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# Fixed Exchange Rate Regimes & Asymmetric Shocks

A study of Denmark's fixed exchange rate policy in the macroeconomic turbulence during the 2020's

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## Abstract

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Unprecedented economic environments provide unique opportunities for economic studies, and the macroeconomic turbulence of the 2020's has exposed the vulnerability of fixed exchange rate systems. This study examines the challenges asymmetric shocks pose to fixed exchange rates. The purpose is to evaluate Denmark's fixed exchange rate regime given current developments in Germany where an energy crisis is accelerating deindustrialization.

The thesis is an extended literature review; however, it has combined this research method with a case study and mixed-method analysis to establish the relevance of Germany's energy crisis and deindustrialization. Subsequently, it discusses potential challenges for Denmark's fixed exchange rate based on exchange rate theory and the case of Germany's energy crisis. Lastly, it assesses whether a new exchange rate policy is preferred and examines alternative solutions.

With emphasis on exchange rate theory, the study encompasses theoretical concepts and empirical observations ranging from Optimum Currency Area theory to experiences with comparable exchange rate regimes in Argentina and Switzerland.

Current economic development in Germany shows the energy crisis accelerating an already ongoing deindustrialization. Denmark's economic structure differs from Germany's, and data indicates deteriorating business cycle synchronization. With Denmark's monetary policy reserved for maintaining a stable exchange rate, it hampers the country's ability to adjust for asymmetric shocks. It can be concluded that Denmark's fixed exchange rate will come under great pressure due to Germany's energy crisis, and it will necessitate a re-assessment of the fixed exchange rate policy.

Keywords: exchange rate policy, fixed exchange rates, monetary union, asymmetric shocks, optimum currency area theory

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## **Glossary**

ECB	European Central Bank
EMS	European Monetary System
EMU	European Monetary Union
ERM	Exchange Rate Mechanism
ERMII	Exchange Rate Mechanism 2
OCA	Optimum Currency Area

# 1 Introduction

The thesis is an extended literature review examining Denmark's fixed exchange rate policy in a contemporary context with consideration to possible adaptations to be desired for future economic prosperity. With extensive coverage of relevant economic- and exchange rate theory, it creates the foundation for engaging in a discussion of Denmark's fixed exchange rate. Exchange rate policy is a widely debated topic within the field of macroeconomics, and new empirical observations are continuously added to an already extensive record. Indisputable solutions rarely exist, which further fuels the debate of exchange rate policy. Optimum Currency Area (OCA) theory was pioneered by Mundell and is the theoretical foundation for monetary unions; the most extreme form of fixed exchange rate, where a country abandons its sovereign currency in favour of a common currency. For this type of exchange rate regime to succeed, distinct criteria should be fulfilled. These criteria and their applicability to Denmark's fixed exchange rate will be investigated throughout this thesis in the context of Germany's energy crisis with emphasis on asymmetric shocks. The case of the Eurozone, to which Denmark's exchange rate is fixed, is an example of a suboptimal currency area – yet somehow it continuously surprises economists by being a functional and somewhat successful monetary union. Various exchange rate policies have their advantages and disadvantages, and there are proponents for both fixed- and floating exchange rates. Both policies are viable, however, theory suggests that national economies are unique and require different policies to reach full economic potential and prosperity. This is evident by Denmark's incredible success with a fixed exchange rate regime, which among economists is widely considered a temporary solution as it is not sustainable over the long term.

The thesis will dissect the history of the Danish exchange rate policy and establish its success in a historical context as well as in the outlook of a challenging macroeconomic environment. While Denmark have experienced great success with stability and credibility from the fixed exchange rate, not all countries experience similar results. This was the unfortunate reality for

Argentina's currency board collapse in the early 2000's, which showcases the necessity of adopting an exchange rate policy that accommodates and compliments the individual country's economic structure. While the immediate impact of the currency board greatly improved Argentina's economy in the short term, it ultimately collapsed and had detrimental consequences. This is highly relevant to study and understand, as Denmark should avoid a similar scenario.

Challenges for fixed exchange rate regimes commonly arise from a lack of business cycle synchronization resulting in asymmetric shocks. With OCA theory stressing the importance of business cycle synchronization in currency areas, it is highly relevant to examine Denmark's synchronization with Eurozone countries; particularly with Germany as a fundamental member and influencing factor of the European Central Bank's (ECB) policymaking. Despite Denmark not having adopted the Euro, they have through the fixed exchange rate relinquished autonomy over monetary policymaking. Having the ECB deciding shared monetary policy in the European Monetary Union (EMU) leaves the Danish National Bank with little to no influence. A seemingly smart decision historically, however, with fixed exchange rates commonly considered to be temporary policies, it is highly relevant to evaluate how the regime is expected to fare in the future. Germany's energy crisis in the 2020's sets the framework for a timely evaluation of Denmark's fixed exchange rate, and whether historical performance justifies continuation of the exchange rate regime given potential future developments. With Denmark having reaped the benefits of a fixed exchange rate since its introduction, the present and future benefits seem less apparent and a transition to a new exchange rate regime could be preferred. Seeing the German energy crisis accelerating an already ongoing deindustrialization, theory suggests that asymmetric shocks will occur and inflict significant pressure on the fixed exchange rate, and thus necessitate a re-assessment of Denmark's exchange rate regime.

## 2 Literature Review

### 2.1 OCA Theory

Sovereign nations experience prosperity and downturns of varying magnitude, and the subsequent inflationary- and deflationary pressures, and trade imbalances are likewise different. Whereas some of the imbalance might theoretically be possible to rectify through surplus-experiencing countries acting benevolently to support deficit countries, it is highly unlikely to work in practice. Instead, the country experiencing surplus will attempt to fight inflation by tightening credit restrictions, and the burden of adjustment will instead fall on the country experiencing deficits. Robert Mundell also argues that a demand shift between two countries and subsequent imbalances and unemployment could be solved through currency appreciation and depreciation if both countries operated with flexible exchange rates. However, this scenario is only applicable if the national borders are corresponding perfectly to the areas experiencing either inflationary- or deflationary pressures. When accounting for asymmetries in supply and demand spanning beyond national borders, the actual effect proves to be very different as one country is likely to experience both inflationary and deflationary pressures in various regions. Thus, an increase in demand in one regional area would require a different approach to monetary policy than another regional area experiencing a decrease in demand. When these areas are located within the same national border, no single monetary policy would be able to restore equilibrium (Mundell, 1961).

As an alternative solution, OCA theory was introduced by Mundell in 1961 and elaborated upon by Ronald McKinnon in 1963 and Peter Kenen in 1969. With economists debating whether floating exchange rates or fixed exchange rates between national currencies would be superior exchange rate systems, Mundell introduced a new approach with emphasis on economic integration: OCA theory. This concept builds upon the notion that geographical areas with a sufficient degree of factor mobility could benefit from establishing a monetary union with a common currency instead of independent countries maintaining



sovereign national currencies and independent monetary policies. Ergo, an efficient and collectively beneficial monetary union would require synchronous business cycles to prevent asymmetric shocks internally. Countries, or the optimum currency area, would thus prosper and experience greater stability in employment, balance of payments, and inflation. While not providing an absolute characterization of currency areas empirically, Mundell defines a theoretical framework for optimum currency areas with consideration to limitations in the feasible number of currency areas due to transaction costs, speculative risks, and simply common sense. With consideration to these limitations, currency areas should thus be defined by factor mobility existing within, and factor immobility existing between each currency area. Exchange rates should be floating between the currency areas, and a common currency should be used within each currency area with one central bank managing each currency and monetary policies for the respective area. However, with currency areas being defined based on factor mobility, existing sovereign nations should essentially cease to exist unless the national borders coincide with those of the currency area (Mundell, 1961). McKinnon (1963) elaborates upon Mundell's thoughts by adding the variable of openness of economies and how tradable and non-tradable goods influence optimum currency areas. He claims that the greater degree of openness in an economy, the less beneficial it would be to employ a flexible exchange rate and fixed exchange rates would instead be the superior exchange rate system. Exchange rate changes affect exportable goods and importable goods more than they affect non-tradeable goods, due to the nature of these goods not being influenced by supply and demand of other economies. Thus, a change in the exchange rate would cause imbalance between prices of tradable and non-tradable goods, which correlates with open economies being more vulnerable to exchange rate changes due to greater consumption of tradable goods. Instead, an economy would have to find trade balance equilibrium through fiscal policies, which leads back to Mundell's criteria of currency areas being in synchronous business cycles as a necessity for successful policy execution. Kenen (cited in Dellas & Tavlas, 2009) developed the work of OCA theory even further by accentuating the importance of fiscal integration for smooth rebalancing of funds between regions within a

currency area, as well as the importance of diversification in economic structure and production. More importantly, he widened the scope of potential currency areas by theorizing that regions within a currency area would not have to be fully uniform. With adequate labour mobility it would be sufficient for two regions to have similar industries or production structures, as a potential industry specific shock would be symmetrical and impact both regions somewhat evenly.

## 2.2 Monetary Unions

A monetary union can, based on the previously described OCA theory, be boiled down to a monetary arrangement of a common currency within a specified area, where a common institution is governing monetary policy and members have relinquished any sovereign currency and international reserves. These criteria are commonly agreed upon as being essential to form a monetary union, whereas the necessity of many other criteria have been much debated by economists (Allen, 1976: 4-6). However, as with most models in economics there are several pre-requisites, exemptions, and versions, as it within a monetary union even is possible to have more than one currency. According to Allen (1976: 4-6), several currencies can form a monetary union through fixed-exchange rates policies, which with varying degrees of fluctuation bands intend to maintain a stable exchange rate between the given currencies. The degree of economic convergence is ultimately a question of what member countries wish to achieve by entering a monetary union and the purpose of establishing it. While it is fair to say that economic prosperity is the purpose for entering a monetary union, it is inappropriate to define a common purpose for all types and variances of monetary unions. According to Allen (1976: 6-7) it largely depends on how much a country is willing to relinquish their autonomy over fiscal- and credit-policies, which is further supported by De Grauwe (2020: 103-109), who distinguishes between incomplete monetary unions and full monetary unions.

The EMU is a text-book example of an incomplete monetary union. In De Grauwe's (2020: 132) eyes, the challenges within the EMU arise from the fact

that it is an incomplete monetary union. However, completing the monetary union would require member states to not only relinquish their currency and monetary policy, but also parts of their governments' responsibilities in fiscal policy. According to Allen (1976: 11-12) this type of convergence would be comparable to that of the United States where local interests are non-existent, and the twelve Federal Reserve banks have very little independence.

Countries experiencing high or unstable inflation might see it as a benefit to join a monetary union. Krugman, Obstfeld & Melitz (2023: 699) claim the credibility theory of the European Monetary System (EMS) can prove to be a preventive mechanism against governments using fiscal policies irresponsibly as it would be costly to violate a fixed exchange rate system. Thus, a government will automatically gain credibility, which would prevent speculative attacks. However, countries with bad reputations of managing fiscal policies will still be at greater risk of experiencing speculative behaviour resulting in potential debt crises, according to De Grauwe (2020: 46-49).

### 2.2.1 The European Monetary Union

Interestingly, the EMU was by some economists deemed unlikely to succeed due to the lack of labour mobility (Meade 1957, cited in Mundell 1961). Mundell, based on the criteria he outlined for optimum currency areas, was also sceptical of the idea of a monetary union in Europe. Others (Scitovsky 1958, cited in Mundell 1961) argued that the establishment of a European monetary union would promote factor mobility, more specifically capital mobility, and thus also enhance convergence of the involved economies.

Nonetheless, major motivations to establishing a monetary union in Europe were growing distrust in the United States' willingness or ability to fulfil its international monetary responsibilities, as agreed at Bretton Woods following the Second World War. Combined with the desire for a unified European market with less trade barriers and greater labour flexibility, it created a foundation for establishing a European monetary union. Additionally, the German Bundesbank

had the reputation of maintaining stable inflation rates, which other European countries could benefit from with fixed exchange rates to prevent speculative attacks (Krugman et al., 2023, 694-701). European countries were, during the Bretton Woods system, operating with fixed exchange rates, which pegged national currencies to the US dollar. However, as the Bretton Woods system finally broke down in 1973, European countries continued with floating exchange rates before implementing the EMS in 1979. The 8 EMS countries, including Denmark, implemented fixed exchange rates through the Exchange Rate Mechanism (ERM). The following years were impacted heavily by a turbulent macroeconomic environment, which also affected Denmark's future policies as described in section 2.4.3. Original fluctuation bands were increased from  $\pm 2.25$  percent (%) to  $\pm 15$  percent (%) due to speculative attacks on currencies in 1991 (Krugman et al., 2023: 694-699). While the foundation of what has since become the European Union in 1957 was already an early step towards establishing a monetary union, the official establishment of the EMU happened in 1991 with the signing of the Maastricht Treaty. Several years of implementation and progressive convergence followed with the introduction of the Euro in 1999 before completion of the EMU in 2003 (De Grauwe, 2020: 122-123). With the introduction of the Euro, a new institution was created in the ECB which together with the national central banks in the Eurozone constitutes the Eurosystem (Krugman et al., 2023: 704).

## 2.3 Central Banks

Key elements in the relationship between the ECB and the Danish National Bank are their roles and mandates for the Eurozone and Denmark, which is to ensure price stability. This is ensured by preventing shocks from disrupting the economy and thus decreasing economic activity. The ECB manages this mainly through monetary policy, but also through foreign exchange operations, by managing the euro exchange rate, and by maintaining smooth payment operations within the monetary union. However, the Danish National Bank mainly relies on fixed exchange rate policy with the Euro as a key mechanism in maintaining price stability (ECB a, n.d.; Danmarks Nationalbank b, n.d.).

