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Pegging the CEEC's Currencies to the Euro

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ABSTRACT

Existing work on the potential role of the euro as an international currency generally focuses on the means-of-payment and store-of-value functions. The unit-of-account function is often left aside, perhaps because trade invoicing is especially subject to inertia, due to network externalities, or because this function is considered to be a consequence of other functions.

However the unit-of-account function also includes the use of an international currency as a monetary anchor. This function is crucial for the internationalisation process since it determines the risk of using an international currency for other functions. In addition, pegging the national currency to a foreign anchor is a centralised decision that can be taken relatively quickly, unlike private decisions which are decentralised and subject to strong externalities.

In the short run, the euro will hardly compete with the dollar as a *world* anchor. This is because the choice of a monetary anchor is related to real integration. For instance, it makes little sense for Mexico or Canada to peg their currencies to the euro, since most trade and capital flows are carried out with the United States. Still, the euro could emerge as a *regional* anchor, in the area surrounding the eleven countries initially constituting the euro-zone. This paper studies whether Central and Eastern European Countries (CEECs) will have an incentive to peg their currencies to the euro.

In the first section, we study whether the behaviour of CEECs' currencies over 1992-1996 matches the theory of optimal currency areas. Adapting a cross-section estimation method initiated by Bayoumi and Eichengreen (1997), we show that in the CEECs, nominal exchange rate variability against the dollar has generally been too small compared to what would have been required by an optimal currency area standard, estimated on a 49 country sample. In fact, this standard indicates that the CEECs should stabilise their currencies more against the euro than against the dollar.

The second section proposes a theoretical model for the choice of a real basket peg, when public authorities encounter an external financial constraint. Calibrating the model shows that the CEECs will have an incentive to peg their currencies in real terms to the euro or to baskets in which the euro is prominent, whether or not they can co-operate with each other.

Keywords: optimum currency areas, international currencies, monetary pegs, Central and Eastern European countries.

JEL classification: F31, F33, F36..

RÉSUMÉ

Les travaux sur l'éventuelle émergence de l'euro comme monnaie internationale insistent en général sur les fonctions de moyen de paiement et de réserve de valeur. La fonction d'unité de compte est souvent laissée de côté, peut-être parce que la cotation du commerce international est particulièrement exposée à une inertie due aux externalités de réseau, ou parce que les monnaies de cotation paraissent découler de leur usage pour les autres fonctions.

Cependant la fonction d'unité de compte ne se limite pas à la tarification du commerce international. Elle touche aussi à l'utilisation des monnaies internationales comme ancrage pour la politique monétaire. Cette fonction d'ancrage est cruciale dans un processus d'internationalisation, car elle conditionne le risque qu'il y a à utiliser la monnaie internationale pour les autres fonctions. En outre, l'ancrage monétaire est une décision politique qui peut être rapide puisqu'elle est centralisée (par opposition aux décisions des entrepreneurs privés qui sont davantage soumises à des externalités).

À court terme, l'euro concurrencera difficilement le dollar comme monnaie d'ancrage *mondiale*, car les décisions d'ancrage sont liées au degré d'intégration réelle. Ainsi, il est peu probable que le Mexique et le Canada ancrent leurs monnaies sur l'euro puisque les États-Unis constituent leur premier partenaire commercial et financier. Cependant, l'euro pourrait émerger comme monnaie d'ancrage *régionale*, dans l'aire d'influence des onze pays qui constitueront initialement la zone euro. La présente étude tente de déterminer si les pays d'Europe Centrale et Orientale (Pecos) auront intérêt à adopter l'euro comme monnaie d'ancrage.

La première partie examine si le comportement des Pecos entre 1992 et 1996 est conforme à ce que prédit la théorie des zones monétaires optimales. Adaptant une méthode d'estimation en coupe proposée par Bayoumi et Eichengreen (1997), on montre que la variabilité nominale des taux de change des Pecos a généralement été trop faible face au dollar en comparaison de ce qu'aurait prescrit une norme issue de la théorie des zones monétaires optimales estimée sur un échantillon de 49 pays. En fait, cette norme implique que les Pecos devraient privilégier l'euro comme monnaie d'ancrage nominal.

