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EURO ADOPTION OBLIGED COUNTRIES VIEWED BY MELITZ OPTIMUM CURRENCY AREA MODEL

Abstract:

Empirically applied alternative Optimum Currency Area theory model proposed by J. Mélitz. We calculated trade-weighted terms of trade covariance of several European countries bound to become Eurozone members. The higher the covariance, the higher the cost of joining the Eurozone. Considering the openness index and nominal rigidities, we ordered the countries by the (dis)advantage of joining the Eurozone. According to the model, the highest cost of joining the currency block is attributed to Croatia as its trade partners have high covariance of terms of trade. Croatia is also not as open as other countries like the Czech Republic or Hungary, showing relatively higher nominal rigidity. On the other hand, Bulgaria appears to profit from adopting the Euro the most.

Keywords:

Eurozone, Optimum Currency Area

JEL Classification: E52, F20, E00

Introduction

Is becoming a member of the Eurozone economically beneficial or not? This is still highly debated topic as 7 members of the European Union are legally obliged to join the currency bloc. While many of the economists do not consider Eurozone to be an Optimal Currency Area (OCA) judged by the classical OCA criterions as proposed by Mundell, Kennen, Mckinnon and Fleming, they still consider the Eurozone to be potentially beneficial. The conclusion based only on these classical OCA theories would be simplifying. There are many other aspects to be considered evaluating the pros and cons of the currency union. Indeed R. Mundell, whose theory stated that the key to successful currency union is labour mobility, is now considered a founding father of Euro. The paper is motivated by less known OCA theory proposed by French economist J. Méltiz that is focused on the cost analysis of losing economy's exchange rate flexibility.

The aim is to empirically use the Optimum Currency Area (OCA) theory proposed in "A suggested reformulation of the theory of the optimal currency areas "by J. Méltiz on the candidate Eurozone countries and evaluate the beneficial effect of common currency on the economies. The Melitz's model is one of the most salient modern OCA theories. However, the theory of OCA is completely different from the classical approaches from the 1960's and the 1970's. The theory is based on maximizing the net benefits of a monetary union. The main idea is that the cost to a country of giving up the nominal exchange rate with given wage price stickiness is dependent on the country weighted covariance of terms of trade with its trading partners. High covariance means high cost of giving up the country's own currency, because when an asymmetric shock calls for an adjustment in terms of trade, moving all these terms by a set percentage will be appropriate and losing the exchange rate instrument would be costly. In case of a low covariance, moving the exchange rate will do little good and in case of negative covariance, altering the exchange rate in one direction will change many relative prices the opposite way. Another criterion is the openness of the countries. The size of the costs is then directly proportional to nominal rigidities. If there was none, there would be no cost of giving up own currency, on the other hand the harder the rigidities, the higher the cost. As one of the adjusting mechanism- the exchange rate (ER) is missing, the whole adjustment must be done through inflation or labour movement.

Related Literature

Labour

The theory of optimal currency areas was started by Canadian economist Robert Mundell who asked the question of what is the optimal size of an area (economy) that should use the same currency.

Mundell¹ (1961) claims that when asymmetric demand shock hits two countries with independent currencies, the only thing that must happen to restore the equilibrium in both economies is the currency depreciation in the country inflicted with negative shock (A) and appreciation in the country with positive shock (B). However, if the two countries have common currency, the exchange rate adjustment cannot happen. Then, the stabilizing mechanisms are either wage adjustment or labour mobility. The wage adjustment should restore

¹ Robert Mundell obtained Nobel prize in Economy in 1999 "for his analysis of monetary and fiscal policy under different exchange rate regimes and his analysis of optimum currency areas" and he is today considered as the architect of European Monetary Union (EMU).

competitiveness in A by shifting the aggregate supply curve to the right and thus make the same amount of product cheaper. The opposite will happen in country B. Although there is a secondary effect of the wage changes and this is the movement of aggregate demand even lower in A and increased aggregate demand in B.

Assuming labour mobility across the two countries, the laid off workers from country A move to country B and there is no need for wage adjustment in any of the countries.