### 2.3.1 Inflation & Monetary Policy

Inflation, a sustained increase in prices, is commonly characterized as a negative phenomenon. It is a concern for both consumers and central banks as purchasing power deteriorates and affects price stability, yet central banks are equally concerned about the implications it has for exchange rates. Higher inflation in one country will result in higher prices, which prompts consumers to look for foreign products thus causing an appreciation of the foreign currency and a depreciation in the domestic currency. Natural balancing of exchange rates because of inflation is viewed through the purchasing power parity model, as purchasing power in each country will re-balance through changes in exchange rates despite differing inflation rates (Miller & Benjamin, 2012: 167-172; Moss, 2007: 127).

As described by the ECB's and the Danish National Bank's objectives of price stability, inflation rates near two percent are to be desired (Danmarks Nationalbank a, n.d.). The challenge is to maintain inflation rates near this target, which is why monetary policy is indispensable for central banks. The balance between economic growth and sustainable inflation is incredibly delicate. Through monetary policies, central banks can influence money supply, which propagates through the economic system until it reaches consumers. The ECB influences economic activity mainly through interest rates, in which it sets the interest rate on refinancing operations, the rate on deposit facilities, and the rate for marginal lending (ECB b, n.d.). Furthermore, it can influence economic activity through various lending rates for commercial banks. Another interesting, and more recent, instrument is the ability to influence consumer and business behaviour through forward guidance. By implying or sharing intentions of future actions, central banks can influence interest rate expectations and thus the effective interest rates in advance of any policy rate adjustments. In a scenario where interest rates are at- or near the zero lower bound, and the central bank wishes to stimulate the economy further, they can provide forward guidance of prolonged low interest rates compared to expectations. Likewise, forward

guidance of their intentions of increasing interest rates can cause consumer spending and lending to slow down (Sutherland, 2022: 1-6).

Conversely, the Danish National Bank does not operate with the instrument of forward guidance. It does operate with interest rates and various lending arrangements for commercial banks as the ECB. However, a fixed-exchange-rate policy strongly limits the Danish National Bank's flexibility in deciding on interest rates and eliminates the opportunity of influencing consumer and business behaviour through forward guidance (Danmarks Nationalbank b, n.d.).

There are various theories on the reasons inflation occurs, such as demand-pull and cost-push inflation, and even inflation because of excessive money supply. The challenge for the ECB and the Danish National Bank is to identify the underlying inflationary pressures, and subsequently adjust their monetary policies accordingly. The appropriate solution in environments of high inflation would be to increase interest rates to slow the economy. The expected effect of higher interest rates is that it will be more expensive to borrow money, which will cause consumers and companies to borrow less and thus spend less. As demand falls there will be less pressure on suppliers and manufacturers, which translates to inflation rates stabilising or even decreasing. It is, however, a very delicate balance as less expenditure in the economy can lead to companies reducing workforce, which then causes increasing unemployment. This could lead to an inversion of monetary policies, as central banks would instead have to lower interest rates to kickstart demand and thus stimulate the economy again (Moss, 2007: 34-38).

While it may seem simple, there are several other dynamics to consider in monetary policies. One of these is the relation between interest rates and currencies. When tightening of economies happens and money supply decreases, there will be less currency circulating, causing the currency value to appreciate. While it seems great for an economy that its currency appreciates relative to other currencies, it also makes it more expensive for trade partners to purchase goods from the given economy. This relationship is of great

importance when considering an economy's relative position compared to the global economy – and especially those economies with which they mainly engage in import and export (Moss, 2007: 35-38).

While it is not per se relevant for the scope of this research, evidence provided by Christensen (2015a) suggests that a critique could also be directed at the EMU and ECB regarding their monetary policy in regard to nominal GDP growth and public debt growth. Suboptimal and even wrong decisions in monetary policies can happen for independent national banks as well as the ECB, which means it is not a risk isolated to the ECB. However, in a monetary union each member country relies on the policy set forward by the central bank, which is concerned about the collective economic growth of the currency area as a whole and not growth for the individual country.

## 2.4 Exchange Rates

International trade is essential in open economies and exchange rates are the facilitator that ensures smooth trade operations between countries and economies. The Euro itself is worthless in USA; however, exchanging it to the equivalent value in US Dollars allows for trade between parties that hold Euros and US Dollars (Sloman & Garratt, 2018: 457-458). With exchange rates being an integral part of international trade, the dynamics of exchange rates require great attention from central banks. There is not a single solution that is superior to others, and countries can - and do - operate with various forms of exchange rate regimes. Some countries have floating exchange rates such as the American Dollar. Others choose the exact opposite option such as Ecuador, which has fully adopted the American dollar, which means it operates with a completely fixed exchange rate. A less radical solution would be a fixed exchange rate that is pegged to another currency or even gold (Krugman & Wells, 2013: 569-572).

Demand and supply are the dynamics that influence the exchange rate of floating currencies. The greater demand there is for a currency, the more it will

appreciate relative to other currencies. While an appreciating currency might seem advantageous, there are both benefits and costs associated with it. An appreciating currency will result in consumers being able to purchase more foreign goods and services, yet it will also result in decreasing domestic demand and manufacturing as domestic companies become less competitive. It will be more expensive for companies to manufacture domestically, and they will instead search for foreign options. Thus, a country and domestic companies will lose income and purchasing power parity will be restored between the given countries. Likewise, a depreciating currency will result in lower demand for foreign goods and greater competitiveness for domestic production (Miller & Benjamin, 2012: 167-172). Viewing these dynamics in the context of the relationship between the Eurozone and Denmark largely explains Denmark's desire to operate with a fixed exchange rate instead of a floating exchange rate, which will be elaborated on in section 2.4.2.

#### 2.4.1 Fixed Exchange Rates

Contrary to floating exchange rates, fixed exchange rates are not allowed to float freely in the market depending on supply and demand. Instead, central banks keep the exchange rate at a pre-determined, fixed rate relative to another currency or precious metal such as gold. While supply and demand determine the value of free-floating currencies, they also have an influence on fixed exchange rates. Central banks keep the exchange rate fixed in a market of fluctuating supply and demand through foreign exchange intervention where they participate in trade of currencies (Krugman et al., 2023: 549-551).

Various arguments have been brought up in the discussion and comparison of floating- and fixed exchange rates and the topic is heavily debated between economists. The perhaps greatest benefit of fixed exchange rates is the stability it provides in international trade as it eliminates risks of appreciating or depreciating currencies. Countries are more likely to engage in foreign trade when they will not incur costs or diminishing profits due to exchange rate fluctuations. Another possible benefit is that it prevents speculators from



engaging in trade with the currency and cause speculative attacks. If the central bank is credible and effective in keeping the exchange rate stable, speculators will not have any reason to suspect fluctuations they could profit from. Likewise, credibility is also an important factor that influences inflation policies. If the union or country which a currency is pegged to has a credible approach to managing inflation, other countries can benefit of that as described in section 2.2. The positive influence fixed exchange rates have on fiscal policies are also to be considered since governments cannot rely on central banks and monetary policies to correct potential irresponsible behaviour. They must conduct sustainable fiscal policies even if it would have negative impact on domestic economy in the short term. (Krugman & Wells, 2013: 569-572; Sloman & Garratt, 2018: 464-467).

Naturally, fixed exchange rates are not only advantageous as there are also significant costs and challenges when pegging a currency to another. Employing a fixed exchange rate means that countries reserve monetary policies for maintaining stable exchange rates. While monetary policy is commonly used as an instrument to maintain price stability, it is also relevant in relation to balance of payment deficits. Deficits and surplus are common, and perfectly normal when engaging in international trade. However, if deficits are present for an extended period it starts to become a problem and balance needs to be restored or at least for the imbalance to be reduced. In a scenario where a country imports more than it exports; it will become indebted to other countries and see current account deficits. The loss of competitiveness could stem from e.g., higher domestic wages causing a rise in prices of domestic products, which prompts foreign countries to look for alternative products. There are two ways of re-balancing the current account. It could be done either through fiscal policies in the form of increased taxes or decreased government spending, or through a currency devaluation. The currency devaluation would increase international competitiveness and thus aggregate demand whereas contractionary fiscal policies would decrease aggregate expenditure. However, in a fixed exchange rate system the option of devaluing the currency would not be desired – and for some countries it would not even be considered an option.

Therefore, the only realistic solution would be contractionary fiscal policy with the less desired outcomes it brings, such as higher unemployment and recessions in worst cases. Additionally, there is a trade-off where the costs of fiscal tightening would surpass the reputational costs of devaluing a currency despite operating with a fixed exchange rate (De Grauwe, 2020: 103-111).

The Maastricht Treaty criteria for member states in the EMU require public-sector deficits to remain below 3 percent of the country's GDP, and for public debt to be below 60 percent of GDP (Krugman 2023: 703). These criteria can limit member states' possibilities of using expansionary fiscal policies during a recession, which can cause severe damage to the economy if the ECB's monetary policy is not accommodating to the economic environment in the impacted country.

Another major cost of operating with a fixed exchange rate is that it requires significant reserves of the currency the exchange rate is pegged to. This is a large investment with a low return, and in case of speculative attacks or a lack of confidence in the domestic currency, they could even experience outflows of a magnitude that exceed their foreign reserves, according to Krugman & Wells (2013: 569-572). Outflows of the currency would require the central bank to defend the exchange rate by selling foreign currency against the domestic currency, which is verified by the Danish National Bank in their daily operations (Danmarks Nationalbank c, n.d.). And the question of sufficient liquidity is a valid concern as it is a finite quantity, and an outflow would only be exacerbated by speculators if there is a lack of credibility in the authorities or if the fixed exchange rate is not considered sustainable due to current account deficits. (De Grauwe, 2020: 103-111; Sloman & Garratt, 2018: 464-467).

#### 2.4.2 Denmark's Fixed Exchange Rate

Denmark implemented a fixed exchange rate regime in 1982 and has since been operating with fixed exchange rates. Before the EMU was established, the Danish Krone was pegged to the German D-Mark and later to the Euro once

that was introduced in 1999. With this policy the Danish National Bank must ensure that the Danish Krone stays within a certain range of the Euro. This creates the foundation for a very close co-operation with the Eurozone, and Denmark's monetary policy is fully reserved for maintaining a stable exchange rate with the Euro. One of the reasons for this decision is that Denmark has the same interest as the Eurozone and when it comes to inflation, it also aim at a rate of near 2%. The central rate of Danish Kroner is 746.038 per 100 euro, and it is allowed to fluctuate up to 2.25 percent either above or below the central rate. In reality the Danish Krone has been fluctuating much closer to the central rate since the Euro was introduced. The exchange rate of the Danish Krone is influenced by supply and demand relative to the Euro. If there is high demand for Danish Kroner, the value will appreciate, and the National Bank must react to avoid breaching the 2.25% agreement. The Danish National Bank operates with two different tools when it ensures the exchange rate stays stable: interest rate adjustments and intervention (Danmarks Nationalbank c, n.d.).

Interest rate adjustments will affect demand for the Danish Krone, as higher interest rates will cause the Danish Krone to appreciate relative to the Euro and oppositely lower interest rates will depreciate the currency relative to the Euro. This is the reason monetary policy is fully reserved for the fixed exchange rate policy in Denmark, contrary to the ECB which utilizes the monetary policy to reach its inflation target. However, as the ECB and the Danish National Bank share the same objectives, the interest rates in Denmark will indirectly be used to reach or maintain 2% inflation – under the assumption the Eurozone and Denmark experience similar business cycles and symmetric demand- and supply shocks, which will be investigated in section 2.6 and 4.3. The other option is intervention, which means that the Danish National Bank can buy and sell kroner against the Euro. If the demand for Kroner is high, the Danish National Bank can decide to sell more and thus increase the supply of Kroner. That way the higher demand will not cause the exchange rate to appreciate. Likewise, the Danish National Bank can buy kroner against the Euro if there is low demand for Kroner to keep the exchange rate from depreciating. Through monthly publications of their spendings, the Danish National Bank ensures

transparency of the extent of its interventions. They proclaim the interventions to mainly be of modest amounts, yet in case of speculative attacks on the currency, they intervene to a greater degree. While the Danish government is ultimately the responsible entity for fiscal policy, the Danish National Bank provides analyses bi-annually for the Danish Government and can thus influence policymaking. (Danmarks Nationalbank c, n.d.; Danmarks Nationalbank d, n.d.).

### 2.4.3 History & Politics of Denmark's Fixed Exchange Rate Policy

The paradigm of fixed exchange rates in Denmark was implemented in 1982 with a peg to the German D-Mark and later to the Euro in 1999. Denmark's economy had in the 1970's and early 1980's experienced turbulence with high unemployment, high inflation as well as large imbalances in the current account with deficits predominantly between 2 and 5%. After a period of economic growth – internationally as well as in Denmark – inflation increased rapidly, which between 1973 and 1974 was amplified by the oil shocks as oil prices increased rapidly. The economic environment was a major challenge in Denmark and higher interest rates were followed by higher unemployment. Economic policymaking suffered under myopic interests during these years with wage indexation contributing to higher inflation as well as the Danish government trying to combat increasing unemployment through fiscal spending. However, this caused large budget deficits and the high interest rates only amplified interest payment expenditure. The Danish government attempted several devaluations of the Danish Krone to increase competitiveness, but these failed and instead resulted in higher inflation. During the 1970's and early 1980's, Denmark's economy declined faster than other European countries according to Christensen & Topp (1997:5), which is supported by Dam (2008) who has investigated the correlation between business cycles in Denmark and European economies. The challenges with high inflation, high unemployment, and severe current account deficits and government finances were so severe that the Danish government resigned in 1982. The new government approached the challenges differently, and they implemented a law against the

overwhelming wage indexation as well as tightening of government spending and fiscal policies. However, the most important change in the context of this thesis, was the decision to implement a fixed exchange rate system within the EMS. Denmark was already an existing member of the EMS since 1979 and had participated in the ERM with a basket of common currencies, the European Currency Unit. However, the original system allowed for unlimited intervention and adjustment of exchange rates, which Denmark exploited by devaluing the Danish Krone on several occasions. With the fixed exchange rate, Denmark wished to benefit from the financial stability of the other EMS countries, and the new arrangement had greater credibility as devaluation was not an option. Furthermore, the new arrangement came under immediate pressure as Denmark's closest trading partner, Sweden, devalued their currency shortly after Denmark had committed to the fixed exchange rate within the EMS. The new government did not cave into the pressure and refrained from devaluing the currency, which immediately increased the credibility of the new fixed exchange rate system. The changes proved to be successful over the following years, as inflation rates dropped significantly in the late 1980's, and the current account went from being in deficit to surplus in the early 1990's. While unemployment still increased and the financial sector incurred considerable losses, Denmark was better off than the neighbouring Nordic countries; in contrast to the prior decade where myopic interests caused the Danish economy to lag its European peers (Abildgren, 2004: 24-30; Christensen & Topp, 1997; Danmarks Nationalbank c, n.d.; Hoffmeyer & Hansen, 1993: 43-49; Vastrup, 1988: 96-105).