La seconde partie propose un modèle théorique de choix d'un panier d'ancrage réel optimal dans lequel les autorités font face à une contrainte extérieure. Le chiffrage du modèle montre que les Pecos seront incités à ancrer leurs monnaies en termes réels sur l'euro ou sur un panier dans lequel l'euro sera majoritaire, qu'ils puissent ou non se coordonner entre eux.

Mots-clés : zones monétaires optimales, monnaies internationales, ancrage monétaire, Europe centrale et orientale.

Classement JEL : F31, F33, F36.

Pegging the CEEC's Currencies to the Euro

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1. INTRODUCTION

The emergence of the euro as an international currency is often put forward as a likely outcome of European Monetary Unification. The basic argument is that EMU will constitute a major shock to the International Monetary System that could overcome inertial effects which characterise the internationalisation process. The impact of EMU on the use of the European currencies(y) for various international functions has been studied. For instance, Portes and Rey (1998) stress the vehicle function, while Bénassy, Italianer and Pisani-Ferry (1994), Artus (1997), MacCauley and White (1997), Prati and Schinasi (1997), Masson and Turtleboom (1997) discuss the store-of-value function. Hartmann (1996) analyses the potential role of the euro for trade denomination, i.e. as a private unit of account But the public unit-of-account (monetary anchor) function is generally neglected when dealing with the competition for international money status. Still, this function has a strong impact on the use of the international currency for other functions, for two main reasons:

(i) Defending an international peg requires official reserves (stock) and official interventions (flow) in the foreign exchange market concerned. Thus, the anchor function boosts the public store-of-value and means-of-payments functions. Due to increased turnover, transaction costs decline, which increases the incentive of both the public and the private sectors to use the same currency for its various international functions.

(ii) The risk and cost of using a specific foreign currency for the various functions is lower when it is used as a monetary anchor, i.e. when the domestic currency is pegged to the foreign one. This is because a stable exchange rate makes hedging either unnecessary or less costly, and because pricing in this international currency (instead of another one) leads to more stable demand and to more stable profits.

However, Asian or Latin American countries will unlikely peg their currencies to the euro, at least in the early phases of EMU. This is because the European Union is not their main partner, and because these countries have been used to pegging their currencies to the US dollar.

A natural expansion area for the euro would be the Central and Eastern European countries (CEECs). To date, however, these countries generally have not pegged their currencies to Core-EMS currencies (Table 1). The only exception is Estonia which adopted a

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DM currency board [1]. In other countries, the exchange rate regime has either been a floating regime, or a peg to a basket containing over 30% of US dollars.

Table 1: Exchange rate Regimes in the CEECs over 1990-1996

Country	Exchange rate regime	Composition of the basket at end-1996
Bulgaria	Managed float from Feb. 1991 to July 1997. Currency board since then.	
Czech Rep.	Fixed basket from Dec.1990 to May 1997. Managed float since then.	DM (68%), USD (32%).
Estonia	Currency board.	DM
Hungary	Adjustable peg since before 1989. Crawling peg since March 1995.	ECU (70%), USD (30%).
Latvia	Managed float since July 1992.	SDR
Lithuania	Floating since Oct. 1992.	USD
Poland	Currency board since April 1994. Fixed basket from Jan. 1990 to Oct. 1991. Crawling peg since then.	USD (45%), DM (35%), £ (10%), FF (5%), SF (5%).
Romania	Managed float since August 1992.	
Slovak Rep.	Fixed basket since December 1990.	DM (60%), USD (40%).
Slovenia	Managed float since October 1991.	

Sources: IMF, *Exchange Arrangements & Exchange Restrictions* (1997), Halpern & Wyplosz (1997).

This paper addresses the optimality of the pegging strategies followed by the CEECs, and the potential role of the euro as an anchor currency in the region. The question of the optimal exchange rate regime is discussed in various papers (see, for instance, Savvides, 1990 or Edwards, 1996), and the dabate has been revived by the Asian currency crisis of 1997. In this paper, we do not discuss the optimal degree of flexibility in general, but rather the best pegging strategy once monetary authorities consider reducing exchange rate variability.

