

BUSINESS CYCLE SYNCHRONIZATION

On the heterogeneous aspects of monetary transmission
in the Eurozone



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Abstract

The purpose of this thesis is to conceptualize the discrepancies between the Eurozone economies and how these discrepancies can lead to differences in the functioning of the monetary transmission mechanism. First, the discrepancies are discussed from the perspective of the optimal currency area theory. Second, the workings of the monetary policy instruments of the European Central Bank are explained. Finally, these topics are put in the context of the monetary transmission mechanism and more specifically it is explained how these topics cause heterogenous monetary transmission. It is concluded that discrepancies between the Eurozone countries do lead to heterogenous transmission and that the interactions between constituents of transmission are too unpredictable to be systematically used for business cycle synchronization.

List of abbreviations

EU	-	European Union
EMU	-	European Monetary Union
ESCB	-	European System of Central Banks
ECB	-	European Central Bank
NCB	-	National Central Bank
OCA	-	Optimal Currency Area
OMO	-	Open Market Operation
MRO	-	Main Refinancing Operation
LTRO	-	Longer-term Refinancing Operation
FD	-	Fixed-term Deposit
FX swap	-	Foreign Exchange swap
SMP	-	Securities Market Programme
CBPP	-	Covered Bond Purchase Programme
ABSPP	-	Asset Backed securities Programme
PSPP	-	Public Sector Purchase Programme
CSPP	-	Corporate Sector Purchase Programme
VAR	-	Vector Auto-Regression

Introduction

The Euro was introduced to facilitate the economic integration of the European Union (EU). The European Monetary Union (EMU) is a project initiated by various members of the EU. The participating countries in the EMU ultimately abandon their national currency and adopt the Euro as their new currency. These countries are known as the eurozone. The Euro currency is managed by the European System of Central Banks (ESCB). At the centre of the ESCB is the European Central Bank (ECB). The ECB is surrounded by the national central banks (NCB) of its members. The primary goal of the ECB is to achieve price stability in the Eurozone. The Eurozone has existed for two decades now and this currency union has already seen heavy economic downturn and crises¹, not even to mention the political tension that it has experienced². However noble and ideal the idea of economic integration in the EU seems, it may take more to achieve it than only the introduction of a common currency. The efficiency of the Eurozone has been criticized by numerous economists. Traditionally, a recurring theme in the critique is the theory of the Optimal Currency Area (OCA). Standard references are Mundell (1961), Mckinnon (1963) and Kenen (1969)³. The OCA theory defines the criteria a monetary union has to meet in order to benefit from being a monetary union. The benefits of a monetary union come down to increased economic efficiency and are quantified by Rose (2000) and Rose and Wincoop (2001). The main criteria OCA theory focusses on are fiscal integration, labour mobility and symmetrical economic shocks.⁴ Unfortunately for the Eurozone, it does not really meet these criteria (Eichengreen, 1990; Von Hagen & Neumann, 1994; De Grauwe & Vanhaverbeke, 1993; Krugman, 2013). This paper will specifically focus on one of these criteria. That is that different countries or groups of countries in the EU are subject to different economic shocks (Bayoumi & Eichengreen, 1992; Beine, Candelon & Sekkat, 2003; Fidrmuc & Korhonen, 2003). Recently, this argument has been updated and it has been shown that asymmetries have become smaller.

¹ Extensive summaries of the subprime mortgage crisis and the sovereign debt crisis are respectively made by Demyanyk and Van Hemert (2009) in "Understanding the subprime mortgage crisis" and Kräussl, Lehnert and Stefanova (2016) in "The European sovereign debt crisis: What have we learned?".

² Wiener and Della Sala (1997) and Christiansen (2001) for example give suggestions for how political tension can arise in the framework of the European Union.

³ Overviews of contributions to optimal currency area theory are given by Ishiyama (1975), Tower and Willett (1976) and Mongelli (2002).

⁴ These are the main aspects; other aspects that are for example the openness of the economy which is specifically mentioned by Mckinnon (1963) and the diversity of the economy which is specifically mentioned by Kenen(1969).

However, significant asymmetries in economic shocks do still exist (Campos & Macchiarelli, 2016).

Why focus on the asymmetric business cycles aspect instead of focussing on the others or on a combination of them? The reason for this is that changes to the other aspects have a much heavier political load to them than the synchronization of business cycles has. That is, to achieve fiscal integration the Eurozone countries would have to start some form of a fiscal union. This will have consequences for how the government's income of the participating countries is spent. In other words, it restricts the sovereignty of the participating countries in some way. Obviously, not all member state politicians are keen on further surrendering their national sovereignty to the EU. This is evident by the amount of anti-Europe or so-called Eurosceptic political parties.⁵ A similar situation is true for labour market mobility. Legislators will need to align their policies to make the challenge for a labourer to move around as small as possible. Otherwise, labour forces will never be truly incentivized or supported to become more mobile. The aspect of business cycle synchronization from the perspective of the ECB does not have this political dimension because the ECB is completely independent from the European politics. Therefore, the possible role that the ECB could play in synchronizing business cycles has to be clear.

Alas, the Eurozone is not an OCA. But what can the ECB do about that? The purpose of this paper is to investigate how effective the ECB can manage the asymmetrical business cycles in the Eurozone. A key point in this investigation is the monetary transmission mechanism and how discrepant economies can influence this mechanism differently. The central question this paper tries to answer is as follows:

Are the European Central Bank policy instruments effective in synchronizing the Eurozone business cycles?

To find an answer to this question, this paper is divided in three parts, each with its own sub-question. The aim of the first part is to identify the discrepancies that exist between the

⁵ Information about all the Eurosceptic political that exist can be found on:

https://en.wikipedia.org/wiki/Euroscepticism#See_also

Information about the public opinion of the EU is documented by the Eurobarometer. More information can be found here: <http://ec.europa.eu/COMMFrontOffice/publicopinion/index.cfm>

countries of the Eurozone. This sets the stage for understanding how the Eurozone economies are different from each other and how this could ultimately lead to asymmetric economies. It is also important to understand the discrepancies between the Eurozone economies because it is fundamental for heterogeneous transmissive effects that are discussed later on. This part also considers the persistency of the discrepancies. This because of the possible convergence over time of a currency area. The corresponding sub-question is as follows:

Can we identify persistent discrepancies between the economies of the Eurozone?

The second part is meant to explore the policy instruments the ECB has at its disposal and how those instruments work. This understanding is important because it clarifies what possibilities the ECB has at its disposal to conduct its policy. The corresponding sub-question of this part is as follows:

Through what channels/mechanisms do the monetary policy instruments of the European Central Bank work?

Finally, the third part aims to combine the findings of the first two parts together. It tries to determine in what way the instruments of the ECB influence the different economies of the Eurozone. It searches for possible heterogeneous effects that exist in the transmission of monetary policy and answers whether the ECB could effectively make use of these effects. The following sub-question is formulated:

Can the European Central Bank monetary policy instruments affect the individual Eurozone economies differently?

These three parts are followed by a final answer to the main question in the form of a conclusion and a discussion of the implications of this conclusion.

Part one: Discrepancies in the Eurozone

Can we identify persistent discrepancies between the economies of the Eurozone?

It is essential for the economies in any currency union to have certain characteristics in common for the union to function beneficially. This is for two specific reasons that are closely related to each other. First, the economies should have those characteristics that make them subject to symmetrical economic shocks. Monetary Authorities can only conduct one policy across the union; They cannot set different interest rates for each region. If different regions of the union consistently demand for different policies, the union will become costly to sustain. Second, the economies should have those characteristics that make them process monetary policy similarly. If two economies are structured in such a way that they react in different ways to the monetary policy, it again will become costly to sustain the union. For these reasons it is crucial to understand what discrepancies exist between the Eurozone economies and how these discrepancies relate to asymmetrical business cycles and the monetary transmission. The discrepancies ought to be considered in two ways. First, it is necessary to identify the discrepancies inherent to the Eurozone economies. Second, it is important to understand the convergence over time of a currency union. That is, how will the economies of the Eurozone develop as time passes? It is likely that the discrepancies that one could observe at the beginning of the EMU have changed to some extent now that the Union already exists for some time. De Grauwe (2009) extensively discusses the contents of OCA theory. He summarizes important topics that can be related to both the way the Eurozone economies are exposed to asymmetrical shocks and the way they respond differently to the monetary transmission. These topics are: wage flexibility, labour market flexibility, labour market institutions, legal systems and economic diversity.⁶

Let us first consider wage and labour market flexibility. Both of these are fundamental parts of an OCA. Both have also been researched heavily in this context. Essentially, wage flexibility is possible as an adjustment mechanism when exchange rates are no longer an option. Similar to exchange rates, wage flexibility allows two economies in different phases of the economic cycle to adjust to each other by making the economy in recession relatively more competitive with decreasing wages and making the booming economy less competitive