During the 1990's several events and economic activities in Europe challenged Denmark's fixed exchange rate, most notably the UK's decision to exit the ERM system. This decision was made after reunification of West- and East Germany, which required strict monetary policies in Germany. With other European countries experiencing differing economic conditions (i.e. an asymmetric shock), that required a different approach to monetary policies, the ERM was under severe pressure. In the same period Denmark returned to a Social Democratic government in 1993, which was also in charge during the currency devaluations

and economic turmoil prior to the fixed exchange rate regime. In a fierce battle with speculators, the Danish government in co-operation with the Danish National Bank and other members of the ERM, managed to defend the fixed exchange rate and strengthen the credibility even further. The Danish economy prospered in the 1990's with low inflation rates, current account surpluses and low interest rates. While the unemployment rate spiked during the 1990's, it improved significantly towards the late 1990's (Abildgren, Andersen & Thomsen, 2010: 7-10; Christensen & Topp, 1997; 5-10).

The Danish National Bank continued to be heavily involved in the process of establishing the EMU during the 1990's despite having agreed upon the Edinburgh Agreement, which allowed Denmark an opt-out clause from the ERM II framework and the Euro. According to Abildgren et al. (2010: 14-16) during this period there began to form a consensus that Denmark would fully join the ERM II and adopt the Euro as their currency, and the Danish National Bank persistently advocated for it. Among the arguments they stated that opting out would significantly reduce their influence, occlude them from participation in knowledge sharing amongst central banks, and Danish monetary policy would be reliant on decisions made by the ECB. Nonetheless, Denmark ultimately decided not to join the Eurozone and instead maintain the fixed exchange rate policy, which had assured stable exchange rates and economic stability since 1982 and continued to do so after the Euro was introduced (Abildgren et al., 2010: 214-224).

#### 2.4.4 Critique of Denmark's fixed exchange rate

The debate between floating exchange rates and fixed exchange rates is not only limited to Denmark, but also a common topic amongst several European countries. According to Christensen (2015b), there is a significant correlation in economic prosperity between countries with floating exchange rates and countries with fixed exchange rates. Countries with fixed exchange rates, of which most are fixed to the degree that they have adopted the Euro, experienced significantly worse changes in real GDP between 2007 and 2015

with a median growth rate of 1.5%. Comparatively, European countries with free floating exchange rates experienced a median growth of 7.9% (Christensen, 2015b). Christensen goes as far as calling the euro: “a *Monetary Strangulation Mechanism*”, as asymmetric shocks cause economic damage since monetary policies cannot be used to the same extent for these countries, as they can for countries with free floating rates.

Ravn (2012: 21-23) presents another challenge with the Danish model, which is that while monetary policy in Denmark is not decided directly by domestic inflation and business cycles, adjustments to interest rates can still have an impact. This means that Denmark essentially has given full autonomy of monetary decision making to the ECB, even though the state of Denmark’s economy might require a different monetary policy than decided by the ECB. The relevance of this is a question of business cycle synchronization and whether Denmark and the Eurozone would be likely to experience asymmetric shocks, which will be investigated in section 2.6 and empirically in section 4.3.

Another critique of the Danish model is also that the Danish National Bank is not only limited in its monetary policy decisions, but also stripped of the possibility of deciding whether a fixed exchange rate should be abandoned for the benefit of a new policy. The decision on a fixed exchange is a mandate carried by politicians in Denmark. And as politicians are elected democratically by the citizens of Denmark, it is a decision by the people. The question is whether people are rational and knowledgeable in the topic of exchange rate policy and what system would allow Denmark’s economy to prosper. In fact, the Danish National Bank has declared that it never intends to abandon the fixed exchange rate policy. According to Codogno and De Grauwe (2015), the only logical solution to the current system is that Denmark still has the opportunity to abandon the EMU and the fixed exchange rate in case of, for example, a major shock. In a situation like that it might be preferred to abandon the policy, devalue or revalue the currency, and then continue with a floating currency. If Denmark would be a fully integrated member of the EMU and adopt the Euro, it would not be able to do so. So, despite Denmark currently being in a situation

where it is essentially a Euro-country, then it still has the opportunity to relatively quickly abandon the system compared to countries that are fully integrated.

The issue with keeping both doors open, is that it can create speculative behaviour that will force the Danish National Bank to choose one or the other direction. This might not be relevant at this point in time (early 2024), as the Danish Krone is experiencing upwards pressure, because the country can in principle print unlimited Danish Kroner to keep it within the fluctuation bands. According to Allen (1976: 8-14) the perception of citizens and speculators is also highly relevant, as they might view a fixed exchange rate policy as lack of commitment to the monetary union or as just a temporary solution.

Fixed exchange rate regimes rarely stand the test of time, and they can never be considered a permanent solution, according to Codogno and De Grauwe (2015), as they claim fixed exchange rate regimes eventually will have to be abandoned. They further claim that the longer a country employs a fixed exchange rate policy the more difficult it will be to abandon it, as witnessed by Switzerland. With Switzerland abandoning the fixed exchange rate policy in favour of a floating exchange rate, it caused severe financial losses for unknowing market participants as the Swiss Franc appreciated significantly following the announcement. The decision was at the time heavily criticised and the Swiss National Bank lost credibility as they had fiercely defended the fixed exchange rate and its continuance (Wyplosz, 2015). Switzerland's decision further fuelled speculations that Denmark could choose to abandon their currency peg as well according to Codogno & De Grauwe (2015).

#### 2.4.5 Stability of Denmark's fixed exchange rate

Despite extensive critique of fixed exchange rate systems, as well as Denmark's fixed exchange rate, Denmark's tenure with a currency peg has remained relatively stable since its introduction. Paradoxically, this is described by Eichengreen (2023: 781-782) as being a "*problem*" for experts in the field of international finance. The Danish fixed exchange rate regime does not adhere



to the consensus of fixed exchange rates systems being fragile and thus considered temporary solutions. According to Eichengreen (2023: 788-790), this can largely be attributed to the credibility aspect of Denmark's fixed exchange rate. The longevity of the regime has contributed to greater credibility, which is supported by Bizuneh (2021: 72-73), who through Kaplan-Meyer calculations has identified a tendency of fixed exchange rate regimes being less likely to be abandoned after 18 years' existence. This is of great relevance in understanding the critique of Denmark's fixed exchange rate presented by Codogno and De Grauwe's (2015) in the previous section, which was published shortly after Switzerland's decision to abandon its currency peg. They anticipated that the Swiss decision would cause upwards pressure on the Danish Krone and uncertainty towards Denmark's commitment to their currency peg, which potentially could cause Denmark to follow the same path and abandon the peg. Eichengreen, having the benefit of hindsight, claims that Switzerland's abandonment ultimately increased credibility in Denmark's currency peg; contrary to Codogno and De Grauwe's arguments of weakened credibility. Likewise, the previously weathered challenges of the ERM Crisis in 1992 as well as the Global Financial Crisis have strengthened the credibility, and more recently the Covid-19 pandemic and the subsequent economic turmoil. Denmark has thus showed commitment to the currency peg in both times of upwards- and downwards pressure on the Danish Krone.

Eichengreen (2023: 782-788) also touches on other factors contributing to Denmark's currency peg stability. Firstly, sufficient foreign reserves are a necessity for a stable currency peg, and Denmark holds foreign reserves of 65 billion Euro. Despite a current account surplus of 30 billion Euro, the short-term external debt of 235 billion Euro exceeds the foreign reserve holding. In theory it could be disastrous during a speculative attack or a short-term debt runoff, yet the high creditworthiness of borrowers prevents this in Denmark's case. While Eichengreen argues it is not the fundamental reason for exchange rate stability, it does remain a reason for the lack of instability as seen in other fixed exchange rate regimes. Secondly, fiscal- and financial policies have been sound with only relatively minor budget deficits occurring and a well-functioning

banking system. This stands in sharp contrast to the fiscal discipline in Argentina in the late 1990's, which according to Schuler (2003: 29-36) was a large contributor to the remarkable collapse of their currency board, an alternative fixed exchange rate system, which is elaborated on in section 2.4.6.

Related to fiscal policies are also the flexibility of the Danish labour market. While Eichengreen does not discern labour flexibility between Denmark and the Eurozone, he does highlight the extensive, domestic social security system, which serves as an insurance policy for laid-off workers and unemployed. It prevents long-term unemployment and a volatile economy during business cycles. Eichengreen continues to touch on the positive effects of accommodating monetary policies set by the ECB having created upwards pressure on the Danish Krone, which all things equal is to be preferred over downwards pressure due to the theoretical possibility of unlimited printing of domestic currency to counteract upwards pressure. Likewise, in the event of downward pressure or speculative attacks to a degree that intervention at the margins would be required, it would be in the scope of the ECB to intervene and in stabilize the exchange rate in a joint effort with the Danish National Bank. Lastly, intervention by the Danish National Bank has previously proven very successful in stabilizing the exchange rate.

#### 2.4.6 Alternative exchange rate systems

With various viewpoints on the critique of fixed exchange rates, it is essential to understand the consequences of exchange rate systems collapsing. In the worst case, a fixed exchange rate regime could result in a situation such as Argentina's between 1998 and 2002 where their currency board regime ultimately collapsed. The currency board arrangement was introduced in the early 1990's to combat hyperinflation, and Argentina subsequently experienced overwhelming prosperity. On the surface the currency board seemed prosperous with an average real GDP growth rate of 8,2% from 1991 to 1994 and 5,7% from 1991 to 1998. This growth, however, was mainly driven by rapidly increasing investment rates and to some extent a rise in consumption.

The current account was under pressure due to rising imports and inflows of foreign capital. While the Argentinian economy statistically grew, not everyone benefitted from the prosperity. Unemployment started rising during the same years, and thus the beneficiaries of the prosperous development were the wealthy. The unequal distribution of income was further amplified by real wage growth not matching increasing productivity, which was a product of foreign investments that ultimately made more workers redundant (Maute, 2006: 21-22 & 166-170; Gurtner, 2003: 210-212). The economic growth and its imbalances came at a great cost; however, the reason for the currency board's downfall is not unequivocally agreed upon.

Schuler (2003: 1) touches on this in an elaborate study, which highlights the severe economic challenges accumulating between 1998 to 2002 that followed the otherwise prosperous 1990's. These challenges resulted in a GDP that decreased by a staggering 28%, a domestic currency that depreciated significantly, inflation rates topping at 41%, as well as detrimental developments in real wages, unemployment, and exports. Schuler (2003: 29-36) argues for several factors influencing the downfall with external shocks being the catalysts as recessions in Brazil and Russia caused caution among investors. Additionally, Schuler touches on several fiscal decisions hurting the economy, which is supported by Murphy, Artana & Navajas (2003: 23-26) as they among other reasons attribute it to the lack of fiscal discipline and excessive expenditure creating unsustainable government debt. Schuler (2003: 18-26) claims that neither the currency board nor an overvalued real exchange rate of the Argentinian peso, was the problem. This stands in stark contrast to Gurtner (2003: 218-223), who largely attributes the downfall of the Argentinian currency board to fundamental issues in the establishment of a currency board with a 1-to-1 peg between the Argentinian peso and the US dollar, and an overvaluation in the real exchange rate causing current account deficits. Gurtner emphasizes the lack of correlation in business cycles between Argentina and the US as a major vulnerability for the currency board, which came to expression when external shocks in 1999 caused a recession. These views are in alignment with the views of Maute (2006: 166-167), who claims Argentina's higher inflation rate

in the early 1990's caused an overvaluation in the real exchange rate, and further elaborates on the growing current account deficit caused by soaring demand for imports and a deterioration in the terms of trade harming export. Maute (2006: 199-249), contrary to Schuler, acknowledges that an overvaluation happened in the real exchange rate, and presents several impacting factors; Including fiscal irresponsibility, real exchange rate overvaluation, current account deficits, and external shocks. She ultimately concludes that fiscal recklessness was contributing to the overvaluation of the real exchange rate, and that it ultimately was the main reason for the currency board collapse.<sup>1</sup>

A currency board is the closest arrangement to a fully fixed exchange rate (monetary union), where a country keeps its national currency with the purpose of benefitting from another currency's stability, credibility, and historically low- and stable inflation as well as protecting from endogenous and exogenous shocks. According to Maute (2006: 120-121), countries with inefficient stabilization policies that historically have been struggling with price instability, could beneficially employ a system with a currency board instead of an autonomous central bank. Relinquishing discretionary power would diminish the relevance of previous unsuccessful stabilization policies would, and as the currency board country would achieve higher credibility in an instant it would furthermore be less likely to experience speculative attacks. Therefore, currency boards have historically been preferred in developing countries or smaller economies according to Enoch & Gulde (1998). An interesting emphasis in Enoch & Gulde's study is the returning confidence in currency boards highlighted by Argentina's success in combating hyperinflation in 1991. It is, however, worth noting that the paper was published before the collapse of the Argentinian currency board during 2001 and first days of 2002.