If none of the two stabilizing mechanisms work, that is no wage decline and labour movement happens in A, then the country is stuck in disequilibrium (under its potential product) with higher unemployment. Country B due to wage increases experiences inflation. Eventually, the higher inflation in B makes A more competitive.

In 1973, Mundell wrote another significant paper on currency unions (CU), where he argues that CU is more efficient insurance system against asymmetric shocks than national currencies. When asymmetric shock hits CU with two countries (A- negatively, B positively), the capital will flow from B to A, as citizens of A will more easily borrow money to keep their consumption standards from citizens of B who experience spike of income. This will be more complicated to achieve in case of national currencies due to exchange rate risk. The argument assumes that the capital markets will be sufficiently integrated. He also adds another benefit of CU, exchange rates are often driven by speculative and psychological motives rather than underlying fundamentals and therefore they are sometimes sources of asymmetric shocks rather than a tool to mitigate them.

Openness

Another criterion for membership in OCA was proposed McKinnon (1963). The more the country is open, the lower the cost of giving up its own currency. Openness is defined as economy's trade (export+ import) over its GDP. Open economy has goods markets integrated to the rest of the world, thus depreciation only imports inflation and thus the effectivity of ER devaluation is low. Losing own currency is not such a cost.

Structure

According to Kennen (1969), the members of CU should have similar industrial structure. If symmetric shock strikes the entire CU where economic structures are equally diversified, then the monetary policy will be effective. On the other hand, if the economies in CU are specialized, then even symmetric shock will have asymmetric results and monetary policy gets paralyzed.

Dynamics

Related to the Kennen's criterion of industrial structure similarity is the question of how the industrial structure changes by entering a CU. European Commission claims in the report One Market, One Money (1990) that trade among European industrial countries is to some extent an intra-industry trade which is characterized by imperfect competition and economies of scale. Hence, the countries have similar industry structures and trade similar products between each other. The common currency will amplify these tendencies and thus most of the shocks will have symmetric character.

P. Krugman argues on the example of the USA that as the trade integration progresses, the different industries tend to make regional hubs due to economics of scale, such as automobile industry. In the USA that is undoubtedly more integrated than Eurozone are the industrial activities much more regionally concentrated.

The argument of deeper integration through common currency is further explored by large set of literature that was set off by A. K. Rose (2000). He wrote the very famous and very provocative paper on this topic. By using the gravity model with panel dataset, he concluded that introducing a common currency in two countries will lead up to 300% increase in trade volume. Nowadays, it is certain that such optimistic conclusion is extremely upward biased. Among the reasons why his results were so far-fetched is presence of very small countries and colonies that ceased to use the currency of their parent country and the endogeneity of the monetary union (Frankel, 2008), (Cieslik, Michalek, & Mycielski, 2012). However, this paper attracted large amount of comments and critique. Baldwin, Skudelny, & Taglioni (2005) correct this result to increase in mutual trade in an interval of 54% to 140%, even those numbers seem today overly optimistic. Furthermore, Bun & Klaasen (2007) estimate the impact of Euro on trade at 3% which is already on the boundary of statistical significance. Similar numbers are achieved by method proposed by Serlenga & Shin (2013) where they use cross sectionally dependent panel gravity model. Berger & Nitsch (2008) apply gradualist approach where they use panel data starting in 1948, and they identify a trend of 10 intensification of intra-European trade. Once they control for this trend, the beneficial effect of Euro on trade disappears.

Inflation

Flemming (1971) claims that another condition to joining CU is to have similar preferences on inflation and similar productivity growth, should there be no increase in unemployment in one of the countries.

Application of Barro- Gordon model on open economies and empirical evidence (Italy) shows that CU of high inflation-prone country with a low inflation country brings benefits to the high inflation country. The high inflation country can benefit from giving up its currency and "borrowing" credibility for its inflation targets from the other country. This is however only possible if the common central bank is from the low- inflation country and it is only possible if the high-inflation country gives up fully on its currency, i.e. fixing the exchange rate does not help as it is not credible enough. The Barro- Gordon model also explains why some countries chose to dollarize their economies.