⁶ This is not an all-including list of topics treated by OCA theory. Merely those parts are used that contribute to the subject of this paper.

with high wages. In other words, the external devaluation mechanism of exchange rates can be substituted by the internal devaluation mechanism of flexible wages. The more flexible the wages are, the easier the economies in the monetary union can respond to asymmetrical cycles. Labour market flexibility relates to this process of internal devaluation in some way as it means that the workforce that is unemployed in the economy in recession can easily reallocate to the booming economy to work there. The flexibility in the supply and demand of labour in the currency union on the one hand accommodates the adjustment of wages and on the other hand supports the economies in dealing with asymmetric shocks (Mundell, 1961; De Grauwe, 2009). A good way to address the discrepancies in wage and labour market flexibility is by looking at the competitiveness of the Eurozone members (De Grauwe, 2010). If the wage and labour markets are more capable to adjust internationally (they do not diverge competitiveness), it follows that the economies are also more capable to deal with asymmetries through the channel of wage and labour markets. It has been shown that there is a lack of competitiveness in the Eurozone. Malliaropoulos (2010) for instance suggests that the Greek economy has declined in competitiveness by 10 percent since the year 2000 using sectoral price and wage indices. An overview of the development of competitiveness over time is given by Wyplosz (2013). One important point Wyplosz (2013) addresses is that nominal unit labour costs is not a good indicator for competitiveness development (this argues against the measures the EU has taken to converge the member countries in terms of competitiveness. These measures are presented later this section). Instead, competitiveness needs to be measured by comparing the domestic traded good price index and the average traded good price index for the other countries. Using a proxy of real effective exchange rates, Wyplosz (2013) finds that there has been convergence in the levels of competitiveness in the Eurozone. He ends with the conclusion that the actual important cause of divergence is a difference in domestic demand. Differences in competitiveness followed from demand shocks. The EU has tried to address issues of competitiveness differences with the introduction of the Euro Plus Pact in 2011.⁷⁸ The Euro Plus Pact specifically addresses the following areas: competitiveness, employment, public finances and financial stability (with a special emphasis on competitiveness). Each member state is free to address these topics in the way it believes is best for itself. The pact does however make suggestions for policies. These are for example: changing the wage setting arrangements so wages can adjust more easily and

⁷ For more information on the specific traits of the Euro Plus Pact see: https://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/120296.pdf

⁸ Also known as the 'Competitiveness Pact' and the 'Pact for the Euro'.

more similarly across the Eurozone; make wages in the public sector only increase modestly; lower taxes on labour to stimulate labour market participation; set a relatively equal retirement age across the Eurozone; reform inefficient healthcare systems. Unfortunately, empirics show that these measures are not as effective as was hoped. The results of Wyplosz (2013) have already been discussed. He shows that addressing demand shocks is more important than addressing competitiveness differences. Furthermore, Gros and Alcidi (2011) show that there are natural flaws in the measuring of the competitiveness in the Eurozone. They do this with unit labour cost as a competitiveness indicator and by showing that standard competitiveness indicators cannot predict international imbalances. Gabrisch and Staehr (2014) have similar results. They find that changes in the current account balance can explain changes in unit labour cost but not the other way around. This while unit labour cost is generally used by the Eurozone as an indicator of competitiveness. Overall, this indicates that the measures introduced by the Euro Plus Pact are too superficial as there is no empirical evidence that directly targeting competitiveness through policy works. In summation, there are discrepancies in the wage and labour market. However, these have converged since the introduction of the Euro and therefore the discrepancies have become smaller. Even though the EU has taken active measures to stimulate convergence, it has been shown that these measures have not really been effective. Asymmetric demand shocks have been identified to play an important role in causing divergence. Should discrepancies in wage and labour market flexibility be considered in monetary transmission? The findings suggest not. Wage and labour market flexibility do contribute to a currency union functioning well. However, systematic discrepancies between the Eurozone countries cannot be identified as the competitiveness of the Eurozone countries converges over time and as it is subject to other economic variables such as demand shocks.

One other aspect in the area of labour markets that should be considered are the labour market institutions. Labour market institutions play an important role in the forming of wages. Therefore, structural differences in the organization of these institutions can lead to different wage formations. One important way in which labour institutions can be organized differently is that of centralized versus decentralized labour unions (Bruno & Sachs 1985; Calmfors & Driffill, 1988, Checchi & Lucifora, 2002). Bruno and Sachs (1985) conclude that a system of centralized unions will lead to different wage negotiations than a decentralized system after a shock in the economy. That is because centralized unions will try to avoid making excessive wage demands because that will ultimately only increase inflation and thus

negate real wage increases. This differs from a decentralized system that is inherently more competitive as all unions will try to increase the nominal wage of its members while at the same time knowing that all other unions are increasing their member's wages as well. This will lead to excessive demands. These differences in union organization will lead to different responses to economic shocks and thus can stimulate price divergence. Furthermore, it should be emphasized that this type of discrepancy between labour markets is likely persistent over a long period of time after the introduction of a common currency. De Grauwe (2009) for instance points out that while the monetary policy is centralized and labour unions can therefore expect the same reaction to changes in the real economy, national governments can still have their own particular employment policies besides the monetary policy. They can create more jobs in the public sector to just name an example. This suggests that even though differences in responses to real economic changes will be smaller, these differences will likely never cease to exist as long as national governments have some degree of autonomy. A comprehensive overview of the European labour market institutions is given by Hancké (2013). He describes how the European labour market institutions have developed since the start of the EMU and how there still exists a lack of international wage policy coordination. He concludes that integration of such policy is necessary for the sustainability of EMU. Likewise are the conclusions of Hancké (2002) and Glassner and Pochet (2011). They conclude that the diversity of labour market institutions has changed since the start of EMU, but there still is not enough international wage setting coordination, nor is there indication that the current systems will overcome this. An extensive empirical overview of the position of labour institutions in the Eurozone is given by Driffill (2006). He reports on changes in the density of trade unions, the collective bargaining coverage and the centralization of bargaining. He concludes that in general labour unions have decreased in membership, power and influence. Overall labour unions have become less centralized and coordinated bargaining has decreased as well. Are there any particular discrepancies between the Eurozone countries? It is not possible to see a systematic trend in the development of labour institutions. For example, Driffill (2006) reports that the centralization of the bargaining process in Germany has remained constant over the years. He reports an index close to that of Germany and likewise unchanged for Italy. The role of Italy and of Germany since the introduction of the Euro have been largely different. The fact that the centralization of their bargaining process was similar and has hardly changed over the years suggests that this did not have a significant influence in the development of asymmetric business shocks. Surely, considering the all the countries in the Eurozone, opposing developments can be seen.

However, these developments do not match the role the particular countries have played since the introduction of the Euro. For example, some countries that have experienced serious financial turmoil during the sovereign debt crisis (Spain for example) have developed similarly in the area of labour institutions as countries that survived the debt crisis relatively well (Belgium for example). This suggests that it would be complicated to account for labour market institution discrepancies in monetary policy because there are interactions with other (unidentified) variables that cause illogical movements.

One completely other aspect that needs to be considered are differences in legal systems. Cecchetti (1999) offers a good starting point to understand why different legal systems deserve to be considered. He concludes that differences in legal systems lead to discrepancies in financial structures. These structures cause regional differences in the monetary transmission mechanism. More specifically, countries where the private sector is more dependent on funding from banks and where the banking system is more volatile and decentralized will be relatively stronger influenced by monetary policy. In what way can a legal system influence the economy? La Porta *et al.* (1997, 1999) and La Porta and Lopez-de-Silanes (1998) describe how shareholder rights, creditor rights and enforcement can change the behaviour of economic agents. They conclude that legal rules, concerning shareholder and creditor rights, and the enforcement of those rules differs per country and that because of this the size and extent of capital markets also differs per country. Change of behaviour is not limited to companies in this regard, it also applies to households. Most importantly it affects the mortgage markets as mortgages tend to be completely different products across countries (De Grauwe, 2009). Empirical evidence on different reactions to interest rate changes is given by Cecchetti (1999).⁹ First, he reports indices on the size and concentration of the banking industry, the banking industry health and the availability of alternative finance in Eurozone countries. In these indices, large differences between the countries can be seen. For instance in the size and concentration of the banking industry, German banks are very lowly concentrated while Dutch banks are very highly concentrated. Similarly, the banking industry health is relatively low in Ireland and relatively high in Finland. These indices are used to make an overall indication of the relative impact of monetary policy in each country. Again, significant differences in responsiveness to monetary policy can be seen. These are used to

⁹ Cecchetti (1999) uses the same approach as Ehrmann (1998), who researched the differences in the intensity of the response of output and prices to monetary shocks across countries.