The exchange rate regimes reported by the International Monetary Fund may not be representative of actual exchange rate policies. Indeed, Bayoumi and Eichengreen (1997) argue that "Actual exchange rate behaviour may in fact convey more information about underlying economic determinants than the putative exchange rate regimes" (p. 762). Following this view, the *de facto* exchange rate regimes will be proxied by exchange rate variability in this paper.

[1] Bulgaria adopted a similar central banking system in July 1997.

The choice of an international monetary anchor is generally explained by the theory of optimum currency areas (Mundell, 1961; McKinnon, 1963). According to this theory, two countries A and B have an interest in fixing their bilateral, nominal exchange rate if they face mostly symmetric shocks (i.e., shocks of the same type at the same time in the same direction), if their bilateral trade is important, and if output factors are mobile between the two countries. In Section 2, we use a methodology initiated by Bayoumi and Eichengreen in order to assess whether the anchoring strategies of the CEECs have been consistent with the theory of optimum currency areas.

The theory of optimum currency areas (OCAs) assumes that monetary authorities aim at stabilising the output growth rate. However, due to financial constraints, final targets in terms of output growth are often dominated by intermediate targets in terms of price competitiveness and the ability to borrow. This could modify the optimum currency area diagnosis. Section 3 presents a simple model showing that external constraints reinforce the OCA diagnosis for the CEECs currencies. It is concluded in Section 4 that the CEECs should have an incentive to peg their currencies to the euro or to a basket in which the euro is prominent.

2. CEECs' PEGGING STRATEGIES IN THE LIGHT OF THE THEORY OF OPTIMUM CURRENCY AREAS

2.1. Background

According to the literature on optimum currency areas (Mundell, 1961; McKinnon, 1963; Kenen, 1969), two countries should peg their bilateral exchange rate if several conditions are fulfilled, which make the adjustment of the exchange rate either ineffective or unnecessary to stabilise output:

(i) most shocks to real output are common to both countries;

(ii) foreign trade represents a large share of GDP;

(iii) the other country is an important trade partner;

(iv) specific shocks can be adjusted by factor mobility, real wage flexibility and/or fiscal federalism.

Bayoumi and Eichengreen (1996, 1997 and 1998) render the OCA literature operational through cross-country estimations where the variability of each bilateral exchange rate is explained by the asymmetry of business cycles between the two partners, the asymmetry in the distribution of their trade across three sectors, the bilateral openness ratio and the size of the two countries. These explanatory variables are designed to catch points (i) to (iii), labour mobility and fiscal federalism being relinquished due to the fact that "they have not been important factors in responding to shocks acrosss different countries, at least over the historical period" (Bayoumi and Eichengreen, 1996 p. 14). Their results, obtained either for industrialised countries or for both industrialised and Asian countries, support the theory of optimum currency areas in the sense that asymmetry in business cycles and in trade structures, bilateral closure and size all increase exchange rate variability. Conversely, the

relative stability of exchange rates within Europe and within Asian countries other than Japan are consistent with high real integration.

Bénassy-Quéré (1997) argues that the relative stability of intra-Asian exchange rates was likely to come from similar dollar pegs, contrasting to the stability of intra-European exchange rates which really stems from monetary regionalism. Because emerging countries dot not consider pegging their currencies to those of other emerging countries, the choice of a monetary anchor should be related to bilateral integration with the countries issuing international currencies only. From this point of view, the Asian pegs to the dollar did not match the OCA theory. Because most Asian currencies followed similar pegs, this behaviour appeared to be consistent with the OCA theory *ex post* although it was not *ex ante*.

2.2. Methodology

Here we use cross-country estimations in order to analyse the rationale for *de facto* exchange rate regimes in the CEECs. Because we are interested in currency pegs, we only consider the behaviour of exchange rates against three potential international anchors: the US dollar, the Deutschemark (as a prefiguration of the euro) and the yen. The variability of 49 currencies against these three currencies is explained by the asymmetry of business cycles with respect to the United States, Core-EMS countries and Japan, by the share of intra-industry trade in bilateral trade with each anchor area, and by the relative size of each country compared to each anchor area [2]. The rationale is that (i) asymmetric business cycles should come from either asymmetric shocks or asymmetric structures that justify frequent exchange rate adjustment, (ii) industry-specific shocks have relatively symmetric effects in two countries whose bilateral trade is mostly intra-industry, reducing the needs for exchange rate variations, and (iii) a small country has more incentive than a big one to peg its currency, because it is generally more open in terms of trade as well as factor mobility; but it will prefer to peg it to the currency of a large country or area. Hence, our three variables summarise the various criteria for exchange rate stability pointed out by the OCA literature [3].