Groll (2014), shows new keynesian DSGE model how a country that is unable or unwilling to employ optimum monetary policy can benefit from entering a CU with more optimal monetary policy, i.e. can import stable inflation. This finding is similar in its implications to application of Barro- Gordon model in open economies.

Debt dynamics of CU

De Grauwe (2011) points out that members of CU lost their own monetary policy and thus lowered their ability to pay the sovereign debt emitted in their own currency (the CU currency). The central banks in countries that are not part of a CU have always the possibility to provide the liquidity to the sovereign to avoid a default. This usually leads to inflation but defends the country against financial markets forced bankruptcy. The fact that countries in CU are missing the control over the currency in which they issue their debts may lead at times of crisis to self-

fulfilling default, because markets will consider their bonds riskier and thus they will have to pay higher interests at time of recession which will make them even more vulnerable and will further increase their debt and vulnerability. The control over the currency in which the sovereign issues its debt shields the country against this vicious cycle.

Effectivity of national monetary policies

Since the main cost of joining a CU is a loss of independent monetary policy. The question of effectivity of national monetary policy arises. Classical analysis shows that a country hit by negative demand shock in any case must lower its real wage. So, if there was no money illusion, there would be no additional cost. However, in the real world- where money illusion exists, the adjustment will be costlier in the country without the possibility of altering the exchange rate. The cost of adjustment is then given by country's institutional features of labour and product markets (Hancke, 2013)

The modern OCA theory

Bayoumi (1994) developed a model that incorporated the most significant previous OCA arguments, namely Mundell's, McKinnon's and Kenen arguments. Bayoumi's model shows that CU can raise welfare for the member economies, but it unambiguously lowers welfare of the countries remaining outside. Benefits of the CU in form of lower transaction costs are limited only to its members but the output that would be otherwise traded with outsiders is lowered. This can be however outdone by more efficient allocation of resources and economies of scale that would lead to higher production that could benefit as insiders so outsiders.

Another insight of the Bayoumi model is that incentives differ for the candidate country and for the incumbent members. The entrant benefits from lower transaction costs with the whole CU, while the CU only gains from new the trade with the new country. Even, if a small country would not want to join the CU for the described benefits, there is an incentive of not being left out as that would likely cause additional costs.

Theory and methodology

Melitz's proposed OCA theory, like any other OCA theory, is based on a cost-benefit analysis. The theory is focused mainly on the usefulness of the country's independent monetary policy. The two main variables are the x -openness of the country and u - the trade-weighted ratio of the countries involved in the CU.

Openness is defined as the value-added of trade over the total product (GDP) of the country or export (import) removed of the imported (exported) part over the total product.

The size of CU is variable u , for which $0 \leq u \leq 1$. If u is 0, there is no CU enlargement beyond the current borders. On the other hand, if u is 1 the country is in CU with all its trade partners. 50% means half of the trade is made with partners within the CU. In this analysis I used the country weights that are used to assemble effective real exchange rates by Bank of International Settlements (BIS). To evaluate the variable u , I have to make a few assumptions.

An exchange rate is a tool capable of reaching trade adjustment without needing to move resources between nontradables and tradables. The countries can change their terms of trade and be at least at some markets a price maker. If the countries were price-takers on all their export markets, then the adjustment through exchange rate is only done by modifying the prices of nontradables relative to tradables. A purely price-taking country has no incentives to have a floating exchange rate. The key to the value of a flexible exchange rate is the capability

of altering the terms of trade with foreigners, i.e., the ability to change the price of exports relative to imports.

Another assumption is downward price-wage rigidity. As known, if prices and wages are perfectly flexible, then there is no cost of a fixed exchange rate. However, due to price and wage inflexibility, the fixed exchange rate causes difficulty in short-run adjustment. How high are such costs?

The costs associated with losing flexible exchange rate depend on how much improvement the adjustable exchange rate brings. If the country changes its ER, it will do so proportionately with each trading partner. Therefore, the covariance of the terms of trade between its trading partner is crucial. If a country appreciates its currency with one trading partner but with another, it would instead need to depreciate, then its usefulness becomes low. If the covariance is high, the exchange rate adjustment is a valuable tool to mitigate short-run costs of price adjustment. If the covariance is low or negative, then the flexible ER is of little or no help.