calculate the response variety in the hypothetical case of a change in the interest rates. The conclusion suggests that there are heterogeneous transmission effects. More specifically, countries in which the banking system plays a more prominent role are more sensitive to changes in the interest rates. This because the lending channel is bigger in these countries. The same issue as with labour market institutions can be seen: countries that have different economic histories have many similarities in their legal systems. This again suggests that it would be complicated to account for legal system discrepancies in monetary policy as it seems that there are interactions with other (unidentified) variables

Finally, economic diversity needs to be considered as it has consequences that can either pose problems or benefits in a currency union. The creation of a monetary union can strongly affect the industrial structures and the intra-trade patterns (Frankel & Rose, 1997, 1998; Fidrmuc, 2004). How this can pose a problem was originally explained by Myrdal (1957) and Kaldor (1966). It is applied to the case of the EMU by Krugman (1991, 1993) and Eichengreen (1992). The idea is that trade integration incentivizes producers to use economies of scale by increasingly concentrating their production process in one place. This will ultimately lead to large discrepancies between countries as entirely different industries will establish themselves in specific regions. Given that different industries are exposed to different economic shocks, oil producers for example depend heavily on the price of oil whereas agriculture depends on environmental factors, the countries' economies will also be subject to different shocks.¹⁰ Furthermore, Kalemli-Ozcan, Sorensen and Yosha (2003) argue that integration of the financial markets also contribute to this as risk-sharing opportunities incentivize specialisation. However, there is also an opposing view to this. That is that the reduction of trade barriers by forming a monetary union will cause the intra-industry trade to increase. This will lead to countries importing and exporting a more similar array of goods. Following this theory, the countries' economies will become more similar and subject to the same economic shocks (EC Commission, 1990; Gros & Thygesen, 1998; OECD, 1999; Fontagné & Freudenberg, 1999; Aiginger & Leitner, 2002). Now that some years have passed, it is important to review these two standpoints. Mongelli, Papadopoulos and Reinhold (2017) provide a very good overview of the development of these theories. They consider the major industries in the Eurozone economies and what share these industries have in the total value added. Their findings indicate that there indeed have been major changes in the

¹⁰ The importance of output diversification is also stressed by Mckinnon (1963) and Kenen (1969).

economic structures of the Eurozone countries. For example, all countries but Germany and Austria have seen a decline in the industrial sector. More specifically, Austria, Germany and Ireland have kept relatively high shares in the industrial sector while Belgium, the Netherlands, France, Spain, Greece, Portugal and Luxembourg have had declining shares in the industrial sector since the introduction of the Euro. An entirely different situation is true for the construction sector. One can see how the share of this industry has been dependent on economic circumstances. The share used to be extremely high in Spain and Ireland before the housing market crisis but has heavily declined afterwards. Now Ireland and are among have relative shares of construction that are among the lowest together with the traditionally low share of Germany. Similarly, the financial crisis goes together with large changes in the share of the public sector in the Netherlands and in Portugal. However, the share of the public sector has remained relatively stable. The findings leaves us with clear conclusions. First, it is concluded that the European economies have developed to become more heterogenous. This suggests that heterogenous effects in this regard have decreased as well. Second, deeper interactions between financial markets and trade should be considered as well. That is, different industries are not equally as much related to the financial system because of the different nature of their business. Those industries that keep closer relations to financial institutions are therefore more likely to react instantaneously to changes in the monetary policy than industries that do not keep those types of relationships. Dale and Haldane (1995) for instance showed that there is a time difference in the response of public and private sectors to changes in the interest rates. Furthermore, evidence on specific sectoral differences is given by Dedola and Lippi (2005). They do however not measure all the Eurozone economies (only Germany, France and Italy). But their results do give a good indication of sectoral differences in response to interest rate changes. They show for example how some industries systematically respond more to changes in monetary policy than others and that these different responses also differ for each country. Motor vehicle related industries are for instance much more responsive than food production related industries. The problem unfortunately is that Dedola and Lippi (2005) categorize the industries they have research different from Mongelli, Papadopoulos and Reinhold (2017). This makes it difficult to compare their results and make a concrete conclusion. Put together, it can be concluded that the Eurozone economies have developed differently over time in structure and that different industries across countries respond differently to changes in the macroeconomic policy. It is however not yet possible to make a quantitative distinction of heterogeneous effects in the

monetary transmission of Eurozone economies as to my knowledge empirical research does not exist on this particular topic.

This part has presented and discussed discrepancies that exist between the Eurozone countries in various aspects. It has become clear that there certainly are many discrepancies. However, in many cases it seems complicated to really quantify the effects these discrepancies could have on monetary transmission. This because there does not seem to be a logical connection between the discrepancies and the economic position of the countries in the Eurozone. This suggests that there are deeper interactions at work that ought to be clarified. Because of this is not possible to systematically distinguish between the Eurozone economies or to put them in specific groups based on some similar traits.

Part two: Policy instruments of the European Central Bank

Through what channels/mechanisms do the monetary policy instruments of the European Central Bank work?

The purpose of the European Central Bank monetary policy is to achieve and maintain price stability in the Eurozone. The ECB strives to do this by controlling the interest rates, managing the liquidity in the economy and by signalling the stance of their monetary policy. Furthermore, it tries to prevent or mitigate economic disturbances that can cause the monetary transmission mechanism to function improperly. The ECB traditionally uses three instruments to do these things: open market operations, standing facilities and minimum reserve requirements. As of the financial crisis of 2008, unconventional policy (a fourth instrument) was introduced, primarily to keep the monetary transmission mechanism working properly. This subsection presents the properties and the workings of these four instruments.

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Open market operations

The primary instrument with which the ECB conducts its policy and exerts influence over the interest rates in the economy is an open market operation (OMO). Open market operations are typically performed in a decentralised way by the NCB's.¹² With this instrument, the ECB can either provide or absorb capital from the private sector (also described as 'counterparties'). These types of operations can be performed in five different ways: reverse transactions, outright transaction (OMT), the issuance of debt certificates, foreign exchange swaps (FX swap) and the collection of fixed-term deposits (FD). A reverse transaction occurs when the ECB buys or sells assets under a repurchase agreement (also known as a 'repo') or issues credit in exchange for a collateral.¹³ Outright transactions are, as the name suggests, transactions where the ECB directly participates in the market. More specifically, the ECB purchases sovereign bonds issued by an Eurozone member. By artificially creating demand,

¹¹ Detailed descriptions and an overview of the instruments is also provided on the website of the ECB:

<https://www.ecb.europa.eu/mopo/implement/html/index.en.html>

Information is also provided in publications of the ECB. More specifically, the monetary policy of the ECB (2011) and the implementation of monetary policy in the euro area (2015). Both documents are mentioned in the list of references. Finally, an overview of the ECB monetary policy and the usage of the various instruments is given by Micossi (2015).

¹² In order to prevent confusion, I will refer to the ECB as the one that uses the decentralized instruments instead of the NCB's.

¹³ There exists a list of criteria which determines what assets are eligible as a collateral. This list is usually referred to as the 'Single list'.

the ECB can prevent large differences in sovereign bond yields from occurring when one particular member has fiscal problems.¹⁴ The issuance of debt certificates allows the ECB to signal its stance towards the counterparties by exerting more control over the monetary base. It allows the ECB to absorb liquidity and thus create a liquidity shortage. A foreign exchange swap is the simultaneous purchase and sale of the same amounts of the same two currencies. They are used to manage the Euro with respect to other currencies by preventing large fluctuations in the liquidity and the interest rates. Finally, another use for the ECB to absorb liquidity from the market is by collecting fixed-term deposits. The idea is similar to that of debt certificate issuance and that is that the ECB can actively manipulate the monetary base.

Of these five operations, reverse transactions are the primary and most important operation. There are four different uses of this instrument: main refinancing operations (MRO), longer-term refinancing operations (LTRO), fine-tuning reverse operations (FTO) and structural reverse operations. MRO's and LTRO's are largely similar. That is, they are all executed in a tender system where the counterparties bid for liquidity provided or collected by the ECB. There are two types of tenders: fixed rate tenders and variable rate tenders. In a fixed rate tender, the ECB states the interest rate and the counterparties respond by bidding with an amount of money they want to receive or provide at that interest rate. In a variable rate tender, the counterparties bid with the amount of money as well as with the interest rate they want to receive it at (the ECB sets a minimum interest rate for this). Furthermore, in a variable rate tender, counterparties can put in multiple bids at varying interest rates. The difference between MRO's and LTRO's is, as the names suggest, the maturity of the liquidity. MRO's have a standard maturity of one week and tenders are executed weekly whereas LTRO's have a standard maturity of three months and tenders are executed monthly.¹⁵¹⁶ The tenders allow the ECB to influence the interest rates in the money market. By setting a (minimum) interest rate in the tenders, they set the base for the interest rate counterparties will demand when lending in the private money market. Furthermore, tenders also give the ECB control over the monetary base because the ECB determines the amount of

¹⁴ Although it may seem so, OMT is not the same as quantitative easing. The difference is that quantitative easing provides liquidity to the banking system and ultimately increases the monetary base while the ECB will try to reabsorb the liquidity provided by OMT.

