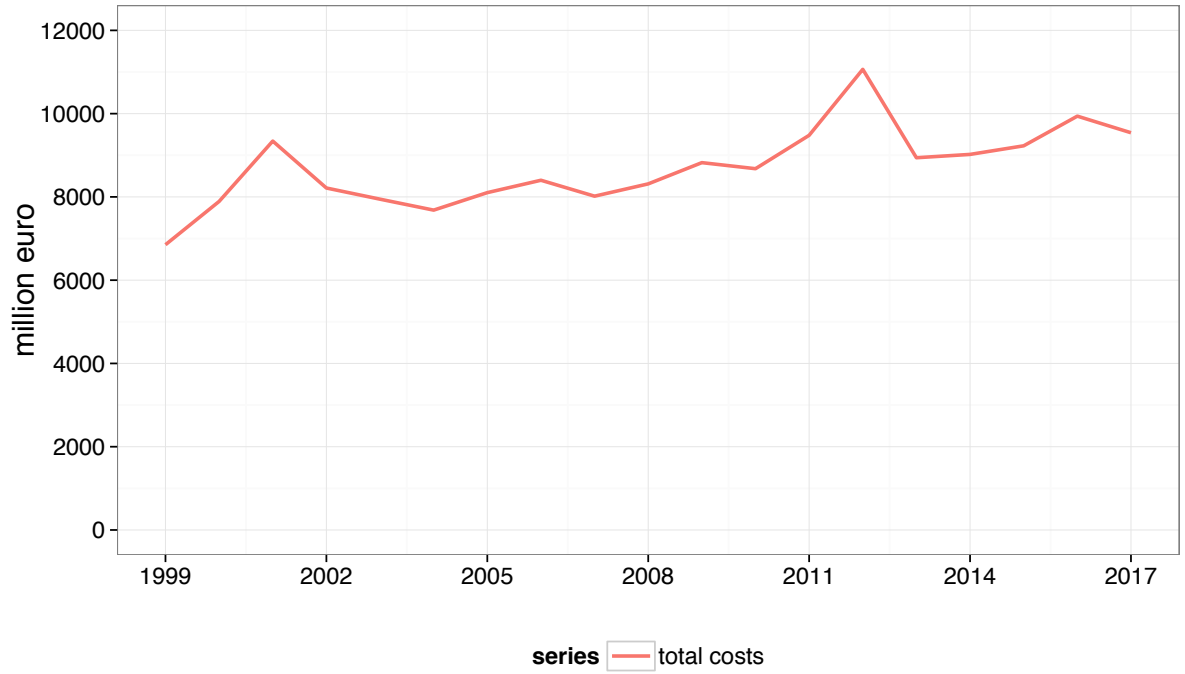
Figure 6: Annual operating expenses of the smaller founding members of the eurosystem from 1999 to 2017 - upper panels include Greece; lower panels exclude Greece



As can be seen in the upper panels of Figure 6, there was an impressive peak in operating expenses at the Bank of Greece in 2012 in the midst of the sovereign debt crisis. They were at € 2,676.8 million, which is about the range of the Banca d'Italia in the early 2000s. A closer look at the annual financial statements of the Bank of Greece reveals that the increase is mostly due to an item denoted "provisions," which increased from €148.0 million in 2007 by a factor of 15 to €2,342.0 million in 2012. Upon closer inspection, one realizes that behind these provisions lie disguised staff costs, as part of them is "covering the Bank's obligation to provide social insurance to its staff" (BoG, 2013, p. A32). The lion's share, however, seems to be related to political measures that had the goal of alleviating the sovereign debt burden and arguably qualify as direct government finance.[7] The item "provisions" in the profit and loss account of the Bank of Greece has since then decreased again.

[7] One other subitem of "provisions" is described as "[p]rovision against general risks under Article 71 of the Statute." This is of great importance, since during the financial year 2012 a paragraph was added to Article 71 of the Statute of the Bank of Greece. With this additional paragraph "the income from Greek government bonds held in the investment portfolio of the Bank of Greece […] may be transferred to the Greek State" (BoG, 2016, pp. 56-57). It is an interesting question for legal experts, whether this qualifies as direct government finance or not, but the answer lies beyond the scope of this paper. From an economic point of view, it most certainly is.

Figure 7: Total operating expenses of the 12 founding members of the eurosystem from 1999 to 2017



In Figure 7, the operating expenses of all 13 founding institutions of the eurosystem are added up. They increased from €6,851.7 million in 1999 to €9,541.0 million in 2017. There are two peaks in the time series, which again correspond to the additional costs of introducing the euro as a physical currency in the early 2000s and the sovereign debt crisis, most notably in Greece. In 2012, the total costs of the 13 founding institutions were €11,063.7 million.