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<sup>1</sup> An extensive elaboration of the Argentinian currency board downfall is not within the scope of this research. However, in the context of fixed exchange rate regimes it is highly relevant to understand what can cause such regimes to collapse. For elaborative info on Argentina's currency board, see Maute 2006, Schuler 2003, Gurtner 2003.

The current Danish model of a fixed exchange rate allows for greater discretionary power than the Argentinian model did with a currency board. While Alesina & Barro (2001) focus on exchange rate regimes for developing countries, their claim that the degree of credibility is the major difference between fixed exchange rates and currency substitution (e.g., dollarization), is also highly relevant in Denmark's situation. The commitment in employing a currency board provides greater credibility as the system is more difficult to abandon than a fixed exchange rate regime, which also applies to the comparison of a monetary union and a currency board. Whereas central banks have greater discretionary power, the currency board's only responsibility is to issue the domestic currency against their reserves of foreign currency. The only assets a currency board holds, are reserves of the foreign currency to which the domestic currency is pegged, acquired through international trade and thus current account surpluses. This requires disciplined economic practices as current account surpluses and deficits directly impact domestic currency with the issuance being one-to-one with the holdings of foreign reserves. Successful implementation of a currency board relies on carefully choosing the optimal anchor currency, determining a desired fixed exchange rate, ensuring full convertibility, relinquishment of monetary policy including local governance over commercial banks, sustainable fiscal policies and a responsible government, and finally credibility rooted in a convincing commitment to the currency board.

Relinquishing monetary policy leaves the currency board country vulnerable and thus requires a strong foundation and financial system, as it will not be an instrument for managing exogenous demand- and supply shocks. However, keeping some extent of discretionary monetary policy in the form of being a lender of last resort could prove beneficial during large shocks (Maute, 2006: 83-92 & 104-119).

## 2.5 Asymmetric Shocks

In fixed exchange rate regimes, it is highly relevant to consider the structures and business cycles of involved countries due to the prevalence of asymmetric

shocks, which is when the effects of supply- and demand shocks are felt differently in industries, regions, or countries. Naturally, it would result in member states desiring different policies, which in a monetary union with common policies would not be possible. With monetary policy being managed by the ECB in the EMU, and member states having relinquished their ability to revalue or devalue their currency, these tools are not available for individual management of asymmetric shocks. Instead, member states have to rely on the common monetary policy and the extent their autonomy over fiscal policies allows them to reduce the impact of the given shock. The larger a monetary union is, the greater is the risk that asymmetric shocks occur, and the effects are exacerbated by the degree of labour- and capital mobility as well as wage- and price flexibility. Even symmetric shocks can be a challenge in a monetary union, as the policy response can cause an asymmetric reaction for member states (Sloman & Garratt, 2019: 473-474). Furthermore, it is relevant to differentiate between shocks caused by endogenous or exogenous variables. According to Mankiw (2009: 8), exogenous variables are occurring outside an economy or a model, whereas the endogenous variables occur within.

Varying inflationary pressures for different areas or economies are also considered asymmetric shocks, and these are emphasized by Redeker (2022) in his view of the early stages of the Russo-Ukrainian war. Supply- and demand shocks can impact economies differently depending on the magnitude of shocks and the degree of exposure the affected economies must what causes the shock. This could, for example, be changes in prices for commodities like oil or gas, which occurred due to the Russo-Ukrainian war. Also disruptions in supply chains as caused by the Covid-19 pandemic impacted countries differently based on their dependency on import and export. There is little room for discussion regarding the theory behind asymmetric shocks. However, there remains disagreement on the degree to which monetary unions experience asymmetric shocks.

Paul de Grauwe (2020: 35-49) explains the influence of asymmetrical shocks and provides theoretical views of these in environments managed by both

independent national banks and centralized central banks. The idea of monetary unions is that demand shocks happen symmetrically, so member countries are impacted equally by sudden increases or decreases in demand. As such events would affect price stability, central banks could through their monetary policies, which are uniform for all member countries, counteract the impacts to return to price stability. Theoretically, this is also how demand shocks would happen and be dealt with in individual countries with independent central banks, in which monetary policies tailored to one specific event would be efficient. This is assuming the given monetary policy would not have implications for neighbouring countries, and thus responsive monetary policies would only have to consider the internal effects in a country. However, there are many other factors to consider for central banks, as asymmetrical shocks can happen within independent countries, not to mention an entire monetary union consisting of converged nations. With monetary policies not being able to be tailored to each specific area experiencing different consequences of either supply- and/or demand shocks, an adequate solution needs to be found that can support price stability across the board. For this reason, it is of great importance to understand the structure of the Danish economy compared to that of Germany and the Eurozone, which will be touched upon in section 4.2.

Macroeconomic turbulence caused by temporary endogenous shocks is not possible to solve with interest rates in a monetary union if business cycles are not synchronous. Additionally, wage- and labour flexibility will not solve a temporary shock. As a result, a monetary union would not have any tools at hand to solve country specific issues. Within national monetary policymaking, a relatively simple stabilization policy would be to adjust interest rates. However, as the monetary union cannot do that on a national level, asymmetric shocks because of different business cycles can result in massive challenges. Additionally, there is the question of trust. A country in economic trouble will face less trust from investors. Less inflow to government bonds will cause higher interest rates which is a huge issue during a recession. The risk of liquidity issues is also a major threat for countries in a scenario like this. As the country is not in charge of its own currency, it would have to find the needed

liquidity through fiscal policies such as lower spending and higher taxes. This could be detrimental during a recession (De Grauwe, 2020: 38-39).

While one might think countries with currency boards (presented in section 2.4.6) have greater resilience towards asymmetric shocks due to greater economic convergence, the impact will be similar to that of countries employing a fixed exchange rate policy. As described by Maute (2006: 125), it largely comes down to the degree in which the business cycles of the currency board country and the reserve country are synchronous. Furthermore, currency board countries rely on fiscal policies in correcting asymmetries through wage and price adjustments according to Enoch & Gulde (1998), which is also applicable to fixed exchange rate systems as described in section 2.4.1.

## 2.6 Business Cycle Synchronization

Preventing asymmetric shocks is best done through business cycle synchronization, which theoretically should cause synchronized economies to be impacted similarly by demand- and/or supply shocks. This is also an essential criterion in OCA theory according to Mundell (1961), regardless of the co-operating trade areas operating with a common currency, a currency board or fixed exchange rates. By establishing optimum currency areas as domains defined by factor mobility, and not by national currency, the greater degree of economic integration will result in business cycle synchronization and thus a greater degree of symmetry.

As stated in section 2.2.1, the EMU was prior to its introduction destined to fail according to some economists. Europe could not be considered an optimum currency area according to Bayoumi & Eichengreen (1992: 25-29 & 34-36), who examined the correlation of demand- and supply shocks between European countries prior to establishment of a common currency in the Eurozone. Their research was centred around Germany as the anchor country, and they found supply shocks to be highly correlated with neighbouring countries, including Denmark, from 1960 to 1988 (see appendix A-1). Less correlation was



observed in demand shocks, yet Denmark as a neighbouring country did see greater correlation with Germany than peripheral countries. Common for peripheral countries was that they did not see high correlation with Germany. A similar study was conducted by Fidrmuc & Kohonen (2001: 18-26), who considered the possible impact on business cycle synchronization in Europe with the EMU being established in 1991. For this purpose, their data spans from 1991 to 2001. Their results on demand- and supply shock correlation (see appendix A-2), show clear differences compared to Bayoumi & Eichengreen's study as the correlation between Germany and members of the Monetary union is lower and the correlation between Germany and peripheral countries are greater. Supply- and demand shocks in Denmark, previously being considered a neighbouring core country, also show less correlation with Germany in Fidrmuc & Kohonen's study from 2001. Both studies place higher emphasis on supply shocks than demand shocks in their assessment of Europe as an optimum currency area.

Bayoumi & Eichengreen (2017: 4-6) revisit their findings from 1992 in a more recent publication, where they investigate the influence of greater symmetry in Europe after the introduction of the Euro. The updated research is consistent with the original research in the conclusion of Europe not being an optimum currency area. However, their findings on core- and peripheral countries is in line with the tendencies seen in Fidrmuc & Kohonen's study, and vastly different from their original research in 1992. They continue to define core countries as countries where demand- and supply shocks are highly correlated with Germany, whereas peripheral countries see low correlation. In Bayoumi & Eichengreen's research of 2017, the core Euro area is now constituted of the GIIPS<sup>2</sup> countries (Greece, Italy, Ireland, Portugal, Spain). Thus, high correlation in demand- and supply shocks have shifted from neighbouring countries to countries previously considered peripheral countries. Generally, the tendency shows greater correlation between Germany and European countries for supply

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<sup>2</sup> The acronym GIIPS or PIIGS refers to the 5 countries heavily involved in the European Debt crisis that began in 2009.

shocks after the introduction of the common currency. Contrary, demand shocks show slightly less correlation between Germany and European countries in 2017, which Bayoumi and Eichengreen (2017: 18-19) consider proof that the European convergence through a single monetary policy is seen through supply shocks and not demand shocks. In further experiments, Bayoumi and Eichengreen included Denmark among other countries despite not being a part of the Eurozone. The results (see appendix A-3) show that not only are supply shocks significantly less correlated with Germany, but that demand shocks even prove to have a negative correlation.

Lukmanova & Tondl (2017: 130-131, 136-140) have conducted similar research through a simultaneous equations model, where they have measured the correlation of a range of economic indicators between 2002 and 2012. Notably, fiscal policies in the form of government debt and current account balances show decoupling of business cycle synchronization when differing between member countries. The implications of these indicators diverging will naturally be desynchronized business cycles, which Lukmanova & Tondl claim will cause a common European monetary policy to be ineffective. While the Maastricht Treaty does impose limits on fiscal divergence between member countries, Lukmanova & Tondl find it necessary to establish a common economic government to manage fiscal policies within the EMU. This view is shared by De Grauwe (2020: 132), who as described in section 2.2 considers the EMU as incomplete and advocates for establishing a budgetary union within the EMU.

### 3 Research Methodology

Through a comprehensive, extended literature review, this thesis builds upon foundational economic theories as well as recent contributions to the extensive topic of macroeconomics. The macroeconomic turbulence in the 2020's provides a unique setting for observing and analysing whether previous theories continue to be applicable or whether new policies are to be preferred. With this thesis being an extended literature review revolving around the thesis statement: "Germany's energy crisis will pressure Denmark's fixed exchange rate system and necessitate a re-assessment of the exchange rate policy.", it attempts to evaluate Denmark's current exchange rate system in a contemporary context. To conduct an evaluative study and engage in a discussion of Denmark's fixed exchange rate, it is necessary to establish and understand developments in the current economic environment. For this reason, some degree of research methodology will be applied. The following section provides insight into the considerations and methods utilized to collect, analyse, and interpret data to establish the extent of the German energy crisis and subsequent deindustrialization.

#### 3.1 Research Design

Germany's energy crisis in relation to Denmark's exchange rate forms the framework for the following section as well as the process of gathering empirical evidence for subsequent conclusions. Jonker & Pennink (2010: 39-40) view research design as the structure of a research process that takes question, theory, and methodology into account and creates coherence between all three components. This notion is an essential aspect in the research process of this thesis, as the extended literature review establishes fundamental theoretical concepts with the thesis statement derived from current events as well as existing theory.

The research for this thesis is thus carried out with a research philosophy of pragmatism, which focus on practical relevance and prioritizes the research

problem at hand. A positivist philosophy was also considered; however, this philosophy's greater focus on measurability and non-ambiguous interpretation was less desired in the context of this research topic (Saunders, Lewis & Thornhill, 2016: 135-144).

These considerations are furthermore aligned with the predominantly deductive approach applied throughout the empirical part, as the research is rooted in exchange rate theory with intention of elaborating on the expected impact of Germany's energy crisis on Denmark's fixed exchange rate. According to Bryman & Bell (2011: 11-14) the deductive approach is applied when research is attempting to test and verify a hypothesis derived from existing theory. Contrary, the inductive approach starts from the point of observation before defining theory based on the observations. This is further elaborated upon by Saunders et al. (2016: 146-150), who include an additional research approach: abduction, which combines deductive and inductive approach. As Denmark's fixed exchange rate regime and the country's relation to the Eurozone is influenced by various complex factors, it is not unlikely that an inductive approach could become necessary if unexpected data were to appear. However, the deductive approach is desired at first as the research is based on pre-known theory and a defined thesis statement.

With the scope of this research being fixed exchange rate regimes in contemporary settings, the study encompasses a very specific scenario in Germany's energy crisis and its impact on Denmark's fixed exchange rate. The given circumstances are nearly impossible to replicate elsewhere due to the countless variables in both the macro- and micro-economic environment as well as endogenous and exogenous conditions pertaining specifically to these two countries. For this reason, the research is designed as a case study with an evaluative purpose which attempts to assess effectiveness of a given scenario (Saunders et al., 2016: 176); in this case whether Denmark's fixed exchange rate continue to be the preferred solution. Yin (2003, cited in Dul & Hak, 2008: 4), defines a case study as:

“... an empirical inquiry that investigates a contemporary phenomenon within its real-life context, especially when the boundaries between object of study and context are not clearly evident. It copes with the technically distinctive situation in which there will be many more variables of interest than data points ...”