¹⁵ The ECB publishes a calendar for the execution dates of the tenders. These calendars can be found here: <https://www.ecb.europa.eu/press/calendars/caleu/html/index.en.html>

¹⁶ On specific events, tenders are organized for longer than standard maturities. These are referred to as targeted longer-term refinancing operations or TLTRO.

money that is allotted in the tenders. FTO's are executed as tenders as well. However, FTO's are not executed on a systematic basis, do not have a standard maturity and can be performed in other ways than reversal transactions. That is, FTO's can also take the form of an outright transaction, foreign exchange swap or the collection of fixed-term deposits. Because of their nature, FTO's offer the ECB flexibility. Whenever an unexpected economic shock happens and counterparties are in sudden need of liquidity, the ECB will be able to provide this with among others FTO's. Finally, structural reverse operations serve to signal the policy stance towards the financial sector. They take the form of reverse transactions in a tender system, their maturity is not standard and their frequency is not necessarily consistent.

Standing facilities

While the ECB greatly influences the private market interest rate by executing the main and longer-term tenders, it influences the boundaries of the interest movements with the standing facilities. There exist two types of standing facilities: the marginal lending facility and the deposit facility. The marginal lending facility allows counterparties to borrow liquidity overnight and the deposit facility allows counterparties to deposit liquidity overnight. Traditionally, the interest to be paid on liquidity borrowed overnight is higher than the interest asked in the refinancing tenders. Likewise, the interest received on liquidity deposited overnight is lower. Similar to the open market operations, the standing facilities are carried out in a decentralised way by the NCB's.

One important characteristic of this instrument is that counterparties use it on their own initiative (opposed to open market operations). Whenever a commercial bank in the Eurozone has a too large deficit or surplus (this is discussed in the 'minimum reserves' part), it needs to borrow or lend the necessary liquidity. It can do so by either borrowing or lending from another bank or by making use of the standing facilities provided by the ECB. Traditionally, interacting with other commercial banks is the most preferred option because the interest rates on the money market are higher for deposits and lower for loans.¹⁷ Using the standing facilities is usually by means of last resort. Because of the way the standing facilities are designed and used, they give a clear indication of the boundaries of the interest rate

¹⁷ The interest rates on the money market are usually referred to as EONIA for overnight liquidity and EURIBOR for a variety of longer-term liquidity. As of 2020, EURIBOR will be replaced by another system, what that system exactly will be is not known at the time of writing this thesis. More information about these tariffs can be found on the website of EURIBOR: <https://www.emmi-benchmarks.eu/>

fluctuations in the money market. Within the middle the interest rate set by the refinancing operations, the marginal lending facility indicates the upper limit of the interest rate and the deposit facility indicates the lower limit. What this in practicality looks like is illustrated by figure 1 in the appendix. Furthermore, table 1 in the appendix gives an overview of the OMO's, the standing facilities and their uses.

Minimum reserve requirements for credit institutions

All credit institutions that are located in the Eurozone are required to maintain a minimum reserve with the local NCB. That means that also institutions whose corporate headquarters are located outside of the Eurozone but are located themselves within the Eurozone are required to maintain a minimum. The opposite is true for institutions whose corporate headquarters are located inside the Eurozone but are themselves located outside of the Eurozone. They are not required to keep a minimum reserve. The minimum reserve is determined off of the reserve base of an institution. The reserve base of an institution is defined by elements on its balance sheet. Table 2 shows what items on the balance sheet contribute to the determination of the required reserves and at what percentage. As you can see, the current minimum reserve percentage is one percent. For some items there is a zero percent rate, this means that an institution does not have to keep reserves for having this items on this balance sheet.

A very important aspect of this instrument is the averaging provision. Credit institutions are allowed to let their reserves fluctuate around the minimum whenever the interest rates are different from those expected during the remainder of the maintenance period. Institutions can do this freely as long as the average of their reserves meets the minimum. This creates an intertemporal arbitrage opportunity whenever the current overnight interest rates differ from the expected future interest rates. Because of this, the averaging provision ensures stability between the current overnight interest rates and the future interest rates and it therefore stabilizes the money market. Furthermore, this instrument also increases the influence the ECB has over the monetary base in the economy as it allows the ECB to manipulate the liquidity shortage. It therefore increases the effectivity of the ECB policy. However, changing the minimum percentage amount is not a popular option, although it can be effective, because it would create uncertainty among financial institutions if the ECB frequently changed the percentage.

Minimum reserves are passively used over periods of time. These periods are called with maintenance periods. One maintenance period lasts from the settlement day of the first MRO that follows the meeting of the Governing Council until the day that precedes the corresponding settlement day in the next month. Similar to market operations, the ECB publishes a calendar of the maintenance periods before the beginning of any year. There is one important interaction between maintenance periods and the averaging provision. Averaging provision is based on the possibility of intertemporal arbitrage, but when a maintenance period comes to its end it also restricts this arbitrage opportunity. Therefore it is custom that there is a higher volatility in the money market interest rates towards the end of every maintenance period. This is also why the standing facilities are typically used more towards the end of a maintenance period. Finally, this instrument is meant to provide stability to the money market, no restrictions. Because of this, the ECB pays interest over the reserves it holds. This interest is equal to the MRO tender interest rate and thus commonly close to the money market interest rate.

Unconventional measures¹⁸

Unconventional or non-standard measures describe a variety of non-standard programmes the ECB has implemented in a response to the economic crises caused by the subprime mortgage crash and the excessive sovereign government debts. The crises created a situation in which the standard instruments no longer functioned properly, that is, the short-term interest rate was approaching zero. Originally, the purpose of these measures was therefore to keep specific parts of the financial market functioning. This aspect is known as credit easing (Smaghi, 2009). Later on, the programmes have been adopted to conduct expansionary monetary policy and negate deflation. This aspect is known as quantitative easing (Micossi, 2015). The ECB implements quantitative easing in the form of asset purchase programmes (APP). Additionally, the aspect of forward guidance should be mentioned. Forward guidance seeks to manipulate the expectations of the economy by giving information about its future monetary policy. Forward guidance can be considered as an unconventional measure on itself as well. In the context of unconventional measures, the ECB has combined forward guidance

¹⁸ Given their unconventional nature, there are different views on their effectivity. In fact, measures such as quantitative easing are among the most controversial terms in monetary policy. This thesis is however not a discussion on the properties of quantitative easing but merely a report on how the ECB has implemented it and with what intention. For an introduction to the history of quantitative easing and empirical evidence on its effects see Joyce *et al.* (2012), Fawley and Neely (2013), Hausken and Ncube (2013) and Fratzscher, Lo Duca & Straub (2017).

with the implementation of the APP's to control the expectations and thus the impact of the APP's. Nowadays, there are four different types of APP's.¹⁹ These are the covered bond purchase programme (CBPP), the asset-backed securities purchase programme (ABSPP), the public sector purchase programme (PSPP) and the corporate sector purchase programme (CSPP). The names give away on what type of assets are purchased in the programme. Respectively, the programmes were introduced in 2009 (later versions were reintroduced in 2011 and 2014), 2014, 2015 and 2016. As of January 2019, none of these programmes make new purchases anymore, however, interest and principal receiving's are being reinvested.

One important distinction between these programmes is the market in which the ECB buys the assets. In the CBPP and the ABSPP the ECB acts in the primary market but in the PSPP and the CSPP the ECB acts in the secondary market. Participation of the ECB in the secondary gives rise to some additional matters. First of all, the ECB should not disturb the prices or impair the market in any other way. As a response to this, the ECB made it a ruling that it can only purchase a limited amount of securities (33% of a country's debt issuance or 25% of a specific issue). Furthermore, the ECB employs a lending programme in which assets bought in the purchasing programme are lend back to the market. Secondly the ECB is restricted in acting as a last resort lender. That means that it can act as one, but the no-bailout clause from the Maastricht treaty for instance indicates that it rather should not. When it acts on the primary market, the ECB has been working its way around this more or less by legally lending indirectly. This type of legal rope jumping is however even more complicated/controversial in the secondary market. One final but very important aspect of the asset programmes that needs to be mentioned is that of risk sharing. Risk sharing refers to the matter who should bear the risk of all the assets bought in the APP's. That is, who takes the losses in the case of a default? The ECB has committed itself to purchasing €60 billion worth of assets on a monthly basis. €10 billion of which will fall under the CBPP and the ABSPP, these purchases are entirely made and held by the ECB. The remaining €50 billion from the PSPP and CSPP is divided between the ECB and the NCB's. 80% is held by the NCB's 20% is held by the ECB. This means that the major risk from the PSPP and CSPP falls upon the

¹⁹ One other programme that has been employed by the ECB is the securities market programme (SMP). This programme was initiated in 2010, lasted until 2012 and the liquidity of it was fully reabsorbed by 2014. The purpose of this programme was to lower the tensions in the financial market that prevented the monetary transmission mechanism from properly functioning (credit easing).

shoulders of the NCB's. The most important conclusion that can be derived out of this is that in the case of a sovereign default, the related sovereign NCB will bear the risk of that default. So instead of collectively taking the losses of a decrease in the securities value (as is the case when the ECB holds the securities), the losses are concentrated in one NCB. If a sovereign default occurs it can and most likely will have a devastating effect on the Eurozone from which it cannot recover.