The variability of exchange rates between i and j (SDS_{ij}) is measured as the standard variation of the quarterly log-variations of bilateral, nominal exchange rates:

$$SDS_{ij} = SD(Log\ S_{ij} - Log\ S_{ij}(-1)), \quad \text{j = USD, DM, yen} \qquad (1)$$

[2] The EMS core includes Germany, France, the Netherlands, Belgium, Denmark and Luxembourg. It is preferred to Germany alone, because for third countries, exchange rate variations *vis-à-vis* the DM will likely have similar effects on trade flows with Germany and with other members of the core.

[3] The share of intra-industry flows in bilateral trade is preferred to the Bayoumi and Eichengreen measure of asymmetric, multilateral trade structures, because two countries selling the same goods to a third country will more likely peg their currencies to the third one than one to another. In addition, unlike Bayoumi and Eichengreen, we do not include a variable of trade openness which is contained in size but covers a restricted definition of openness. Besides, bilateral trade openness did not show up significantly in preliminary regressions.

where S_{ij} stands for the quarterly nominal exchange rate of currency i against currency j (source: IMF, *International Financial Statistics*, line rf), and SD is the standard deviation over 1992:I-1996:IV [4]. Not surprisingly, the variability is smaller for those CEECs currencies which were pegged to a foreign anchor over the period (Table 2). Furthermore, the volatility is generally smaller against the DM than against the two other currencies when the DM was chosen as the unique anchor (Estonia) or as the main anchor (Czech Republic, Slovak Republic). Hungary is an exception, which highlights the importance of considering *de facto* exchange rate regimes instead of official regimes.

Table 2: The volatility of the CEECs currencies against the three reference currencies

% over 1992:I-1996:IV	Standard deviation of the quarterly log variations of the exchange rate			
	against the USD (1)	against the DM (2)	against the yen (3)	(2)/(1)
Bulgaria	12.11	11.60	12.65	0.96
Czech Rep.	2.82	1.16	4.01	0.41
Estonia	3.12	0.25	3.57	0.08
Hungary	2.43	3.51	5.86	1.44
Latvia	5.15	5.27	4.40	1.02
Lithuania	11.33	11.00	13.60	0.97
Poland	3.81	3.49	6.05	0.92
Romania	12.21	13.25	13.69	1.09
Slovak Rep.	2.61	2.28	5.46	0.87
Slovenia	9.25	8.78	11.40	0.95

Source: authors' calculations based on IMF: *International Financial Statistics* (line rf).

The asymmetry of business cycles between i and j (SDY_{ij}) is the standard deviation of the differences in year-on-year log variations of real output between i and j over 1992:I-1996:IV (source: IMF, *International Financial Statistics*, line 66):

$$SDY_{ij} = SD\left(Log\frac{RGDP_i}{RGDP_i(-4)} - Log\frac{RGDP_j}{RGDP_j(-4)} \right), \text{ j = US, Core-EMS, Japan} \qquad (2)$$

[4] This time sample was constrained by the needs to drop the beginning of the transition period, which was not representative of middle and long run strategies.

where $RGDP_i$ stands for i's GDP at constant prices, and SD is the standard deviation operator.