The cost of CU is: $C(x, u)$

If a country enters into universal CU then $u=1$, the cost function $C(u, x)$ is:

$$f(\text{cov}(1), x) \text{ where } \text{cov}(1) > 0, f'(\text{cov}(1)) > 0, 0 < x < 1, f'(x) < 0 \quad (1)$$

Where x is the measure of openness and u is the weighted average of relative covariances with the country's trade partners within CU. We assume a positive covariance and the cost grows with higher covariance of the terms of trade. The openness x has a value from 0 to 1, and the cost decreases with the higher values of x .

In case $u < 1$, the flexible exchange rate won't be lost entirely. Therefore, the cost will be lower.

Another issue arises here: what partners should be chosen to create CU? Countries with negative covariance between its trade partners can have negative costs, which is strict benefit. If they choose the right countries to form CU, their common currency can have positive covariance with the trading partners outside the CU thus, their currency will be a more effective tool. Now, let's abstract from this possibility. The cost is the proportion of the covariance lost to CU:

$$(\text{cov}(u)/\text{cov}(1)) * f(\text{cov}(1), x) \quad (2)$$

to minimize the cost when picking a partner for CU means to minimize the expression $(\text{cov}(u)/\text{cov}(1))$.

The cost of u stems from two sources. The first source is the impossibility of adjustment through manipulating ER with its partners in CU; therefore, the adjustment must be made via price alteration. The second source is caused by ER changes stemming from pressures from other countries in the CU. The joint current account and other influences on the ER create an equilibrium that does not always need to reflect the needs of every single country. Assuming the current prices are the best indicators of the future prices, then the CU is trying to minimize the variance of the expression:

$$\left(\frac{p_u^*}{p} \right) + \left(\frac{p_o^*}{e_u p_u} - \frac{p^*}{ep} \right) \quad (3)$$

where: P is the price at home, p_u^* is the price at the rest of the union, p is the price at home, p_o^* is the one outside the union, p_u is the price within the union (p_u is p_u^* combined with p), p^* is the one abroad, that is p_o^* and p_u^* combined. As for the e

terms, e_u is the multilateral effective ER of the whole CU, while e is the multilateral effective ER of the home country. The first bracket is thus the ratio of prices in the CU excluded home country and prices in the home country. To minimize the first bracket term, it is necessary to pick partners where there is minimal need to adjust prices, this can be facilitated by geographical proximity and similar industrial structure, i.e., the Kenen's criterion. The second bracket term is a difference between the ratio of prices abroad and within CU and the ratio of prices in the home country and the rest of the world. Minimizing the second term's variance means having similar real exchange rates. If fundamentals determine forex rates, it means the partners in the CU should have similar current account positions and propensity to save, etc...

Minimizing the expression above also reduces the expression $(\text{cov}(u)/\text{cov}(1))$. By minimizing the variance of prices home over prices in the rest of CU, the covariance of the prices within CU automatically becomes low too. By reducing the second brackets, we achieve similar needs in adjusting of CU relative prices to the rest of the world.

The benefits of CU is given by simple function $g(u,x)$, where $g'(u) > 0$, and $g'(x) > 0$. The size of CU is improving the money quality as unit of account and as a medium of exchange. The larger the openness, the larger the benefits of elimination of transaction costs and elimination of forex market risks.

Analysis:

In the analysis, I focused on the costs side, where, in my opinion, the Melitz theory presents the main contribution.

There are currently nine countries that are members of the EU and they do not use Euro as their currency. UK is Brexiting and Denmark has permanent opt-out from the obligation to join the Eurozone in the original Maastricht treaty. This means that Bulgaria, Croatia, Czech Republic, Hungary, Poland, Romania and Sweden are legally bound to switch to Euro. Of those seven countries, Bulgaria is in currency board regime, Denmark and Croatia are in ERMII system- that is a conventional peg and the rest is in free-float.