The process of credit easing is very intuitive. During the financial crisis interbank lending had been decreased to a minimum as confidence in the solvability of the borrowing bank had also disappeared. The covered bond market is an important provider of liquidity for the European banks (Beirne *et al.*, 2011). It therefore was crucial that the ECB kept this market segment functioning properly. The ECB introduced the CBPP as a solution by systematically buying covered bonds and thus creating demand for these products. Later on, the ECB introduced the securities market program (SMP) with a similar purpose but with a wider scope of assets to be purchased. All these programmes were introduced with the notion that they were sterilized and thus would not change the monetary base (Fawley & Neely, 2013). Therefore, these programmes can be described as credit easing as their sole purpose was to stabilize financial markets so the monetary transmission would keep functioning.

Quantitative easing is a more thorough policy than credit easing as it is not sterilized. Aside from the influence it exerts over the exchange rate, the fiscal budget and the market demand for assets, there are two channels through which monetary policy can be conducted with quantitative easing. These are the so-called portfolio balance effect and the already mentioned forward guidance (Bernanke, 2012; Rajan, 2013).²⁰ In reality, the workings of these two channels are combined with both ultimately lowering the interest rates. As mentioned before, greatly increasing the monetary base is always necessary in achieving this. The portfolio balance effect seeks to lower the interest rates by changing the relative prices of assets and consequently decreasing the demand for low risk securities in the financial market. Recent studies on this are for example from Woodford (2016), Jouvanceau (2016) and Joyce, Liu and Tonks (2017). Forward guidance is combined with quantitative easing to control the economy's expectations about the policy. The ECB discloses that they are going to commit to

²⁰ Originally, the concept of quantitative easing and its workings has been proposed by Orphanides and Wieland (1998, 2000) and Coenen and Wieland (2003, 2004).

buying assets in the APP's. By consistently living up to its announcements, it can make credible statements about its future policy (in this case for example, its future policy is an APP meant to lower the interest rates). Therefore it can influence the expectations of the market. When the market adapts to the future monetary policy it creates a self-fulfilling prophecy about the future interest rates. This way, the ECB can exert an influence over the longer-term (Coenen *et al.*, 2017).

This sub-section has explained the motivation and the functioning of the ECB monetary policy instruments. It has become clear that the most important instrument the ECB uses are the open market operations. This ultimately is the instrument with which the ECB tries to set the interest rates and with which the ECB can increase or decrease the monetary base. The other standard instruments have a much more passive function of stabilization and ensuring the proper functioning of the money markets so the open market operations maintain their effectivity. It also has become clear that in extraordinary circumstances the ECB resorts to unconventional measures to fulfil this stabilization function. These measures have a much more rigorous impact on the economy than the standard instruments.

Part three: Business cycle synchronization

Can the European Central Bank instruments affect the individual Eurozone economies differently?

Now that the discrepancies in the Eurozone economies have become clear as well as the features of the monetary policy instruments used by the European Central Bank, we can theorize about differences in the monetary transmission mechanism in the Eurozone economies and imagine how these differences can contribute towards synchronizing or desynchronizing business cycles. Figure 2 in the appendix displays through what channels the ECB interest rates ultimately influence the price developments. It also displays what exogenous shocks can disrupt this mechanism. Part 1 of this thesis presented discrepancies between the Eurozone economies and indicates that these discrepancies can lead to heterogenous effects. One can see that changes in the global economy and fiscal policy as presented by figure 2 can surely interfere with the ECB policy. As some countries in the Eurozone are inherently different from each other, they can also respond differently to such changes in the global economy. However, this is beyond the reach of the ECB. On the other hand, we can also see that some discrepancies between the Eurozone economies are a part of the monetary transmission mechanism. Expectations with respect to forward guidance and legal systems with respect to financial markets for example. This indicates that the discrepancies between the Eurozone economies are an inherent cause of heterogenous effects in the monetary transmission mechanism. The existence of such heterogenous effects does not necessarily need to be a good thing. Suppose for instance that the Eurozone business cycles were completely synchronized. Then heterogenous effects would likely lead to desynchronization. Moreover, considering the more realistic scenario in which the Eurozone business cycles are desynchronized, it is not clear how heterogenous effects influence the business cycle. In the most ideal scenario they would cause an anticyclical movement and thus lead to synchronization of business cycles. But in the opposite scenario, they function procyclical, they would only lead to increased desynchronized cycles. This sub-section is dedicated to explore the different channels of monetary transmission and identify possible heterogenous effects that occur in these channels. It does so in order to ultimately make a conclusion about the possibility of business cycle synchronization with heterogenous effects.

An introduction to monetary transmission is offered by Mishkin (1995). He explains how the transmission of monetary policy works through various channels. These are the interest rate

channel, the exchange rate channel, the other asset prices channel and the credit channel.²¹ Through all of these channels, interest rate changes ultimately change the output and prices of an economy. Through the interest rate channel this happens by changing investment decisions with the price of capital. Through the exchange rate channel this happens by appreciation or depreciation of the currency which affects the value of imported and exported goods. Through the other asset prices channel this happens by changing investment decisions through changes in equity prices which on their turn change Tobin's q (Tobin, 1969) and changes in the value of private wealth. Lastly, through the credit channel this happens by altering credit providing institution's reserves and by altering the net worth and cash flow of firms which makes them more cautious towards adverse selection and moral hazard.²²

The monetary transmission mechanism describes thus the collective of channels through which the central bank influences the output and the prices of the economy by setting the interest rates and by controlling the monetary base. A good starting point for the analysing the ECB transmission is given by Angeloni *et al.* (2003). Their research describes the response of macroeconomic variables to changes in the interest rate policy of the ECB assuming that there are no market imperfections (this eliminates the possibility of other channels than the interest rate). They conclude that the interest rate is definitely the most prominent if not a very important transmission channel in allegedly all of the Eurozone countries. This conclusion is based on the empirical research done by Peersman and Smets (2001) and Mojon and Peersman (2001). They use vector autoregression (VAR) models to estimate the response of countries in the Eurozone to changes in the interest rates.

Furthermore, the development of financial markets has further improved the efficiency of the interest rate channel. Because European financial markets were able to integrate more with the Euro, the higher amount of competitiveness (Leuvensteijn *et al.*, 2008) and the improving technology in financial risk management (Gropp, Sorensen & Lichtenberg (2007) have caused a faster passing through of interest rate changes. These findings suggest that *ceteris paribus* the open market operations as the primary instrument have become increasingly

²¹ You can see these channels in figure 2.

²² The monetary transmission mechanism is certainly not an area in which all economists agree. Throughout the years the stock of papers on this topic has steadily been growing. It is however not within the scope of this thesis to go into detail on which channels should be more prominently stressed. The goal of this thesis merely is to establish a theoretical relation between the monetary transmission mechanism and the Eurozone discrepancies. For more information on the properties of the transmission mechanism see Mishkin (1996), Angeloni, Kashyap and Mojon (2003), Boivin, Kiley and Mishkin (2010) and Ireland (2010).

effective for the ECB to set the interest rates. However, the question remains if this channel has ultimately a heterogeneous impact on the Eurozone economies. Much research has been done to find empirical evidence of heterogeneous effects in the monetary transmission mechanism. Serati and Venegoni (2019) most recently used a factor augmented VAR model to look for such effects between Germany, Italy, France and the Netherlands.²³ They find that variables such as business investment, consumption in durable goods and real estate prices respond differently to changes in the interest rate across the Eurozone countries. In particular, they find large differences between the transmission in Italy and Germany. Chatelain *et al.* (2003) find similar differences in the interest rate channel in researching the relationship between firm investment and the monetary policy in Germany, France, Italy and Spain (they use an autoregressive distributed lag model). In particular, they find that the responsiveness in general differs per country. However, they find that initial differences in responses converge as the years pass as well. Furthermore, the responses are not opposite, they only differ in initial degree. They find differences in responsiveness between small and large firms as well. In Italy, small firms are more responsive to monetary policy changes than in other countries for example.