Yin’s description suits the chosen topic nearly perfectly. Dul & Hak (2008: 30-34) continue by discerning between theory-oriented and practice-oriented research. They define theory-oriented case studies as attempting to verify and contribute to theoretical statements, whereas practice-oriented case studies observe a given scenario in practice and evaluate the outcome. This is, however, not to say that practice-oriented research and theory-oriented research cannot come to the same conclusion, as a scenario could play out in practice as theory prescribes. Thus, the research for this thesis will be conducted as a practice-oriented case study as the analysis is not dedicated to verifying OCA- and exchange rate theory, but rather to observe the conditions applicable in the chosen scenario of Germany’s energy crisis’ impact on Denmark’s fixed exchange rate system. This is further aligned with the research philosophy of pragmatism as described previously.

While relevance and scale of the German energy crisis will be investigated through collection and analysis of data, its applicability to Denmark’s fixed exchange rate will be analysed and discussed in relation to theories and views explored in the literature review. In other words, the extended literature review will incorporate elements of data collection- and analysis to offer a practical understanding of fixed exchange rate policies within an unprecedented macroeconomic environment. Thus, it is important to highlight the evaluative purpose of the research.

### 3.2 Research Methods

Quantitative and qualitative methods are the fundamental types of research methods, which broadly differentiate between numeric- and non-numeric data, respectively (Saunders et al., 2016: 165). However, this distinction is too black and white according to Saunders et al., as they argue that both research

methods are commonly utilized in the same studies. Furthermore, they argue an optimal research method is based not only on the research problem, but also on research approach and research philosophy. The research for this thesis is conducted through mixed-method research as the objective is to acquire an elaborate understanding of the relationship between Denmark's fixed exchange rate and the Eurozone. Emphasis is on the macroeconomic environment of the 2020's and application to relevant theory. This choice of method is coherent with Saunderson et al.'s (2016: 165-174 & 184-187) view, as mixed-method works well with a pragmatic philosophy, a deductive approach, and a case study strategy.

Mixed-method can be utilized in various ways, and generally a researcher should decide between using quantitative- and qualitative methods concurrently or sequentially. The sequential variations are more complex and require the researcher to conduct research in phases, where a single method is utilized at each stage. A concurrent utilization will see both methods used concurrently but for different data, and the data will ultimately be triangulated to form a coherent conclusion (Saunders et. al., 2016: 170-174). Concurrent mixed method is utilized for this study, as numerical and non-numerical data will be analysed for different purposes to create a comprehensive understanding of the case study.

While Dul & Hak (2008: 5-6) emphasizes qualitative analysis as commonly being chosen for case studies, they do not restrain case studies from being conducted through quantitative methods. On the contrary, they encourage researchers to utilize quantitative analysis when the researcher finds it beneficial, and the case study allows for it. Quantitative method will be relevant to establish economic patterns and tendencies in the relationship between Germany and Denmark, as well as endogenously within the countries' own borders.

### 3.3 Data Collection & Analysis

Data can generally be narrowed down to three different types: Linguistic, numerical, and visual (Jonker & Pennink, 2010: 36-37). Mixed-method allows for all three types of data to be utilized. Numerical data such as graphs, statistics, and tables on economic indicators will be highly relevant to identify and compare patterns in economic data. Considering the scale of the data needed to establish the extent of Germany's energy crisis (economic indicators such as interest rates and inflation for countries), it is not feasible to collect primary data. Instead, secondary data will be collected. Fortunately, economic indicators are widely published, and most countries are transparent about economic indicators and foreign trade. Non-numerical data such as journals, interview transcripts, and other relevant publications will also be relevant to assess the consensus on Denmark and Germany's economies as well as the fixed exchange rate system.

Saunders et al. (2016: 316-327) further differentiate between documents, surveys, and multiple source secondary data. Multiple source secondary data can for example be compilations of various data in large databases, which will be highly relevant for this study.

### 3.4 Limitations

The contemporary nature of the topic makes the research topic highly relevant, however, it also causes limitations to the amount of data currently available. Likewise, the impact of Germany's energy crisis might not have propagated through the economy yet, and the full extent is likely yet to be seen. This also sets a requirement for this thesis to make assumptions of the extent of potential future developments.

Additionally, one exchange rate regime is rarely identical to another, which makes this research difficult to replicate. Thus, it can be a challenge to verify whether the outcome of this research is accurate and applicable to similar

exchange rate regimes. Replicating the scenario elsewhere could increase credibility of the study.

Outside the scope of this research is also various other factors such as economic indicators and trade relations that could influence exchange rates, as these are highly complex economic concepts. This plethora of exogenous and endogenous factors such as economic structure, international trade, and fiscal policies that affect exchange rates makes it difficult to observe effects of single variables. As these factors are outside the scope of this study, significant correlations could have been omitted.



## 4 Analysis & Discussion

The empirical part consists of two distinct sections. The first section conducts an analysis of current, measurable indicators and tendencies to identify challenges caused by the energy crisis. Focusing on Germany's energy crisis and Denmark's economy and trade, it creates a coherent understanding of the current economic situation.

The challenges created by the energy crisis will be discussed in the second section, as it provides an overview of probable future scenarios and subsequently engages in a discussion of viable solutions based on theory presented in the literature review. Ultimately, the discussion attempts to assess risks and efficiency of Denmark's fixed exchange rate given current challenges and whether a different exchange rate regime should be pursued.

Firstly, however, it is relevant to understand the reasoning for focusing on Denmark and Germany in this study. The EMU as a currency union is highly complex and influenced by a plethora of economic factors as well as individual relations between member countries. The scope of this bachelor's thesis does not allow for a thorough analysis of the EMU as a whole nor the relations between each individual member country. For this reason, the scope of this study has been constricted to encompass Denmark and Germany with emphasis on Denmark's fixed exchange rate regime and Germany's energy crisis. Denmark creates the foundation for this study due to their rather unique exchange rate regime in a European context, as they have decided on an opt-out from becoming a fully integrated member of the EMU in the Eurozone as described by Abildgren et al. (2010: 214-224) in section 2.4.3. Germany is particularly relevant for this study for two reasons: their paramountcy for EMU as a core member and their importance for Denmark as a trade partner. Their paramountcy for EMU stems from the EMU being built upon Germany's historical credibility in inflation targeting and disciplined approach to monetary policy, as explained by Krugman et al. (2023: 694-701) in section 2.2.1. Likewise, Bayoumi & Eichengreen's (1992 & 2017) and Fidrmuc & Korhonen's

studies (2001) use Germany as anchor country in their studies of business cycle synchronization within Europe as described in section 2.6. Germany's importance for Denmark as a trade partner will be investigated and elaborated upon in the following section.

#### 4.1 The German Energy Crisis

High energy prices have been reported throughout Europe during the early 2020's, however, Germany has been in a particularly vulnerable position as the increasing prices coincided with their abandonment of nuclear power. While they benefitted from cheap gas from Russia prior to Russia's invasion of Ukraine, the consequences of halting trade with Russia have been detrimental to industrial economies like Germany (Karnitschnig, 2023). As seen in figure 1, Germany relies heavily on manufacturing as it constituted more than 18% of GDP in 2022. Conversely, less than 12% of Denmark's GDP in 2022 came from manufacturing.

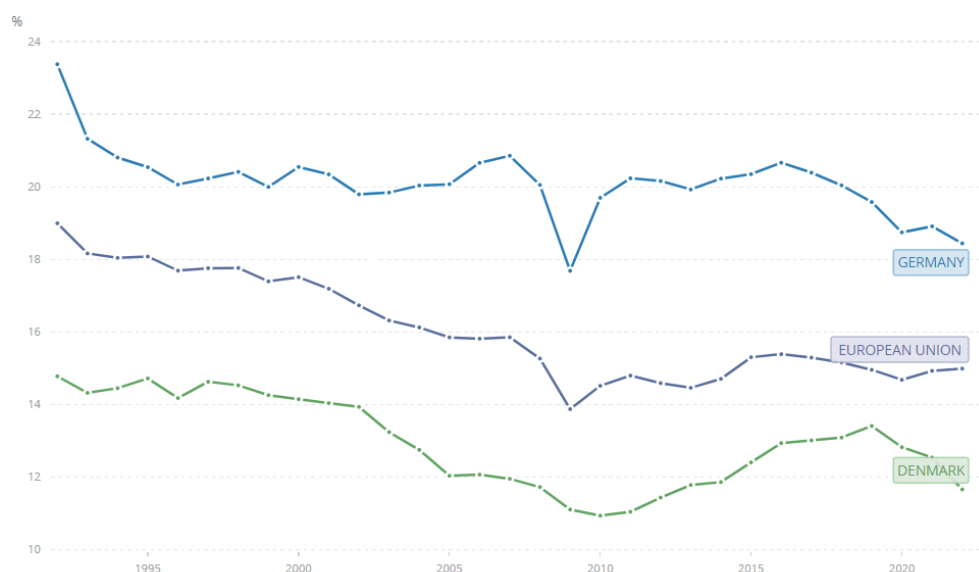


Figure 1: Manufacturing as % of GDP 1992-2022. (The World Bank a, n.d.).

The manufacturing sector is incredibly energy-intensive, which means it does not bode well for an industrial economy when energy prices soar (Chen, Lan, Mineshima, & Zhou, 2023: 2). The picture becomes even more dire when

dissecting the structure of Germany's manufacturing sector. According to a forecast from Statista (see appendix A-4), 33,2% of value-added manufacturing was expected to stem from material products in 2023 (e.g. chemicals, pulp and paper, coking & refined petroleum etc.). These products are among the most energy intensive and constitute the highest energy usage in the European Union (Born, Vogt & Geering, 2022). This is rather dreadful during an energy crisis. Figure 2 illustrates the massive surge in electricity prices in Germany at the time of the Russian trade sanctions, which as of January 2024 is yet to return to levels prior to the Covid-19 pandemic.

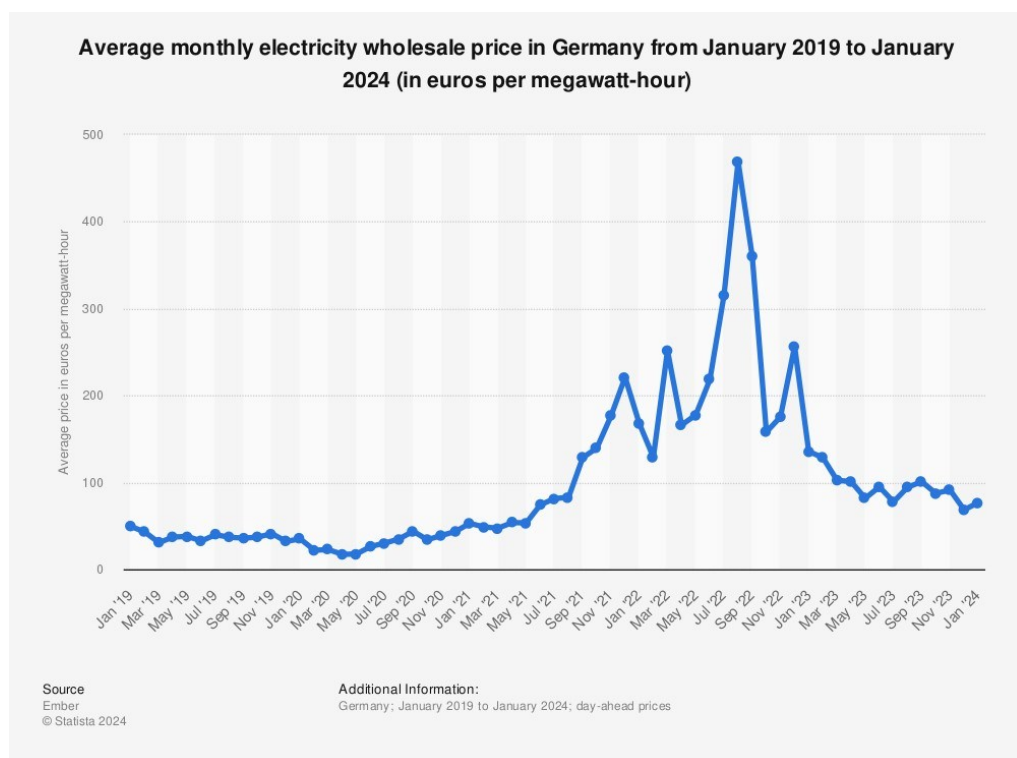


Figure 2: Electricity prices in Germany 2019 to 2024. (Statista Research Department, 2024).

Germany's heavy reliance on natural gas and fossil fuels has been the main culprit for its unfavourable energy market and high electricity prices. According to Statista Research Department (2024), 45% of Germany's power production in 2022 came from fossil fuels, of which a large share was imported – which prior to the Russo-Ukrainian war was a prosperous arrangement for Germany (Karnitschnig, 2023). Thus, the decision to purchase cheap gas from Russia

was a rational decision at the time; however, in hindsight it has been a terrible decision and Germany now suffers the consequences.

According to Chen et al. (2023), Germany has attempted to mitigate the cost pressure of high gas prices by utilizing other sources of energy, which it has succeeded doing to a large degree. However, despite the persuasive effort to combat the energy crisis, Chen et al.'s (2023) results show a potential decrease in Germany's output of 1,2 % in the medium term, if energy prices will remain elevated 20% above the average price prior to the pandemic. Recent tendencies as seen previously in figure 1 also show a decrease in manufacturing as a share of Germany's GDP since 2016. This is highly relevant, as it could indicate an ongoing deindustrialization in Germany, which will be elaborated upon in section 4.4.