The relative size of i compared to j ($RSIZE_{ij}$) is the ratio of current dollar GDPs in i and j in 1995 (source: CEPII-CHELEM database and IMF):

$$RSIZE_{ij} = \frac{SIZE_i}{SIZE_j}, \qquad \text{j = US, Core-EMS, Japan} \tag{3}$$

Finally, the share of intra-industry trade is measured through a relative Grubel and Lloyd index (RGL_{ij}) quantifying the importance of intra-industry trade in *ij* bilateral trade in comparison to in *i*'s external trade with the three pooled reference zones:

$$RGL_{ij} = 100\,\frac{GL_{ij}}{GL_{iw}}, \quad \text{with w = sum of US, Japan and Core-EMS} \tag{4}$$

$$\text{and} \qquad GL_{ij} = 1 - \sum_{k=1}^{70} \frac{X_{ij}^k + M_{ij}^k}{X_{ij} + M_{ij}} \bullet \frac{\left| X_{ij}^k - M_{ij}^k \right|}{X_{ij}^k + M_{ij}^k} \tag{5}$$

(see Grubel and Llyod, 1971). The second term in the sum measures the share of two-side trade in total bilateral trade of product *k*. The first one is the share of product *k* in total bilateral trade. The Grubel and Llyod index varies from zero (only inter-industry trade) to one (only intra-industry trade). Here, a relative Grubel and Lloyd index is preferred to an absolute one because the former takes into account the general intra-industry trade (IIT) behaviour of each country *vis-à-vis* the "rest of the world" (US, Japan and EU), and can therefore control for countries that naturally exhibit less (more) IIT than other ones, due for instance to their input endowments or to their level of development [5]. This index is calculated for 1995 using the 70-products decomposition of the CHELEM database. For the six CEECs which were missing in this database, we used the 100-product decomposition of the GATT database, and performed product groupings in order to meet the 70-product decomposition of CHELEM [6].

Table 3 presents the relative Grubel and Lloyd indexes computed for the CEECs of the sample. The relative proportion of intra-industry trade is always larger with the Core-EMS than with Japan or the United States, which means that industry-specific shocks will

[5] It is well-known that industrial countries exhibit more ITT than developing countries. The Grubel and Llyod index against the three pooled reference zones is not an average of the three bilateral Grubel and Llyod indexes: by construction, there is more intra-industry trade with a large and diversified area than with a specific country, because more products are traded in the former case.

[6] The six countries are the Czech Republic, Estonia, Latvia, Lithuania, the Slovak Republic and Slovenia.

likely have more symmetric impact within Europe than between the CEECs and the US or Japan.

Table 3: Relative Grubel and Lloyd Indexes

	Relative Grubel and Lloyd index with		
	Japan	Core-EMS	USA
Bulgaria	46,49	102,51	38,81
Estonia	1,04	78,31	31,57
Hungary	26,11	100,92	52,33
Latvia	1,66	99,86	43,33
Lithuania	0,79	99,15	19,42
Poland	33,56	98,00	64,35
Czech Rep.	32,54	99,16	59,09
Romania	17,56	100,18	37,83
Slovakia	9,73	100,29	21,05
Slovenia	31,52	99,21	42,51

Source: Authors' calculations based on CHELEM and GATT

Cross-country estimations are carried out for a range of 49 countries including 9 CEECs and 19 industrial countries [7]. Since the variables are pooled for j=USD, DM and yen, the whole sample contains 3x49=147 observations. Given the high heterogeneity of exchange rate variability across countries, there is good ground for heteroskedasticity, and this is what we obtain. We use the method of White (1980) to derive heteroskedastic-consistent standard errors.

The following equation is estimated:

$$SDS_{ij} = a_0 + a_1\, SDY_{ij} + a_2\, RGL_{ij} + a_3\, RSIZE_{ij} + u_{ij} \qquad (6)$$

We expect that $a_1 > 0$, $a_2 < 0$ and $a_3 > 0$. This is because asymmetric shocks (proxied by high SDY_{ij} or low RGL_{ij}) are an incentive for exchange-rate flexibility, whereas a small size compared to the potential anchor partner (low $RSIZE_{ij}$) should lead to more stability.