Another conclusion made by Angeloni *et al.* (2003) is that banks do not seem to play a crucial role in the transmission of policy by ways of lending capital, that is, the credit channel proves not to be that relevant. Their results are in line with Ehrmann *et al.* (2003), who emphasises four characteristics that could influence the monetary transmission. These are the importance of state influence in determining credit flows, relationships in lending, the size of deposit insurance guarantees and the extent of bank networks. For each of these characteristics, bank lending would be less sensitive to the monetary policy. Altunbas, Gambacorta and Marques (2007), Gropp, Sorensen and Lichtenberg (2007) and Purnanandam (2007) also argue against the lending role of banks but from a different perspective. They argue that the development of derivative financial instruments has allowed banks to increasingly shield themselves from changes in the monetary policy, thus making them less responsive to it. Anyway, the finding that the lending role of banks has decreased in importance for the argues against the effectivity of the ECB instruments. Furthermore, Angeloni, Kashyap and Mojon (2003) summarize empirical research on the lending channel in monetary transmission. For the

²³ For detailed information on factor augmented VAR models see Bernanke, Boivin and Elias (2005) and Stock and Watson (2005).

countries Germany, Spain, France, Greece, Italy, the Netherlands, Austria, Portugal and Finland it is indicated by various studies that in none of these countries the lending channel is of big influence or is existent at all.²⁴ This excludes the possibility of heterogenous effects through this channel. Another aspect of the credit channel is that of the balance sheet effect. The balance sheet effect works because of market imperfections introduced by moral hazard and adverse selection (Mishkin, 1996) (Angeloni *et al.*, (2003) assumed a perfect market). The market in mortgages plays a primary role in this effect as banks extend the largest loans in this market with the houses as collateral.²⁵ Because mortgage markets are regionally by nature, differences between these markets may lead to differences in transmission. Part one already established that there are discrepancies in the Eurozone legal systems which can lead to differences in economic agents' behaviour. An excellent example of how this can ultimately alter the transmission through the credit channel is given by De Grauwe (2009): *“To give an example, take an increase in the interest rate. In countries with an Anglo-Saxon type of financial system, this is likely to lead to large wealth effects for consumers. The reason is that consumers hold a lot of bonds and stocks. An interest rate increase lowers bond and stock prices, so that the wealth of consumers is likely to decline. Wealth effects will be less pronounced in countries with Continental-type financial markets. In these countries the interest rate increase will affect consumer spending mainly through the bank-lending channel.”* With this example it becomes clear that transmission through the credit channel can theoretically differ per country as the lending channel seems to have become increasingly immune to interest rate changes and as balance sheet effects widely differ because of differences in legal structures. Empirical results on the contrary do not support this theory. The very recent research by Serati and Venegoni (2019) shows that credit provision to households did respond to changes in the interest rates. However, changes in the provision of credit to the real sector remains constant across the Eurozone in the light of a change in the economy. This indicates that there are no heterogenous effects in the credit channel of monetary transmission.

²⁴ These studies are: Worms (2001) (Germany); Hernando and Martínez-Pagés (2001) (Spain); Loupias, Savignac and Sevestre (2002) (France); Brissimis, Kamberoglou and Simigiannis (2001) (Greece); Gambacorta (2001) (Italy); De Haan (2003) (the Netherlands); Kaufmann (2003) (Austria); Farinha and Robaldo Marques (2001) (Portugal); Topi and Vilmunen (2001) (Finland).

²⁵ Bernanke and Gertler (1995) and Mishkin (2007) provide a very good overview of the workings of the credit channel and the importance of the housing market in this regard.

Similar to the balance sheet aspect of the credit channel, monetary transmission through the channel of other asset prices works (as the name gives away) through the relationship between changes in the interest rates and equity prices. Mishkin (2001) lays the basis for considering this channel. He argues against using this channel in monetary policy. Deducing the effects monetary policy changes have on asset prices, he concludes that the prices of other assets definitely play an important role as a monetary transmission channel. Trying to target these prices is likely to worsen the effectivity of the monetary policy because of variety in nature of shocks in asset prices. Furthermore, controlling the prices of assets in the financial market is beyond the scope of the standard instruments of the ECB. Because of this it is practically impossible to establish a direct empirical relationship between monetary policy changes and the prices of other assets. The transmissive effects of this channel therefore remain largely theoretical.

The exchange rate effect intuitively should not matter much in a currency union, after all, there is only one currency. However, the exchange rate channel ultimately works through changes in the import and export. So while there cannot be an exchange rate effect within the Eurozone, there can very much be an exchange rate effect outside of the Eurozone. It has been established in the first part that the Eurozone economies lack similarity in their output because of heterogeneity in industries (Mongelli, Papadopoulos & Reinhold, 2017). The exchange rate effect transmission becomes relevant when this diversity is put in the context of international trade. You can see in figure 3 and in the appendix how the amounts imported and exported in the Eurozone vary per country. This suggests that some countries are more responsive to exchange rate fluctuations than others. In other words, the exchange rate effect is bound to be stronger in countries whose economies are more internationally oriented. Specifically, when considering figures 3 and 4, we can see that countries Germany, The Netherlands, France, Italy, Spain and Belgium contribute to by far the largest percentage of the total extra-European trade. This means that the output of these countries is much more receptive to exchange rate fluctuations caused through the exchange rate transmission effect. There is one significant downside however to this qualitative relationship and that is that it is extremely difficult to quantify the workings of the exchange rate channel (Angeloni *et al.*, 2003). This means that even though this channel is characterized by heterogenous effects across the Eurozone, it would be very tricky to actually account for these effects and implement them in policy.

What still remains to be discussed is the role of the ECB's unconventional policy in the transmission mechanism. The channels through which unconventional policy works have already been explained in part two. These are the portfolio balance effect and forward guidance. It is important to consider how the portfolio balance effect and forward guidance can influence other channels of monetary transmission. First, there is the empirical evidence given by Tischer (2018). He shows that quantitative easing can alter the amount of bank lending. This suggests that the employment of the asset purchase programmes by the ECB has increased the importance of the bank lending aspect in the credit channel, this change is opposed to the earlier finding that the importance of this aspect has decreased. This suggests a faster passing through of interest rate changes and a relatively larger change in private wealth after a change in the interest rates. This suggests that the transmission through the channel of other asset prices increases when unconventional policy is employed. Overall, the portfolio rebalancing effect of unconventional policy seems to theoretically fulfil its purpose, that is, to maintain or improve the efficiency of other transmission channels in times of economic distress. Empirical evidence on the transmissive effects of the ECB unconventional policy is unfortunately not waterproof. It has been found that the APP's do have transmissive potential, but the possibility of distress these programmes can cause in the financial markets is not excluded (Grosse-Rueschkamp, Steffen & Streitz, 2019; Zaghini, 2019). The question whether portfolio rebalancing is more prominent in one country than another remains a complicated one. On the one hand, empirical evidence indicates that there were heterogeneous responses to the APP's employed by the ECB (Albertazzi, Becker & Boucinha, 2018). On the other hand, The question remains if these heterogeneous responses were endogenous to the APP's or if they are the logical consequence of asymmetry that already existed because of asymmetric economic shocks. To my knowledge, there does not yet exist specific research on this topic. Likewise is the situation for the forward guidance channel. Empirics demonstrate the plausible effectiveness of this channel in the monetary transmission (Wu & Xia, 2016; Wieland, 2019). Furthermore, a multitude of empirical studies have been performed that explore the relationship between forward guidance, or economic expectations in general, and the pricing of assets (Gertler & Karadi, 2015; Leduc & Liu, 2016). However, specific research on the interactions with other transmission channels does not exist to my knowledge.

Now that the channels of monetary transmission have better been defined. It is clear that there are to a varying degree heterogeneous effects in the monetary transmission mechanism across the Eurozone. Now that this has been established, the following question becomes relevant:

Can the heterogeneous transmissive effects be used to synchronize business cycles? To answer this question, three things need to be done. First, the Eurozone economies have to be grouped based on criteria they have in common that indicates the phase of their business cycle. In making these groups, one also needs to consider whether these groups are logical with respect to the discrepancies discussed in part one. That is, do countries with similar characteristics find themselves in the same group and thus in the same business cycle. If this is not the case, then this indicates that the business cycles of these countries are desynchronized because of exogenous reasons. Second, the heterogeneous effects in monetary transmission need to be considered with respect to the groups. Especially the question whether the effects function anticyclical or procyclical is important in this context. Third, the time variance of the transmission channels needs to be considered. Maybe there are heterogeneous effects that cause synchronization. However if these effects only exist for limited amounts of time because they are subject to exogenous macroeconomic variables, then this eliminates the possibility of effectively using them to systematically cause asymmetries in business cycles to disappear.