## 4.2 Denmark's Economy & Trade Relations

Understanding how the German energy crisis affects Denmark and the exchange rate first and foremost requires an understanding of the composition of Denmark's economy and the importance of mutual trade relations between the countries. As discovered in figure 1 in the previous section, less than 12% of Denmark's GDP stems from manufacturing. Delving in to the components of the manufacturing sector (see appendix B), there is a clear overweight of food products, pharmaceuticals, and machinery as these categories represented 60,4% of total manufacturing sales in Denmark in Q3 of 2023. This is an important notion, as particularly pharmaceuticals and machinery are less energy intensive according to Born, Vogt, Geering (2022). Whereas 33,2% of Germany's value-added manufacturing in 2023 was forecasted to stem from material products, this share was only 23,3% of Denmark's reported value-added manufacturing in Q3 of 2023. Thus, high energy has less of an impact on Danish manufacturing, which means the risk of deindustrialization is less of a threat to Denmark. It does not mean deindustrialization cannot happen in Denmark, but that it will likely have less of an impact compared to the same scenario in Germany.

Trade is an essential component of Denmark's GDP, as exports accounted for 70% of the total GDP in 2022 as seen in figure 3. This is significantly higher than Denmark's Nordic peers, and the share has been increasing steadily since 2010. It is integral for Denmark that their export partners are prosperous as these are central sources for Denmark's own prosperity. The large share of exports and dependency on trade partners further manifests the high degree of openness in Denmark's economy. (Dam, 2008: 17).

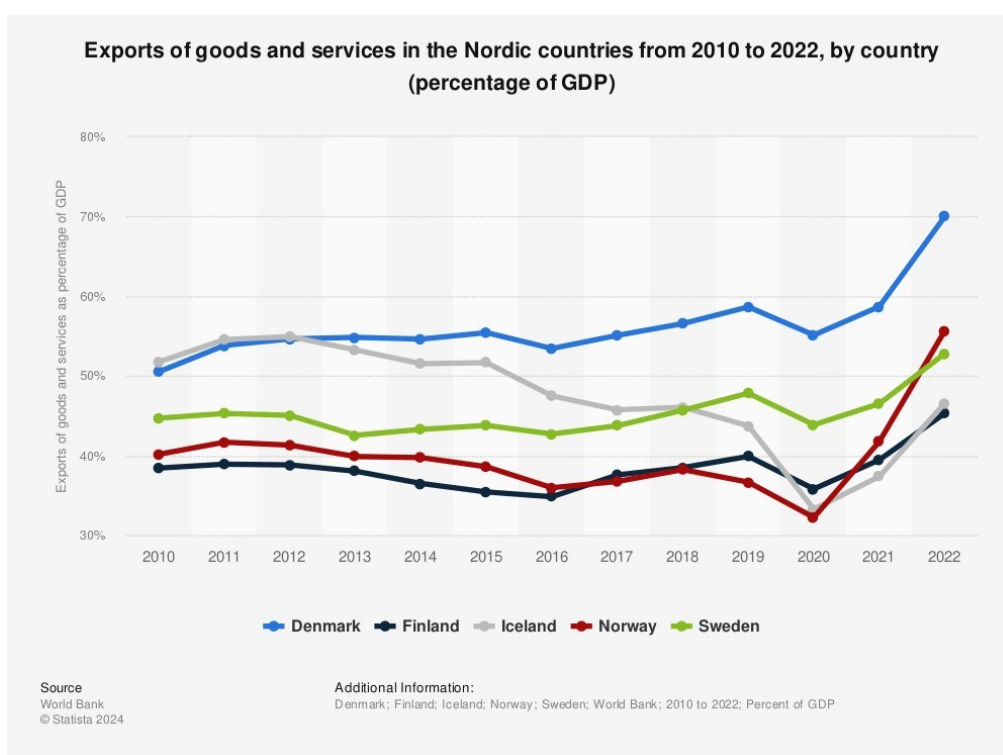


Figure 3: Export of goods and services as percentage of GDP for Nordic countries 2010-2022. (Dyvik, 2024).

It is also worth noting a strong, steady development in Sweden's export as share of GDP as well as Norway's recent surge. Their geographic location in relation to the Eurozone is largely comparable, and both countries operate with floating exchange rates. Thus, the notion of less efficient trade integration by not being a member of the EMU does not appear to cause much of an issue.

Knowing the importance of trade relations for Denmark, it is further relevant to understand Germany's impact on trade. According to Statistics Denmark (b, n.d.), Denmark's largest export partner is Germany with a value of 140 million

DKK exported in 2022. The total value exported by Denmark in 2022 was 927 million DKK, which results in Germany's share being 15,1% of total export. The data paints a clear picture of Germany's importance to Denmark's economy – and it adds further significance to the question of how Germany's energy crisis will impact Denmark.

Another relevant factor in Denmark's economy is the current account balance seen in figure 4.

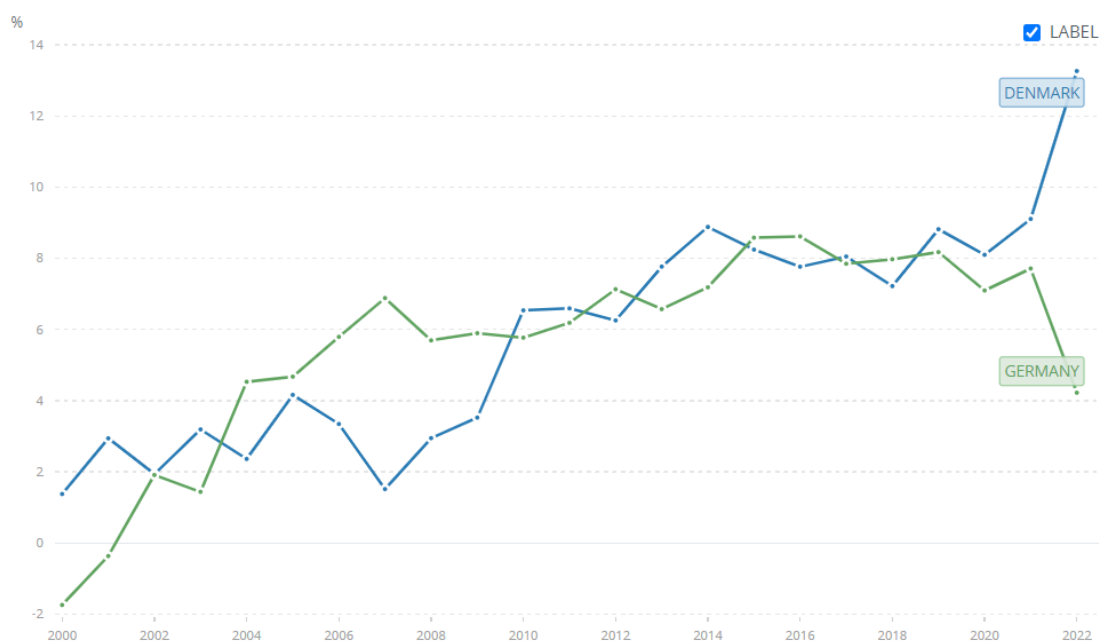


Figure 4: Current Account Balance as % of GDP in Denmark & Germany 2000 to 2022. (The World Bank b, n.d.).

Denmark's current account balance has increased steadily throughout the 21<sup>st</sup> century and rapidly in the 2020's. This can be contributed to the increase in exports as share of GDP, as imports has not increased to the same extent as exports. Thus, Denmark relies heavily on exports, which has also contributed to a significant increase in the current account surplus as share of GDP.

### 4.3 Business Cycle Synchronization

Business cycle synchronization between Denmark and Germany is also relevant to understand considering the German energy crisis. As established by Bayoumi and Eichengreen (2017: 18-19) in section 2.6., there is little to no correlation between supply shocks in Denmark and Germany. Thus, it can be derived that Denmark and Germany are prone to experience asymmetric shocks. With the scope of this study being the energy crisis, a supply side shock, the empirical section will only emphasize correlation of supply shocks and not demand shocks.

While there is little correlation between supply shocks, the GDP growth rate seen in figure 5 is also highly relevant (see appendix C for data inputs). The graph illustrates quarterly GDP growth rate for Denmark and Germany from 2013 to 2023-Q3.

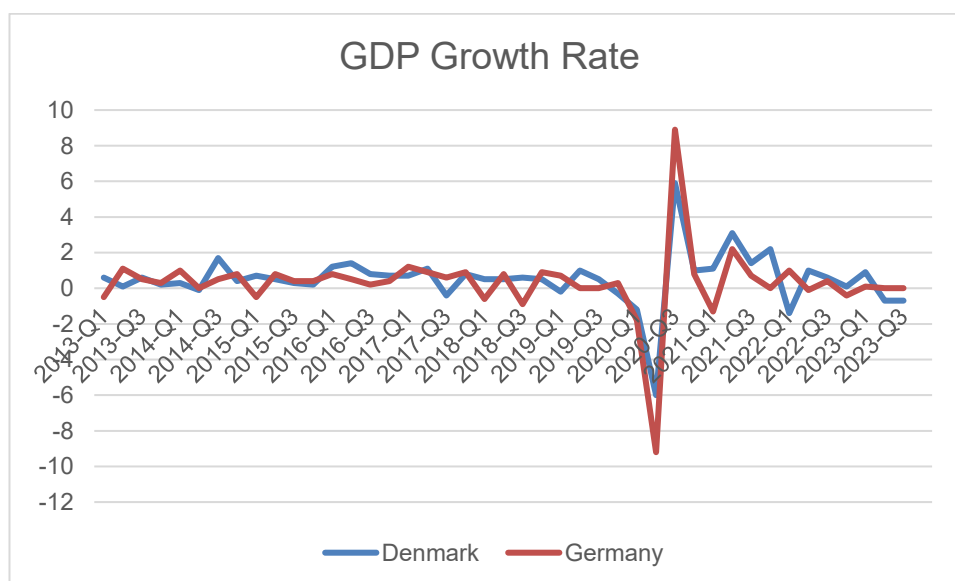


Figure 5: Quarterly GDP growth rate for Denmark and Germany 2013-Q1 to 2023-Q3. (OECD, n.d.)

The correlation coefficient for this period is 0,85 which indicates high correlation between the countries in GDP growth. This result is somewhat deceptive, however, as the Covid-19 pandemic caused heavy outliers in GDP growth rate.

In Bayoumi and Eichengreen's (2017: 17-18) study from 2017, they did not include data from the Global Financial Crisis in 2008-09 as all countries were impacted similarly by the crisis and thus it would skew the results. Removing the two heavy outliers in 2020-Q2 and 2020-Q3 caused by the Covid-19 pandemic and subsequent shutdowns suddenly paints a different picture, as the correlation coefficient is then 0,30, which indicates a weak positive correlation. Thus, business cycle synchronization in terms of supply shocks and GDP growth rate show only weak correlation between Denmark and Germany. This is in alignment with the previous findings on surging energy prices and the difference between Denmark and Germany in manufacturing output as a share of GDP, which illustrates that asymmetric shock between the economies does in fact occur. Another valid point made by Karnitschnig (2023) is the lack of diversification in Germany's economy, which as described by Kenen (cited in Dellas & Tavlas, 2009: 1125) is yet another implication for the EMU. Denmark and Germany thus do not constitute an optimum currency area as defined by Mundell, McKinnon, and Kenen.

#### 4.4 Deindustrialization and the Fixed Exchange Rate

In the previous sections it has been established that Denmark's and Germany's business cycle synchronization in terms of both supply shocks and GDP growth only show little correlation. However, it has also been established that the Danish economy relies heavily on Germany through trade, and a strong German economy will allow Denmark's economy to prosper.

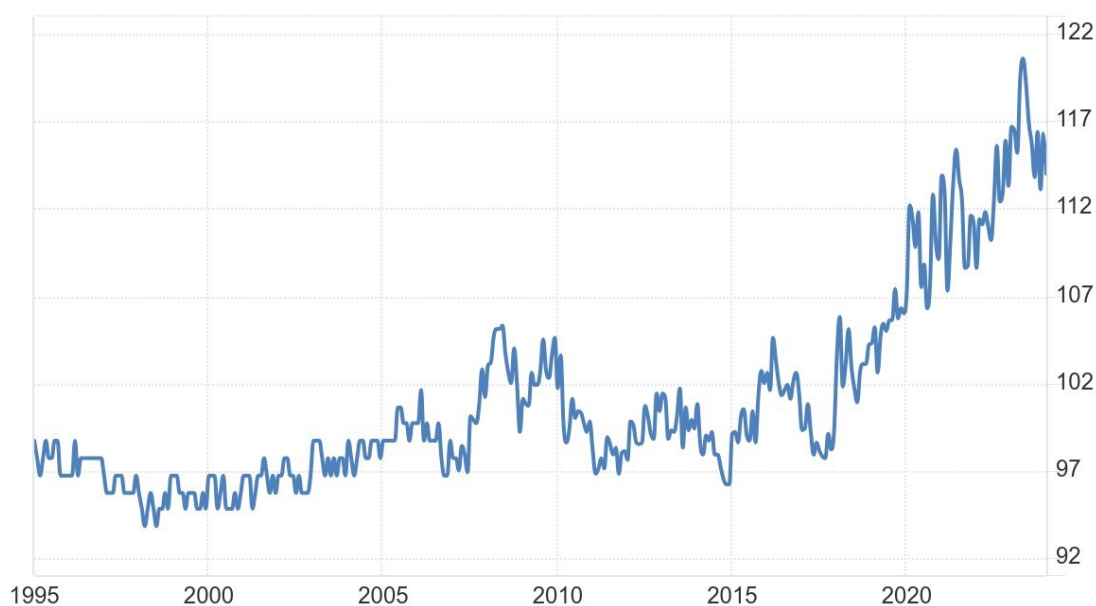
These conclusions lead to the question of deindustrialization and the relevance of understanding the risk for Denmark of such a phenomenon happening in Germany. As previously noted, there has in recent years been a decline in manufacturing as a share of Germany's GDP. This data could indicate a progressing deindustrialization, which is a recurring sentiment in recent articles with reports of some of Germany's largest companies relocating their manufacturing to cheaper countries (Karnitschnig, 2023; Eckl-Dorna, Randow, Look, & Sorge, 2024; Ward-Glenton, 2023). A struggling industrial sector in



Germany will undoubtedly slow domestic economic growth and may in a worst-case scenario even lead to prolonged recessive development in the economy. The consequences of de-industrialization and subsequent economic challenges in Germany are two-fold for Denmark. Having a large share of their trade income derive from exports to Germany, a less prosperous German economy will cause a loss of income for Denmark, which will ultimately affect Danish prosperity unless Denmark would be able to off-set the trade loss through other trade partners. The other factor to consider, is Germany's importance for the EMU and their importance for monetary policy as described in section 2.2.1. With the ECB weighing Germany heavily in their assessment of appropriate monetary policies, it is not unlikely that an asymmetric shock as seen in Europe with the energy crisis and de-industrialization in Germany, will result in sub-optimal policies for other member countries. With the anticipation of recessionary tendencies in Germany, one would expect ECB to impose expansionary monetary policies with lower interest rates and/or quantitative easing as described in section 2.3.1. The increase in money supply would be an effort to encourage lending and capital investment to remedy the impending decline in economic growth. Lower interest rates and increasing money supply in the EMU would also result in depreciation of the Euro. The mechanics of the fixed exchange rate would require Denmark to follow suit and lower interest rates. In case Denmark's interest rate would be left elevated, demand for the Krone would surge. While the Euro would depreciate, the Krone would appreciate relative to the Euro and effectively destroy the fixed exchange rate system. Thus, in the given scenario Denmark would also have to lower the interest rate to maintain the central exchange rate.