In a second step, dummies are included in order to test for a specific behaviour of the CEECs countries *vis-à-vis* the DM and the USD, and to compare it to the specific behaviour of West-European countries *vis-à-vis* the DM. Thus, the following regressions are run:

$$SDS_{ij} = b_0 + b_1\, SDY_{ij} + b_2\, RGL_{ij} + b_3\, RSIZE_{ij} + b_4\, DC_{ij} + b_5\, DE_{ij} + b_6\, DU_{ij} + v_{ij} \qquad (7)$$

[7] The CEECs are those reported in Table 1 less Slovenia for which size data are not available in our data bases.

where $DC_{ij} = 1$ if i is a CEEC and j is the Core-EMS, 0 otherwise; $DE_{ij} = 1$ if i is a West-European country and j is the DM, 0 otherwise; $DU_{ij} = 1$ if i is a CEEC and j is the US, 0 in otherwise. Both the USD and the DM are introduced in the regressions, as most CEECs currencies of the sample are officially pegged to both currencies. These dummies should not be significant if the *de facto* pegs stem from the OCA theory.

Finally, following the methodology of Bayoumi and Eichengreen, we use the estimates to calculate OCA indexes for the CEECs (taking Equation (6) as deterministic). In order to characterise past behaviours, we compare OCA indexes to observed volatilities. Then we use these indexes to select the best currency to be used as a nominal peg.

2.3. Estimations results

Table 4 presents the estimates obtained with the full sample and with sub-samples including either European countries (Western countries and CEECs) or non-OECD countries. In almost all cases, the OCA coefficients are correctly signed: the exchange rate volatility is higher when business cycles differ (*SDY*), when the share of intra-industry trade is relatively small (*RGL*), and when the country is large compared to the potential anchor area (*RSIZE*).

Table 4: OCA estimates

	All countries		Europe		Non-OECD	
	(a)	(b)	(c)	(d)	(e)	(f)
Number of observations	147	147	72	72	90	90
Constant	4.95***	4.966***	3.321***	2.478***	4.985***	5.063***
SDY_{ij}	0.356***	0.379***	0.454***	0.565***	0.336***	0.366***
RGL_{ij}	-0.022***	-0.018**	-0.011	0.017#	-0.023**	-0.024**
$RSIZE_{ij}$	0.040**	0.037**	0.059**	0.042*	0.059	0.032
DC_{ij}	-	-0.982	-	-3.651***	-	-0.428
DE_{ij}	-	-1.752**	-	-2.993***	-	-
$DU_{i,j}$	-	-1.981#	-	-2.403**	-	-1.431
Adjusted R^2	0.299	0.324	0.409	0.522	0.297	0.293
F statistics	21.85***	12.648***	17.42***	13.93***	13.59***	8.37***
S.E. of the regression	2.773	2.726	2.529	2.275	3.037	3.046

Note: *** significant at the 1% level; ** at the 5% level; * at the 10% level; # at the 15% level.

Source: authors' calculations.

The asymmetry of business cycles is always significant at the 1% level in explaining exchange rate volatility, although the regressions say nothing about causality. The coefficient on the relative Grubel and Llyod index is significant for the whole sample as well as for non-OECD countries, but not for European countries alone. The result for the European sample may be due to the fact that European countries exhibit both an important intra-industry trade and a large similarity in their output cycles with other European countries. In contrast, their output fluctuations do not converge with those of the US and Japan, with whom they tend to have less intra-industry trade. Hence, the relative Grubel and Lloyd indexes and the output cycles convey the same information, which can explain the fact

that the former is not significant. As a matter of fact, excluding *SDY* from regression (c) leads *RGL* to become significant at the 5% level; however, the general quality of the regression sharply declines, and *RGL* is no longer significant when the dummies are included.

Finally, the relative size is significant at the 5% level, except for non-OECD countries. The non-significance of relative size for non-OECD countries can be linked to the fact that those non-OECD countries exhibiting a relatively low exchange rate variability against the US dollar can be either small in terms of GDP (Romania, Hungary, Pakistan, Philippines) or large (China, South Korea, Argentina, Mexico).

The coefficient of the Western European dummy (*DE*) is significantly negative, meaning that Western European currencies are excessively pegged to the DM compared to OCA standards. By contrast, the coefficient of the CEEC/DM dummy (*DC*) is not significant, except on the European sub-sample, where it is negative and close to that of *DE*. The latter result may be explained by the fact that OCA coefficients are larger when only European countries are considered. When all countries are considered, CEECs exchange rates against the DM do not deviate from the standard OCA behaviour. Finally, the CEEC/USD dummy (*DU*) is significant at the 15% level when the whole sample is considered, and at 5% for the European sub-sample. This result can be considered as a loose bias towards stability against the USD.