A good criteria to identify the asymmetries between the Eurozone business cycles is the GDP growth rate of the individual countries. A high GDP is correspondent with a high output and thus a booming economy. The opposite is true for a low GDP. Countries that have a relatively high GDP growth rate over recent times are thus in a different state than their counterparts with a relatively low GDP growth rate. Table 3 displays a ranking of the average GDP growth rates of the Eurozone economies. It also displays the average GDP growth rate of the entire Eurozone over the year 2018. Two Using the average, it is possible to separate the countries into three groups: those that have experienced high relative economic expansion, those that have experienced moderate relative economic expansion and those that have experienced low relative economic expansion. Let us identify the countries that are below the average as relatively slow growers, the countries that are up to 1 percent above the average as relatively moderate growers and those above 1 percent as relatively fast growers. One can clearly see that the groups are also geographically close to each other. The slow growers are mostly Central-European, the moderate growers are mostly West-European and the fast growers are mostly Eastern-European. This geographical pattern seems too obvious to conclude that there is not some variable that has caused this systematic ordering; even though it was not possible to really identify such a variable. There is of course the possibility that it is due to some combination of discrepant labour markets, legal systems and economic

diversities. Unfortunately I have not been able to make clear enough distinctions in these area's to do any more than suggest this could be a possibility. Within the scope of this thesis, the systematic ordering seems to be due to exogenous reasons. This unsolid basis makes it difficult to make any statements about heterogenous effects as well. There clearly are heterogenous effects in the monetary transmission mechanism. The heterogenous effects found by Serati and Venegoni (2019) in the interest rate channel are the best example of this. It is likely that there is an interaction of some sort between the diversity of the economies and the transmission through the interest rate channel as it has been found that sectors in different countries respond in varying degrees to changes in the interest rates. On the matter of cyclicity, it has not been found that responses to changes in the monetary policy have been opposite. This means that there is no empirical evidence that the heterogenous effects can cause direct anticyclical movements in asymmetric business cycles. This does not necessarily mean that business cycles cannot synchronize due to heterogenous effects. Because it has been shown that the Eurozone economies respond in varying degrees to changes in the monetary policy, it is possible that there are situations in which a more responsive economy is in a recession and a less responsive economy is booming. In such a particular situation a lowering of the interest rates would lead to more synchronized cycles. However, the opposite situation could also occur and thus leading to desynchronization. This indicates that the capability of heterogenous effects to synchronize business cycles is very reliant on circumstances. Finally, the aspect the time variance of the transmission channels has to be considered. The monetary transmission mechanism appears to be time-variant. As financial systems change, so do the channels through which the monetary policy is transmitted. Examples for this are the reduced importance of the lending aspect of the credit channel and the introduction of unconventional policies that have their own potential but also possibly have a strong interaction with the other channels. This means that the transmission mechanism has to be ongoingly evaluated in the light of changing economic circumstances in order to remain effective. All in all it seems unlikely that heterogenous effects in the monetary transmission mechanism can ever be used to synchronize business cycles in the Eurozone. The variables and the interactions that cause asymmetrical business cycles are difficult to fully identify and quantify. The heterogenous effects in the monetary transmission are difficult to quantify as well because of this. Furthermore, the synchronizing capabilities of the heterogenous effects seem to be dependent on the circumstances. Finally, the functioning of the transmission channels themselves seems to also be dependent on the economic circumstances and therefore time-variant.

Conclusion and discussion

This thesis has come to the following conclusions:

- There do exist discrepancies between the Eurozone economies. These discrepancies cause the Eurozone economies to be asymmetrically exposed to economic shocks. However, it seems to not be possible to use the found discrepancies to systematically distinguish between the Eurozone countries or to put them in specific groups based on some similar traits.
- The most important policy instrument of the ECB is are the open market operations. The ECB uses this instrument to set the interest rates. The other instruments mostly serve to create stability and ensure the proper functioning of the money markets. A special role in this is filled by the after-crisis unconventional policies.
- There is empirical evidence that indicates a heterogeneous impact of the monetary transmission mechanism on different sectors and subsequently on different countries. However, not only are the interactions between the channels of transmission very complex and not at all explored, the transmission mechanism itself is also subject to change as financial markets change and synchronizing capabilities are circumstantial. This eliminates the possibility to use the heterogeneous effects of the transmission mechanism to systematically synchronize business cycles.

The research question of this paper was:

Are the European Central Bank policy instruments effective in synchronizing the Eurozone business cycles?

The findings in this paper give a clear answer to this question: no they are not. The instruments employed by the ECB do work in transmitting interest rates and they do work to keep each other working. But to systematically use them in order to correct for asymmetries is at least for the time being beyond their scope. It is very likely that there are heterogeneous effects to the monetary transmission that can lead under some circumstance to business cycle synchronization. However, in other circumstances, these heterogeneous effects could lead to desynchronization as well. It is extremely complicated to quantify the role discrepancies between economies have in causing asymmetrical business cycles. It therefore becomes also complicated to quantify the role of heterogeneous effects in the transmission mechanism. The

fact that the channels of monetary transmission themselves are time-variant and that their effects depend on economic circumstances does definitely not make matters easier.

The EMU economy has changed significantly since the introduction of the Euro. Therefore, this conclusion can be subject to change as well. As new contemporary instruments such as the asset purchase programmes are employed, economic conditions may change up to the point where monetary instruments become quantifiably more predictable and contribute to synchronizing asymmetries in business cycles through heterogeneous transmission. I recommend that more research needs to be done, especially empirical, on the specific interactions between the various aspects of monetary transmission. These are the interactions between the various channels of transmission, the characteristics of an economy that ultimately determine the real transmissive effect and the characteristics of the monetary instruments with respect to the transmission mechanism.

Appendix

Monetary policy operations	Liquidity providing	Liquidity absorbing	Maturity	Frequency	Procedure
Open market operations					
Main refinancing operation	Reverse transactions	-	One week	Weekly	Standard tenders
Longer-term refinancing operations	Reverse transactions	-	Three months	Monthly	Standard tenders
Fine-tuning operations	Reverse transactions Foreign exchange swaps	Reverse transactions Collection of fixed-term deposits Foreign exchange swaps	Non-standardised	Non-regular	Quick tenders
Structural operations	Reverse transactions Outright purchases	Issuance of ECB debt certificates Outright sales	Standardised or non-standardised	Regular and non-regular	Bilateral procedures Standard tenders
Standing facilities					
Marginal lending facility	Reverse transactions	-	Overnight	Access at the discretion of counterparties	-
Deposit facility	-	Deposits	Overnight	Access at the discretion of counterparties	-

Table 1 Open market operations and standing facilities; Source: ECB

percent per annum

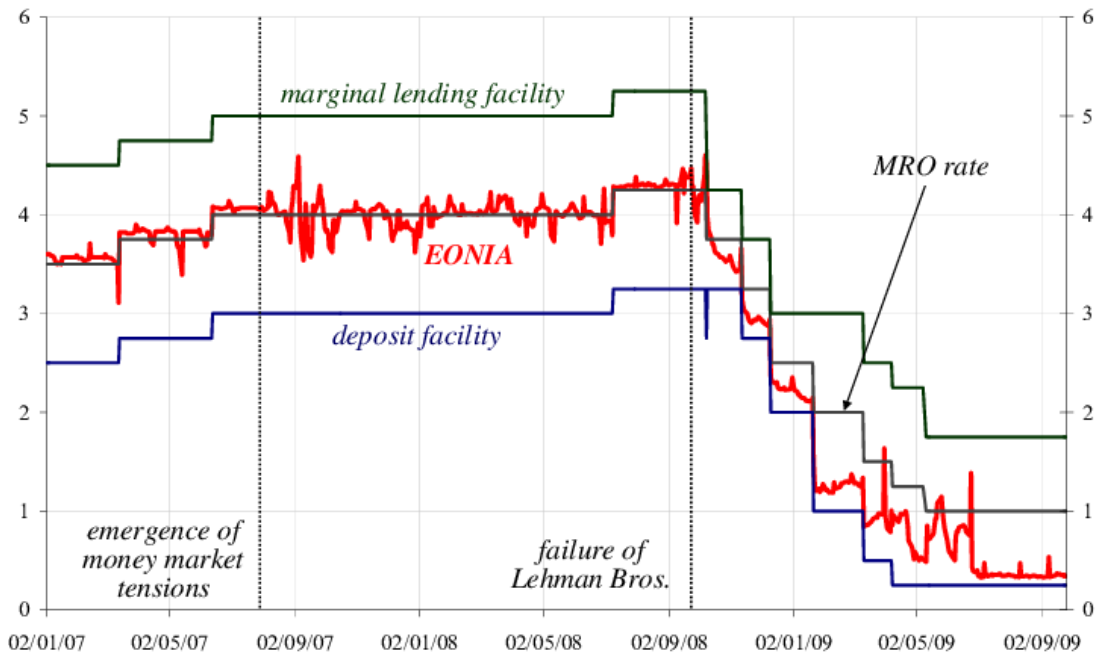


Figure 1 The main refinancing rate, the standing facilities and EONIA; Source: Giannone, Lenza, Pill & Reichlin (2011)

A	
Liabilities to which a 1% reserve ratio is applied	
Deposits (including those that are overnight, have a maturity up to two years and are redeemable at a period of notice up to two years)	
Debt securities issued with a maturity of up to two years (including money market paper)	
B	
Liabilities to which a zero reserve ratio is applied	
Deposits (including those that have a maturity more than two years and are redeemable at a period of notice more than two years)	
Debt securities issued with a maturity of over two years	
Repurchase agreements	
Total reserve base = A + B	