Having established the necessity of Denmark's monetary policy following the ECB's monetary policy, it becomes relevant to assess the outcome of expansionary policies. Particularly the exchange rates effect on Denmark's terms of trade is relevant to consider, as Denmark currently experiences capital inflows with the terms of trade showing total export value exceeds total import value as seen in figure 6.

DK Terms of Trade - points



Source: tradingeconomics.com | Statistics Denmark

Figure 6: Denmark's Terms of Trade. (Trading Economics, n.d.).

As Denmark will follow ECB's expansionary monetary policy, both the Krone and the Euro will depreciate relative to other currencies; however, parity between the exchange rates will remain as the Danish National Bank will defend the currency peg. As described in section 2.4, a depreciating currency should increase domestic demand, yet this dynamic will not be relevant between Denmark and Germany with the fixed exchange rate. The important variable in this context is thus not the primary export partner Germany, but rather other large trade partners such as Norway and Sweden with floating exchange rates. According to the International Trade Administration (2024), Denmark is a net importer of oil and gas and dependent on trade partners for most raw materials and semi-manufactured goods. In this context, Norway is of particular importance as Denmark's by far greatest imports from Norway are electricity, petroleum products, and fish (see appendix D). Recent developments with a depreciating Norwegian Krone relative to the Danish Krone is favourable for Denmark, as imports from Norway have become increasingly attractive. This also contributes to the highlighted development in Denmark's terms of trade and the previously established current account

surplus. However, should the Danish Krone follow the Euro's depreciation because of Germany's deindustrialization, Denmark's terms of trade will deteriorate as Denmark is dependent on e.g. Norway for raw materials and energy for manufacturing of export products- and services. These products would become more expensive for Danish consumers but also for Danish manufacturers, and export prices would have to increase and thus cause inflation. This would make it more expensive for Germany and other Eurozone countries to purchase products from Denmark, but also leave Denmark with a desire of conducting contractionary monetary policy contrary to ECB's desire to support Germany through expansionary monetary policy.

Should the ECB conduct expansionary monetary policy for a prolonged period, particularly considering the current situation where the Danish Krone is experiencing upwards pressure as seen in figure 7, it would put the fixed exchange rate system under significant pressure.

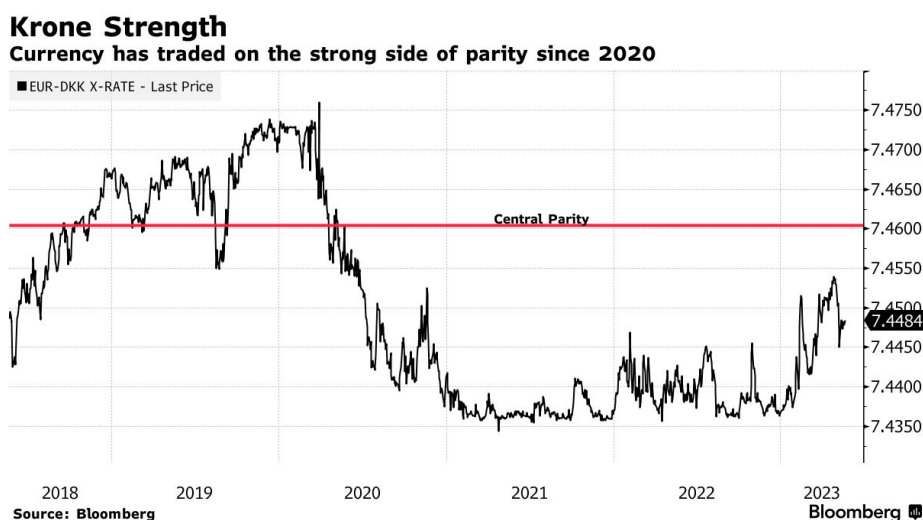


Figure 7: Central parity of DKK to EUR. (Wienberg, 2023).

While upwards pressure is preferred compared to downwards pressure as described in section 2.4.5., it does bring challenges that has to be addressed by the Danish National Bank. As touched upon in section 2.4.2, the Danish National Bank is selling Kroner and purchasing Euro to mitigate the upwards pressure on the Danish Krone, and they could theoretically print unlimited

domestic currency to create artificial downwards pressure incessantly. While this is an effective effort to maintain the central rate relative to the Euro, there is a profound reason for unlimited supply only being possible in theory; it will increase supply of Danish Kroner. If upwards pressure on the currency is sustained and accompanied by continuous intervention, it is to be expected that the increase in money supply will cause higher inflation in Denmark than e.g., in Germany within the foreseeable future. An increase in inflation would cause a deterioration in Denmark's competitiveness with trade partners searching for cheaper alternatives, which could potentially force Denmark's economy into a recession. To prevent this, Denmark would desire contractionary monetary policies to combat inflation, and this is where the ECB and the Danish National Bank experience conflicting interests. It would leave the Danish National Bank in a precarious position where their hands would be tied with the ECB dictating monetary policy in the EMU. Furthermore, such a scenario could ignite a spark for speculators that would put further pressure on the Danish exchange rate and potentially leave Denmark in a situation where they would be left with no choice but to abandon the fixed exchange rate.

Denmark experienced incredible progress from the fixed exchange rate during its early stages of the regime as described in section 2.4.3. The economy was suffering gravely under bad leadership and myopic fiscal policies, which resulted in severe economic instability. However, the current scenario is vastly different from the time when the fixed exchange rate was introduced. Denmark has since proven to be a fiscally responsible country and has even survived severe speculative attacks on the fixed exchange rate. Thus, a high degree of trade integration currently appears to be the greatest, and perhaps only, benefit of the fixed exchange rate. The question is to what degree the German deindustrialization poses a threat to the fixed exchange rate and thus economic stability; however, evidence suggests that an asymmetric shock is already occurring, and Denmark will have to re-assess the fixed exchange rate policy if the economy is to prosper to its full potential.

## 4.5 Alternative Exchange Rate Systems

If Denmark were to abandon the fixed exchange rate, it would be highly relevant to consider the situation that unfolded in Switzerland in 2015 as touched upon in section 2.4.4. According to Wyplosz (2015), Switzerland's fixed exchange rate was a temporary measure, which was implemented in 2011 to alleviate the upwards pressure on the Swiss Franc. The peg restored competitiveness in Switzerland, and the country could continue exporting to European countries. Likewise, Denmark has enjoyed the benefits of greater stability in trade relations - and continues to do so - by being a member of the EMU and having the exchange rate pegged to the Euro. Should Denmark be forced to abandon the fixed exchange rate it could follow in Switzerland's footsteps and instead adopt a floating exchange rate policy. However, Switzerland's decision to abandon the fixed exchange rate was heavily influenced by the prospects of having to employ negative interest rates. This is less of less relevance for Denmark as the country has already shown willingness and capability to operate with negative interest rates. Another important aspect is Switzerland's relation to the United States, given the country's importance as an intermediary between Europe and the US. Had the Swiss Franc followed the Euro into depreciation, it would have had severe consequences for Switzerland's relation to the US and the US Dollar. Both these factors are not applicable to Denmark to the same degree as they were for Switzerland. While full autonomy over monetary policy would be desired, the overall benefits of a floating exchange rate appear less obvious to Denmark than they did to Switzerland. Instead, as stated by McKinnon (1963) in section 2.1., it is likely that a floating exchange rate would have an adverse effect on trade relations as an essential part of Denmark's open economy – the question being to what extent a floating exchange rate would impact these relations. In the case of Norway and Sweden, which both operate with floating exchange rates, the notion of weaker trade integration does not seem to overshadow the benefits of monetary autonomy. Despite negative impact on trade relations, a floating exchange rate does thus appear as a somewhat appealing alternative exchange rate system to the fixed exchange rate policy.

Another alternative could be progressing towards full participation in the EMU by adopting a currency board. This arrangement, as described and exemplified in section 2.4.6. with the case of Argentina, would result in disbanding the Danish National Bank and replacing it with a currency board. It would allow for even greater trade integration with strategically important trade partners in the Eurozone, contrary to the previously discussed option of a floating exchange rate. However, currency boards are commonly adopted by countries lacking monetary- and fiscal credibility and searching to benefit from economic stability of their anchor country. This is far from the current situation in Denmark, and adopting a currency board would essentially be solving a problem that does not exist. In fact, Denmark's credibility and sound fiscal responsibility stands in strong contrast to Argentina's irresponsibility as described in section 2.4.5. A currency board arrangement would not address the actual problem in asymmetric shocks occurring between Germany and Denmark. Rather, it could prove to be a liability for Denmark as it was for Argentina with the catalyst for the downfall of the currency board being external shocks, notably a recession in the neighbouring, essential trade partner Brazil. Thus, abandoning the fixed exchange rate in favour of a currency board does not seem to be a desirable solution for Denmark.

While a currency board is a step towards full monetary integration, the ultimate step would be to join the Eurozone and abandon the Danish Krone as a sovereign currency. The Danes have previously been reluctant to join the Eurozone and would likely continue to be so if a referendum were to be issued today (early 2024). Additionally, neither a currency board nor a full membership of the Eurozone would resolve critiques such as lower economic growth for countries with fixed exchange rates due to suboptimal policymaking by the ECB, as presented in section 2.4.4 and briefly touched upon in section 2.3.1. Despite the critique of the ECB's practices, a full membership of the Eurozone would facilitate even greater seamless trade with Eurozone countries as well as eliminate potential speculative behaviour towards the exchange rate between the Krone and the Euro. Likewise, there would not be a need for the Danish National Bank to balance the exchange rate near the central rate, and it would

even be able to participate on equal terms in EMU central bank meetings as Eurozone members. However, as attractive as it might seem, it still does not address the issue of asymmetric shocks. With Denmark already participating in the EMU to some degree, it is unreasonable to expect that a full membership would lead to perfect economic integration with the Germany and the Eurozone. Without being an optimum currency area, asymmetric shocks would continue to occur and pose a threat to prosperity due to common monetary authority and policies. Current critiques of fixed exchange rate policies as well as Denmark's policy would continue to apply, as Denmark would still not be able to use national monetary policy in a situation where it would be desired. The asymmetric shock with Germany's deindustrialization would continue to unravel, and the ECB would be left with no choice than to address it. This scenario would be identical to the scenario with a fixed exchange rate, as Denmark would be left in a precarious situation with a suboptimal monetary policy. In the eyes of Mundell (1961) and OCA theory, as Denmark and Germany do not constitute an optimum currency area, they would benefit more from flexible exchange rates than a common currency.

Unfortunately, it is not as black and white as the original OCA theory might suggest, which is also the reason various exchange rate policies have been heavily debated. Consensus prior to establishment of the EMU was that Europe did not constitute an optimum currency area and that the monetary union was destined to fail. However, it has largely proven critics wrong thus far. And while sections 2.6 and 4.3 demonstrates that Denmark and Germany do not constitute an optimal currency area, it cannot be excluded that the fixed exchange rate regime would yet again prevail despite coming under heavy pressure by Germany's energy crisis and deindustrialization. As emphasized throughout this study, exchange rates are influenced by a multitude of factors, and it is impossible to boil the future of Denmark's exchange rate down to the outcome of the German deindustrialization. While this study has investigated the impact of German deindustrialization, other phenomena and macroeconomic events could create different scenarios that would affect the exchange rate differently.