U- Covariance of terms of trade

The data to set up the variable u are based on Net Barter Terms of Trade index by World bank. The weights to that are assigned to given currency pair are the weights that Bank for International Settlement (BIS) uses to assemble a real effective exchange rate. I used some simplifications when setting up the variable u for each Euro-adoption-bound country. I only used trade partners for the analysed countries evaluated at least 1% weight by the BIS. That means small trade partners who have little significance for the trade of the nine (seven) analyzed countries are omitted.

Of these nine countries only three of them, the members of V4(without Slovakia), have positive covariance in the ToT among their trade partners. The rest have negative covariance among its most significant trade partners, which means that using exchange rate as a policy tool is ineffective.

The higher the covariance, the higher the cost of giving up the possibility of changing its ER because high covariance means better effectiveness of such a tool.

Table 1: Weighted covariance of terms of trade with all the significant (above 1% in the share of the country's trade) trade partners. It is the u variable compiled by the author.

Country	Total
Croatia	222
Poland	154
CZ	95
Hungary	64
Sweden	-21
Denmark	-40
Romania	-67
UK	-140
Bulgaria	-312

The positive covariance means that the ToT move together and the higher the covariance, the higher the variance among the trade partners or the higher the significance of the partner. On the other hand, negative covariance means ToT with significant trade partners move in the opposite direction.

As the table shows, the highest cost of losing own ER in this sense would be paid by Croatia, Poland, the Czech Republic, and Hungary. Negative numbers mean a negative cost which means a strict benefit.

Bulgaria has a negative covariance of trade terms among its partners with its currency board. The terms of trade of Bulgaria evolve in the opposite direction among its main trade partners. Eurozone, its most prominent trade market, often has opposite terms of trade with other countries such as Russia, Romania, and Switzerland.

Denmark, which also has a peg to the Euro, is a member of ERMII and its ER moves in a narrow band of 2,25% , and appears to have slightly negative covariance. So even if it could change the ER the tool would be of no benefit.

There is, however, an issue to this simple table; for most countries, the potential CU (Eurozone) is also by far their largest trading partner. Therefore, the independent currency may serve well only to adjust this single ER.

X- Openness Index

For the x variable, I used the Openness index by World Bank(WB). There is a difference between the index suggested by theory and the one provided by WB. The theory says that the value added of trade should be divided by GDP to measure openness. However, I only use the whole trade volume in this analysis. Therefore, the x variable will reach higher values than it would have, having calculated only for VA. This should also show relatively higher values of x in countries exporting products with little value added. Nevertheless, it should be enough for comparative reasons in such a small group of relatively similar countries.

The size of a given economy strongly influences the openness index. The rule of thumb is the larger the economy, the smaller the openness. As the larger economy does not need to import as many products and their internal market is large enough to consume more products, the ratio of exports and imports over its GDP is usually lower.

Table 2: The openness index 2017, data World Bank.

Country	Trade/GDP
Hungary	172
Czech Republic	152
Bulgaria	131
Denmark	103
Poland	103
Croatia	100
Eurozone	87
Sweden	86
Romania	85
United Kingdom	62

Some countries' values of openness index exceed the value of 1. The theory intends to be used the added value of trade in the economy, that is its contribution to GDP. However, such data are not up to date. Therefore, I use the simple sum of export and import of the countries over GDP. The higher the number, the more they trade.

As is visible from the table, the most open economies are Hungary, the Czech Republic and Bulgaria. The least open economies according to the index is then Sweden, Romania and UK. The countries at the top of the chart should have lower cost of giving up their own currency

This is the classical McKinnon criterion. The product market integration causes that depreciation of country's exchange rate only results in inflation importing. Countries such as Hungary or the Czech Republic will chiefly increase inflation if they depreciate but the real prices will remain.