It can be concluded that in the past, the CEECs currencies have deviated from what the OCA criterion would have prescribed in the sense of too much stability against the dollar, especially when the OCA criterion is calculated with European countries only. However, the European standard may not be a pure OCA standard since most Western European countries have demonstrated a strong commitment to stabilise intra-European exchange rates even in the presence of asymmetric shocks. In the following, we use the coefficients estimated on the whole sample as a benchmark.

2.4. OCA indexes

Here, we take regression (a) as the OCA standard because it covers the largest sample of countries and does not include extra-OCA dummies. We derive OCA indexes that measure the variability of the exchange rates that would fit the OCA theory. The indexes obtained are then compared to observed volatilities, for East European countries, as well as West European countries outside the Core-EMS (Table 5). In a majority of cases, observed volatility is smaller than the OCA standard would have predicted. In all West European countries but Greece, the observed volatility/OCA index ratio is smaller against the DM than against the dollar, revealing an unexplained bias towards stability against the DM. In contrast, all the CEECs but the Czech Republic and Estonia (who officially pegged their currencies to the DM over the period) display a larger excess volatility against the DM than against the dollar, showing an unexplained bias towards more stability against the dollar.

Table 5: Excess volatility: observed volatility/OCA index

CEECs	Excess volatility against			W-Europe excluding Core-EMS	Excess volatility against		
	DM (1)	US dollar (2)	(1)/(2)		DM (1)	US dollar (2)	(1)/(2)
Bulgaria	1.68	1.44	1.17	Austria	0.02	0.93	0.02
Czech Rep.	0.23	0.48	0.47	Finland	1.01	1.50	0.68
Estonia	0.05	0.51	0.10	Greece	1.25	0.86	1.45
Hungary	0.62	0.37	1.67	Ireland	0.57	0.74	0.77
Latvia	0.61	0.52	1.17	Italy	1.14	1.20	0.95
Lithuania	1.17	1.01	1.16	Norway	0.40	1.25	0.32
Poland	0.85	0.80	1.06	Portugal	0.58	0.62	0.94
Romania	1.73	1.36	1.27	Spain	0.64	1.23	0.52
Slovak Rep.	0.45	0.39	1.16	Sweden	1.28	1.41	0.91
				Switzerland	0.48	1.15	0.42
				UK	0.84	1.15	0.73

Source: authors' calculations based on regression (a) in Table 4.

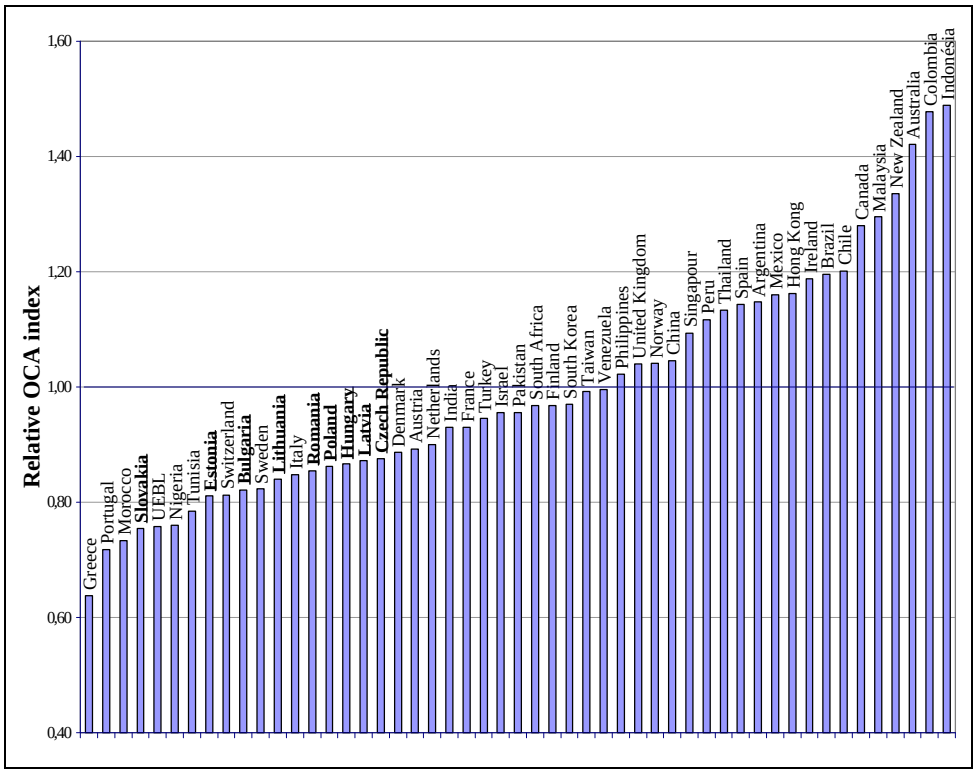
Switching from a positive to a normative point of view, it is now possible to use the OCA indexes to select the appropriate peg in each country. We first eliminate the yen as a possible anchor currency because the OCA indexes against the yen are systematically higher than those against the DM or the US dollar, even in Asian countries. Then, we compute the ratio of the OCA index against the DM over the corresponding index against the dollar. The DM (or euro) should be preferred to the dollar if this ratio is lower than one.