A number of countries have joined the common currency area over the years. In 2007, Slovenia entered the eurozone. Cyprus and Malta followed in 2008 and Slovakia in 2009. Estonia adopted the euro in 2011, and finally, Latvia and Lithuania followed in 2014 and 2015, respectively. Some of the respective national banks are almost negligible in size. The central banks of Malta and Estonia, for example, reported annual expenses of merely €19.0 and €20.0 million in 2017, respectively, which is less than a third of the annual depreciation of tangible and intangible assets at the ECB. The biggest among the new entrants is the central bank of Slovakia with annual expenses of €82.0 million.

Table 2: Operating expenses of the eurosystem by institution in 2016 and 2017 in million euros

Institution	Annual Expenses in 2016	Annual Expenses in 2017
Banque de France	2,171	2,120
Banca d'Italia	2,042	1,964
German Bundesbank	1,811	1,498
European Central Bank	954	1,086
Bank of Greece	636	500
Bank of Spain	492	489
Central Bank of Austria	425	382
National Bank of Belgium	413	440
Central Bank of the Netherlands	379	382

Central Bank of Ireland	233	276
Bank of Portugal	201	242
Bank of Finland	100	97
National Bank of Slovakia	82	81
Central bank of Luxembourg	81	78
Central Bank of Cyprus	43	43
Bank of Latvia	39	38
Bank of Lithuania	36	34
Bank of Slovenia	33	38
Central Bank of Malta	18	19
Bank of Estonia	18	20
TOTAL	10,207	9,827
Eurozone GDP	10,847,485	11,165,124
% of eurozone's GDP	0.094	0.088

Table 2 contains the annual operating expenses of all the 20 current members of the eurozone's central banking system for 2016 and 2017. They add up to €10.2 and € 9.8 billion, respectively. At the same time the eurozone's GDP was about €10.8 and €11.2 trillion. This means that the operating expenses of the eurosystem corresponded to 0.094% and 0.088% of the eurozone's GDP. The costs reported in the annual financial statements of these banks are thus more than three times as high as White's estimated costs for an alternative fractional-reserve gold standard (0.025% of GDP).

Even when we take our upper bound estimate of the flow resource costs of the gold standard with full reserves on M_1 (0.375% of GDP), the costs of the eurosystem come remarkably close to a fourth of that value. This suggests that a gold standard with 25% reserves on the narrow money stock M_1 would be about as costly as the eurosystem. Hence, the actual savings from a fiat standard are much lower in the case of the euro than one might have expected.

4. Outlook and Concluding remarks

The above case study provides a preliminary analysis of the operating expenses of the eurosystem. We have found that the costs of maintaining the central bank system of the euro area in its current form are substantially higher than White's (1999) estimated flow resource costs of a gold standard with fractional reserves. But even when we substantially increase the reserve ratio that White assumed, the operating expenses of the eurosystem remain in the same ballpark. Hence, the traditional cost-saving argument for fiat money, as reinvigorated by Friedman in the 1960s, does not seem to carry much weight here.

The expenses made in the eurosystem are probably very different from what they would have been under a gold standard. For the latter, much more investment in capital goods and heavy machinery would be necessary. In the eurosystem, staff costs tend to be the most dominant item of expenditure. The costs for the actual production of euro coins and banknotes are of course rather low. However, it would be misleading to take only these costs into account. It is precisely the nature of an unbacked fiat currency, such as the euro, that it renders monetary policy much more flexible. Hence, it tends to stimulate expenses for the analysis and supervision of various

monetary policy measures. The latter should not be neglected when we look at the costs of a fiat money system from a business accounting perspective.

There are several directions along which the above analysis could be developed further. First, there is an argument to be made that the reported costs in the annual financial statements of the central banks of the eurozone understate the actual costs of the production and provision of the euro. Indeed, in a fractional-reserve banking system, be it under a fiat or gold standard, it may be too simplistic to merely look at central banks, since money creation to a large extent occurs in commercial banks through the extension of credit to private individuals, businesses, and public institutions. Central banks merely provide the base money stock, but commercial banks create money substitutes far beyond the latter. From that perspective commercial banking can be considered an extended arm of central banking when it comes to money production, and a certain share, albeit not all, of the operating expenses of commercial banks might have to be taken into account in an analysis such as ours.

Second, it might be sensible to put the operating expenses of the eurosystem into perspective by comparison to actual expenses for gold mining and refinement. For one thing, global gold production has not actually decreased since Nixon decided to end the convertibility of the US dollar into gold and the world made the transition to a fiat standard. In fact, it looks as if even more real resources have been devoted to gold production since the 1970s. One possible explanation is that private demand for gold might have increased as it was considered a suitable hedge against the inflationary tendencies of a fiat money system. This does indeed further undermine the cost-saving argument.

Lastly, there are multiple other currency areas that could be studied to extend the above analysis, and to put the operating expenses of the eurosystem into perspective. It is conceivable that other central banking systems operate more cost-efficiently than the eurosystem, but so is the contrary. From a public administration perspective, it might be interesting to compare the cost structure of various central banking systems.

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