Table 2 Required minimum constitutes; Source: ECB

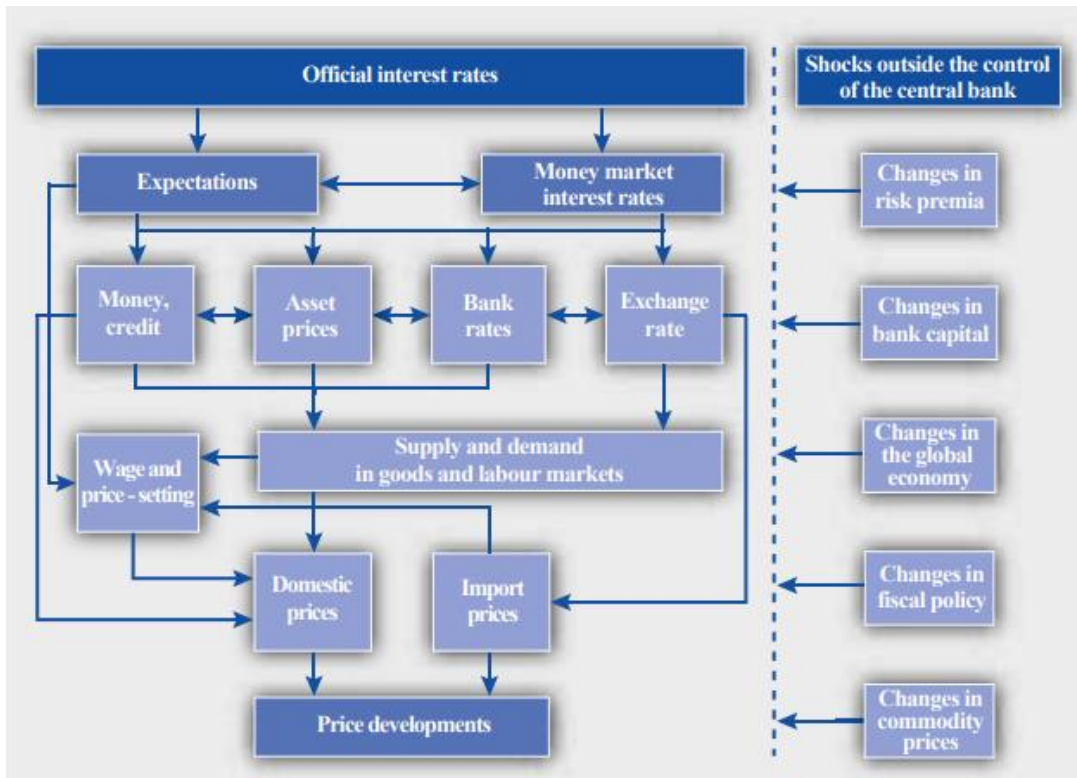


Figure 2 The monetary transmission mechanism; Source: ECB

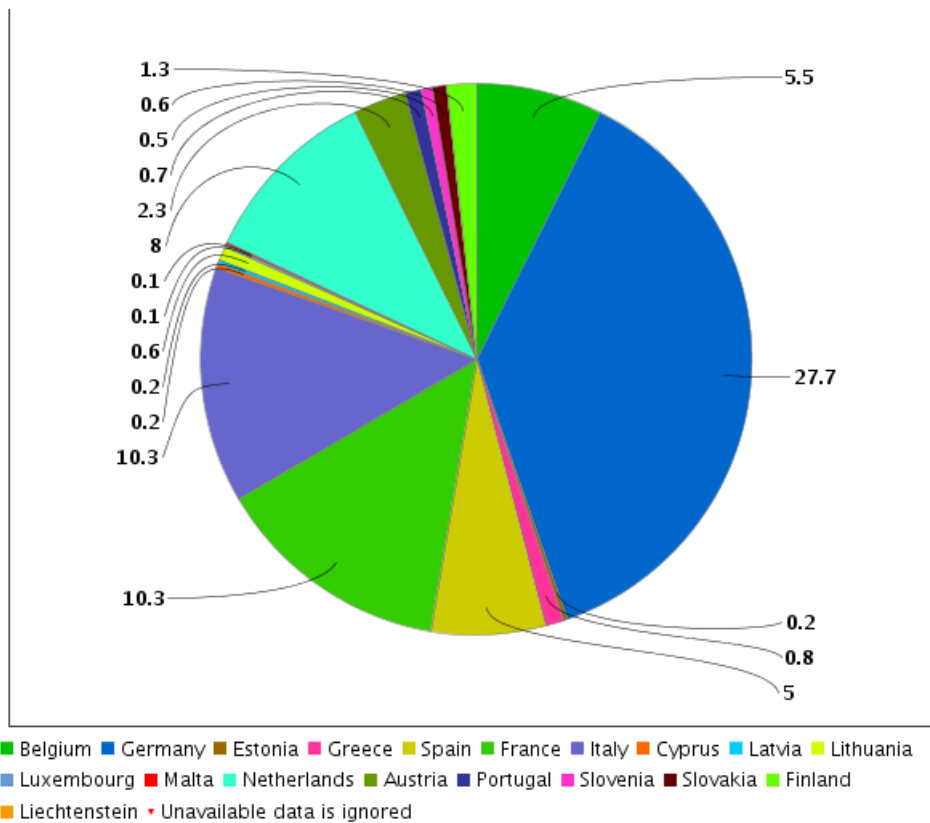


Figure 3 Country relative percentage share of the total extra-Euro export of the EU28, 2018; Source: Eurostat

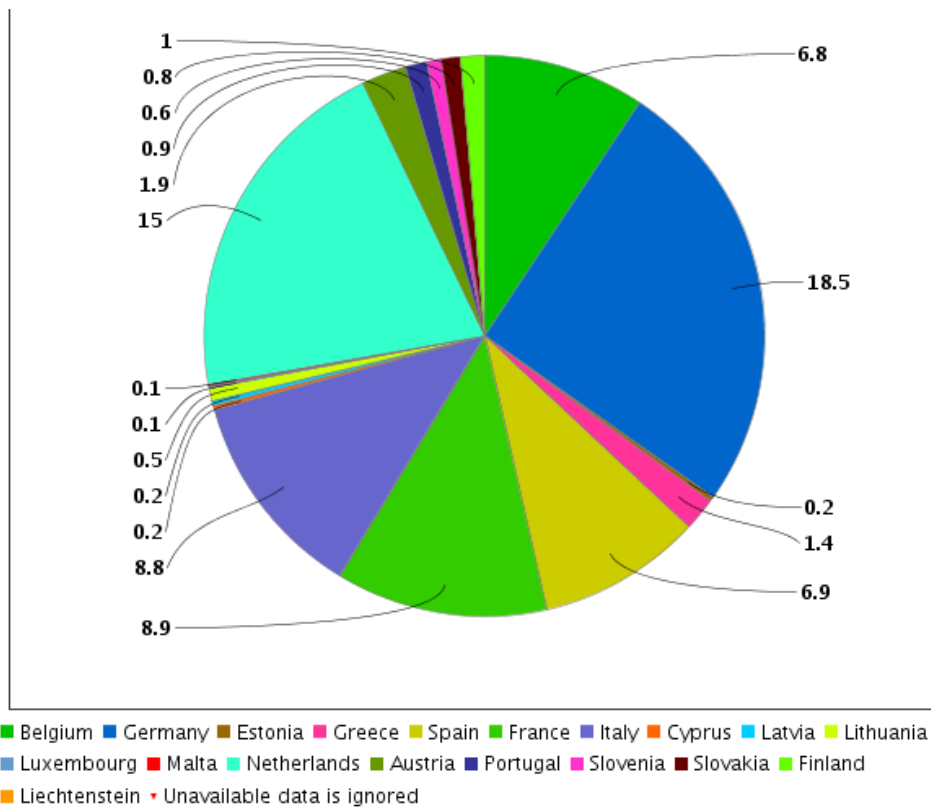


Figure 4 Country relative percentage share of the total extra-Euro import of the EU28, 2018; Source: Eurostat

Country	2018 GDP % growth	
Luxembourg	0.679	Slow growers
Belgium	1.021	
Italy	1.034	
Germany	1.094	
France	1.539	
Average	1.7	
Netherlands	2.079	Moderate growers
Finland	2.147	
Austria	2.155	
Greece	2.191	
Spain	2.295	
Portugal	2.329	Fast growers
Cyprus	2.745	
Malta	3.13	
Estonia	3.591	
Slovakia	3.96	
Slovenia	4.437	
Lithuania	4.936	
Ireland	5.64	
Latvia	5.624	

Table 3 2018 GDP percentage growth ratio's; Source: The World bank

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