## 5 Conclusion

Denmark's fixed exchange rate regime will come under heavy pressure because of the German energy crisis, and alternative exchange rate systems will have to be considered. Germany's manufacturing sector consists of highly energy-intensive production, and Germany's economy relies heavily on manufacturing. With a large share of energy being from fossil fuels, the halt on trade with Russia has resulted in significant spikes in energy prices and thus caused an energy crisis in Germany. The energy crisis is likely to accelerate an already ongoing deindustrialization. Denmark's reliance on manufacturing is lower than Germany's, which already indicates asymmetric conditions between the countries. Instead, Denmark relies heavily on international trade, and particularly export to Germany. Recent economic developments have improved Denmark's current account balance and terms of trade significantly. The future could be vastly different depending on the degree of the German deindustrialization. It paints a clear picture of diverging trends in the respective economies. While Germany is experiencing deteriorating economic indicators, Denmark is experiencing improving economic indicators. Combining this with studies on business cycle synchronization and recent correlation in GDP growth, it shows asymmetries between the Danish and German economies.

With Germany being at the very core of the EMU, the ECB cannot afford to overlook these challenges. Monetary policy will have to be accommodating to Germany's economy. With a fixed exchange rate that pegs the Danish Krone to the Euro, Denmark will have to adhere to the decisions of the ECB and follow suit. Any other approach would effectively destroy the fixed exchange rate. Adaptation to expansionary monetary policy is unlikely to be favourable for Denmark, particularly considering Denmark's dependency on energy and raw materials from countries like Norway. A depreciating Krone would make it more expensive to import necessities and Denmark's terms of trade would worsen. Production of exports would become more expensive and contribute to higher inflation, which would require contractionary monetary policy; the exact opposite of the expansionary policy desired in Germany. Based on these findings it can



be deduced that Denmark and Germany do not constitute an optimum currency area. According to OCA theory, a common currency or a fixed exchange rate is thus not optimal given the scenario. Instead, the fixed exchange rate is likely to face severe pressure and should ultimately be re-assessed.

While there is no clear-cut alternative, the choice stands between a floating exchange rate or becoming a full EMU member and adopting the Euro. Adopting the Euro would essentially mean further strengthening of the fixed exchange rate with the benefits of inflation stabilization and trade integration. However, the problem at hand is rather asymmetric shocks; exemplified with the German energy crisis and deindustrialization. With no monetary autonomy, Denmark would fully rely on the ECB's monetary policy, and with only little business cycle synchronization between Denmark and Germany, the option of adopting the Euro does not appear optimal. Instead, a floating exchange rate would allow for monetary autonomy and Denmark would be able to adjust for asymmetric shocks. While it theoretically should come at a cost of trade integration, the cases of Sweden and Norway suggest this has less impact than anticipated. Thus, this study suggests an exchange rate policy change in favour of a floating exchange rate appears desirable within the foreseeable future.

In a potential future study, another highly relevant exchange rate alternative to investigate, is a hypothetical monetary union between Nordic countries. With Denmark, Norway, and Sweden creating a strong core, it could set the foundation for even more prosperous co-operation between the Nordic countries, which one would assume have more in common than they have with peripheral European countries.

As a final remark, despite evidence pointing towards a re-assessment of the fixed exchange rate policy within a foreseeable future, it cannot be excluded that the fixed exchange rate policy will once again prevail. Should that be the case, then Denmark's exchange rate policy will yet again be subject of future case studies and possibly question the notion of fixed exchange rates being temporary policies.

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## Appendices

### Appendix A: Figures

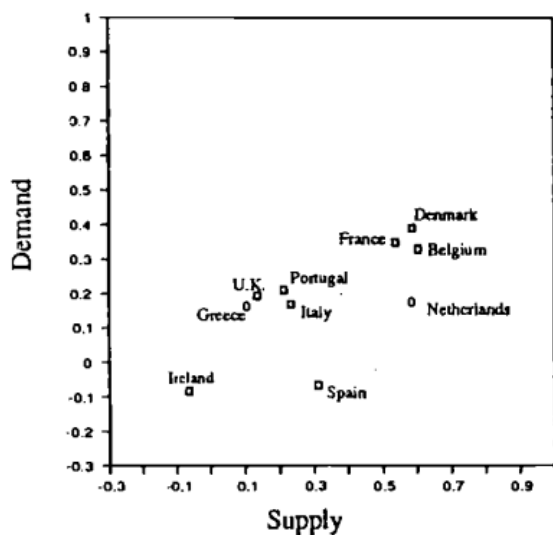


Figure A-1 Correlation of supply and demand between Germany and selected European countries 1960-1988. (Bayoumi & Eichengreen, 1992).

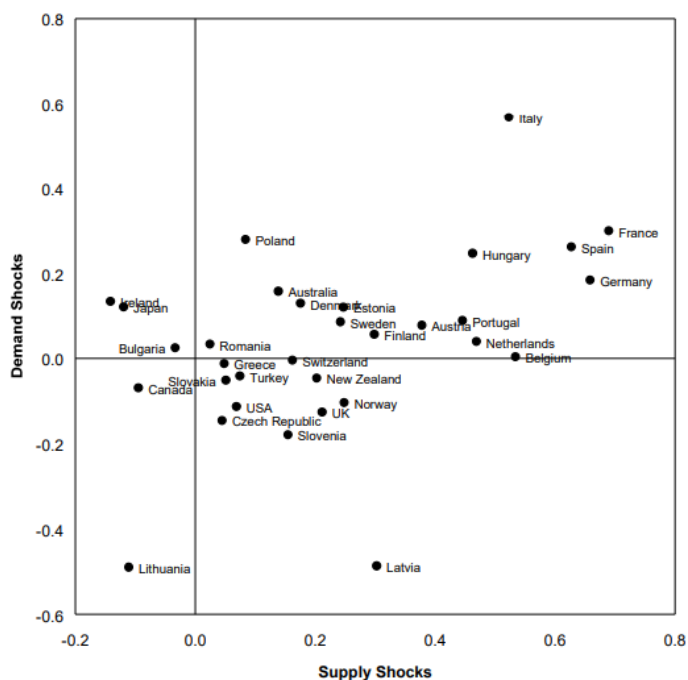


Figure A-2 Correlation of supply and demand between Germany and selected European countries 1991-2001. (Fidrmuc & Kohonen, 2001).



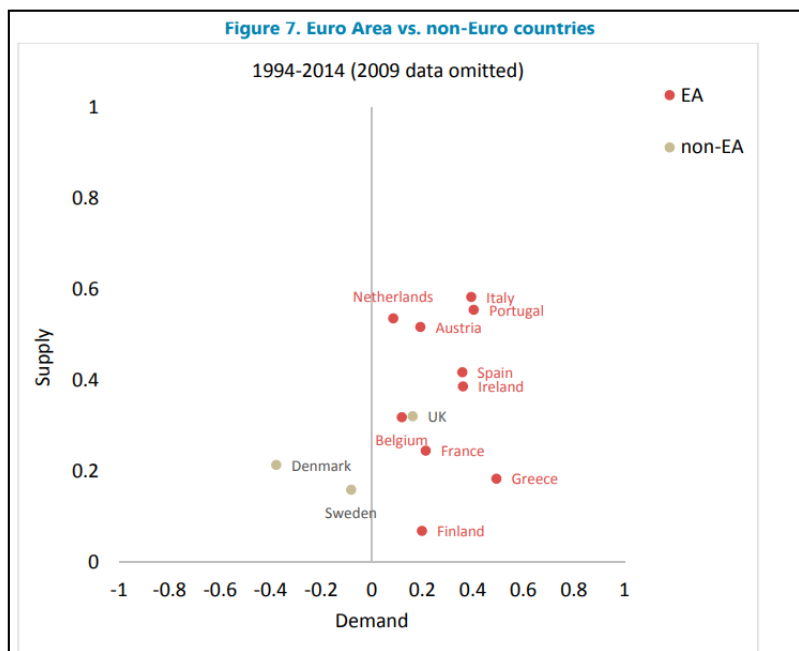


Figure A-3 Correlation of supply and demand between Germany and selected European countries 1994-2014. (Bayoumi & Eichengreen, 2017).

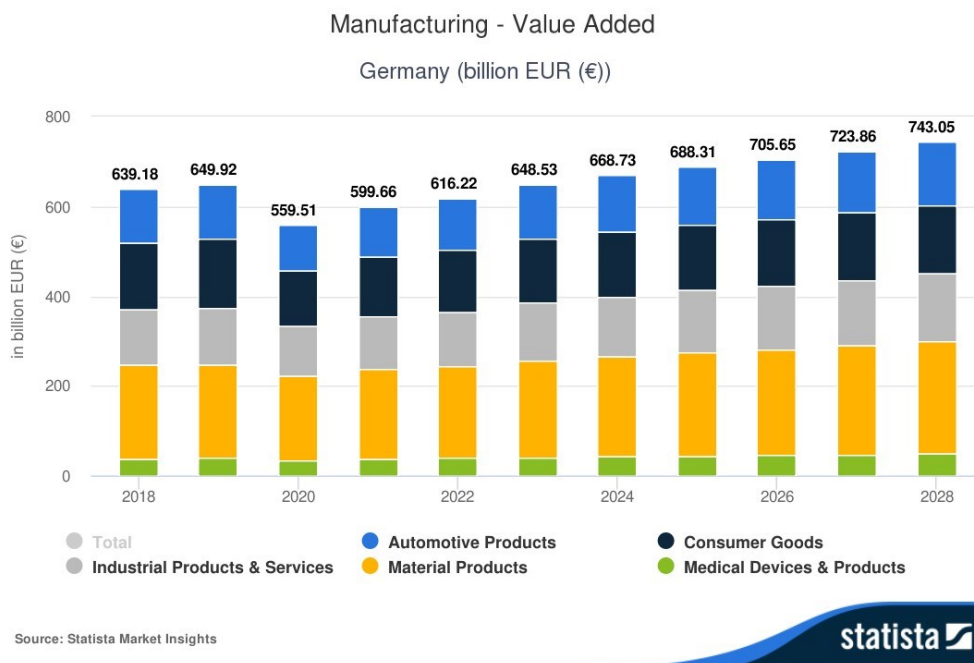


Figure A-4 Forecast of value-added manufacturing by sector in Germany 2018-2028. (Statista Market Insights, 2023).

## Appendix B: Table & Calculation of material products as share of manufacturers sales in Denmark 2023.

Table B: Manufacturers sales in Denmark Q3 2023 (Statistics Denmark a, n.d.)

### Manufacturers' sales (quarters)

Seasonal adjustment: **Non-seasonally adjusted** | Type of turnover: **TOTAL TURNOVER** | Unit: **DKK 1,000**

	2023Q1	2023Q2	2023Q3
<b>C Manufacturing</b>	276 904 178	275 437 589	267 422 894
<b>CA Manufacture of food products, beverages and tobacco</b>	55 270 487	52 925 892	51 899 484
<b>CB Textiles and leather products</b>	2 981 404	2 585 461	2 470 337
<b>CC Wood and paper products and printing</b>	7 602 152	7 202 509	6 603 033
<b>CDE Manufacture of chemicals and oil refineries etc.</b>	28 592 236	26 346 562	26 994 354
<b>CF Pharmaceuticals</b>	58 981 202	61 765 615	61 261 173
<b>CG Manufacture of plastic, glass and concrete</b>	13 086 429	13 392 548	12 548 071
<b>CH Basic metals and fabricated metal products</b>	18 454 545	17 776 811	16 055 092
<b>CI Manufacture of electronic components</b>	9 452 050	8 884 166	8 544 865
<b>CJ Electrical equipment</b>	6 828 306	6 265 692	5 676 301
<b>CK Manufacture of machinery</b>	50 242 324	54 565 291	48 475 694
<b>CL Transport equipment</b>	3 123 980	3 319 131	3 251 598
<b>CM Manufacture of furniture and other manufacturing</b>	22 289 063	20 407 911	23 642 892

Calculation of material products as share of manufacturers sales:

$$CC + CDE + CG + CH = \text{Material Products}$$

$$6\,603\,033 + 26\,994\,354 + 12\,548\,071 + 16\,055\,092 = 62\,200\,550$$

$$\frac{62\,200\,550}{267\,422\,894} * 100\% = 23,26\%$$

$$\text{Material Products} = 62\,200\,550 = 23,26\%$$

**Appendix C: Tables**

Table C: Quarterly GDP Growth Rate in Denmark &amp; Germany (OECD, n.d.).

<b>Quarter</b>	<b>Denmark</b>	<b>Germany</b>	<b>Quarter</b>	<b>Denmark</b>	<b>Germany</b>
2013-Q1	0,6	-0,5	2020-Q1	-1,2	-1,8
2013-Q2	0,1	1,1	2020-Q2	-6	-9,2
2013-Q3	0,6	0,5	2020-Q3	5,9	8,9
2013-Q4	0,2	0,3	2020-Q4	1	0,8
2014-Q1	0,3	1	2021-Q1	1,1	-1,3
2014-Q2	-0,1	0	2021-Q2	3,1	2,2
2014-Q3	1,7	0,5	2021-Q3	1,4	0,7
2014-Q4	0,4	0,8	2021-Q4	2,2	0
2015-Q1	0,7	-0,5	2022-Q1	-1,4	1
2015-Q2	0,5	0,8	2022-Q2	1	-0,1
2015-Q3	0,3	0,4	2022-Q3	0,6	0,4
2015-Q4	0,2	0,4	2022-Q4	0,1	-0,4
2016-Q1	1,2	0,8	2023-Q1	0,9	0,1
2016-Q2	1,4	0,5	2023-Q2	-0,7	0
2016-Q3	0,8	0,2	2023-Q3	-0,7	0
2016-Q4	0,7	0,4			
2017-Q1	0,7	1,2			
2017-Q2	1,1	0,9			
2017-Q3	-0,4	0,6			
2017-Q4	0,8	0,9			
2018-Q1	0,5	-0,6			
2018-Q2	0,5	0,8			
2018-Q3	0,6	-0,9			
2018-Q4	0,5	0,9			
2019-Q1	-0,2	0,7			
2019-Q2	1	0			
2019-Q3	0,5	0			
2019-Q4	-0,3	0,3			