Nominal Rigidity

Table 3: Taken from "Downward nominal and real wage rigidity: Survey evidence from European firms "by Babecký, J., Caju, P., Kosma, T., Lawless, M., Messina, J., & Room, T. (2009)

Country	Wage freezes (downward nominal wage rigidity)	Indexation (downward real wage rigidity)
Austria	0.133	0.098
Belgium	0.118	0.982
Czech Republic	0.265	0.117
Estonia	0.217	0.044
Spain	0.024	0.548
France	0.071	0.096
Greece	0.125	0.200
Hungary	0.059	0.112
Ireland	0.087	0.095
Italy	0.039	0.017
Lithuania	0.199	0.108
Netherlands	0.232	N/A
Poland	0.100	0.069
Portugal	0.150	0.090
Slovenia	0.029	0.235
Total	0.096	0.167
Euro area	0.082	0.201
Non-euro area	0.134	0.085

Note: Proportion of firms having frozen wages over the past five years and applying an automatic indexation mechanism. Figures are employment-weighted and re-scaled to exclude non-responses.

The size of nominal rigidity is country-specific. There are countries whose labour market is more flexible; therefore, the overall cost of losing the own ER will be lower than those with higher price-wage rigidity. Babecký, Caju, Kosma, Lawless, Messina, Room (2009) set up a chart based on their survey of downward nominal wage rigidity (DNWR) and downward real wage rigidity (DRWR). They ask companies about the occurrence of wage freezes or wage indexation. Usually, where there is high percentage of wage indexation, there is lower occurrence of wage freezes and vice versa. The wage freezes here represent the DNWR and indexation represents DRWR.

Interestingly, the countries that are part of the Eurozone have higher share of firms that index wages, while in theory they should have more flexible wages to accommodate an asymmetric shock hitting their economy (for example Belgium) without the possibility to devalue. On the other hand, countries that use their own currency rarely have indexed wages. The possible explanation would be that in these countries the adjustment is conducted via wage freeze and subsequent inflation related to depreciation of the currency.

What is relevant though for our analysis is that all three countries that are in the ECB study are among the less downward-rigid countries.

Conclusion

The weighted covariance of the countries' main partners was set up. The highest covariance was calculated for Croatia. Poland, the Czech Republic and Hungary had also positive covariance. The remaining countries in the research had negative one. If there is negative covariance, it means that trade among country's main trading partners usually needs an opposite movement in nominal ER which is impossible. Therefore, having one's own currency is useless in this view.

On the other hand, high covariance means relatively efficient tool to affect terms of trade via nominal ER. Therefore, the countries with high positive covariance will lose an efficient tool by joining a CU. The importance of having adjustment via terms of trade is dependent on the scale of nominal rigidity. If there is no nominal rigidity, there is no cost in adjusting through prices and wages. Although, some level of nominal rigidity always exists. Czech Republic, Hungary and Poland were part of ECB's study on downward real wage rigidity and proved to be on the relatively less rigid side of the researched countries. This fact lowers the cost of losing sovereign currency.

Altogether, of the nine countries Bulgaria seems to be the biggest benefactor of joining Eurozone based on the analysis. This is because high openness of its economy, very negative covariance of terms of trade, and currency board regime that prevents the country from its own fully independent monetary policy. Therefore, it appears the country has nothing to lose by entering the Eurozone. On the other hand, Croatia whose covariance is the highest among researched countries is also relatively less open compared to other countries, although it is a small economy. Therefore, it seems Croatia is the least beneficial to join the Eurozone from the researched countries. However, the Croatian currency is in ERM2 system and the country will join the Eurozone in January 2023.

The data does not exist for some of the researched countries as of nominal rigidity. However, the Czech Republic, Poland, and Hungary seem to be less downward real wage rigid than most of other Eurozone countries. This is caused by the fact that the countries have only a small share of companies that index their wages and, therefore cannot decrease the real wage.

This aspect makes the three countries rather suitable for entering Eurozone as the adjustment in wages can be done relatively easily. On the other hand, the covariance of the terms of trade among its trade partners is positive; therefore, it can be concluded that the nominal exchange rate tool functions.

Data

Bank for International Settlement	Effective Exchange Rate Indices: Trade Weights (based on 2013 trade data)
World Bank:	Openness Index 2017
World Bank:	Net Barter Terms of Trade Index 2016

Abbreviations

BIS-	Bank for International Settlement
ER-	Exchange Rate
CU-	Currency Union

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