Figure 1 shows that, according to the OCA standard, the CEECs should have pegged their currencies to the DM rather than to the dollar over the period. This is also the case for Mediterranean countries, especially Morocco and Tunisia, and for all West European countries, except the two oil producers (the UK and Norway), Spain and Ireland. Conversely, Latin American and most Asian countries should have preferred the dollar to the DM. A major exception is India, where a large part of external trade is carried out with Europe.

Still, it can be asked whether a basket containing both the DM (or the euro) and the dollar could be preferred to a single currency. This question is especially relevant for those countries whose ratio is close to one, like the UK, Norway and several Asian countries. It is less relevant for the CEECs, whose ratios never exceed 0.9. However emerging countries may use criteria not highlighted by the OCA literature, as argued below.

Figure 1: Relative OCA indexes

A value exceeding 1 means that the USD should be preferred to the euro as a currency peg.



Source: authors' calculations based on regression (a) in Table 2.

3. CEECS PEGGING STRATEGIES WHEN TARGETING EXTERNAL BALANCE

3.1. Targeting external balance

According to the OCA literature, the ultimate objective of the public authorities is to stabilise output. Although such an assumption is generally acceptable, emerging countries encounter financial restrictions which make them concentrate on external targets. In this section, we study the case for pegging the CEECs' currencies to the euro when the exchange rate policy focuses on the external balance, as an intermediate target.

The usual framework to deal with such targeting is the Fundamental Equilibrium Exchange Rate (FEER) approach of Williamson (1994). According to this, the monetary authorities should target a FEER insuring a current account that meets the needs for foreign

investment with full employment [8]. However, the FEER is an effective exchange rate based on the distribution of foreign markets and/or competitors. Given that the FEER is relatively stable, targeting it means pegging the currency in real terms to a basket of foreign currencies corresponding to the weights of the trade partners [9].

Still, the foreign account is not just a question of external competitiveness, when there is an external debt denominated in foreign currencies: a real depreciation improves the trade account if the Marshall-Lerner condition is verified (demand effect) or if higher profitability raises the incentive to export (supply effect). But the external debt is revalued. The net effect on the foreign account is uncertain. This argument applies especially to countries deep in debt like Bulgaria, Hungary or the Slovak Republic (Table 6). With an 11% debt service/GDP ratio, a 10% depreciation against the currency of denomination induces a rise in debt service by 1.1% of GDP. On the other hand, a depreciation of the currency raises external competitiveness. With an export/GDP ratio of 60% and price elasticities of 0.7 for exports and 0.5 for imports, a 10% depreciation raises the trade account by 1.2% of GDP. The net effect of the depreciation on the foreign account is close to zero. It can even be negative for lower price elasticities of trade [10].

Table 6: Some macroeconomic indicators in selected CEECs, in 1997

	CPI inflation % per year	Current account % of GDP	Exports % of GDP	Gross ext. debt % of GDP	Debt service % of GDP
Bulgaria	1095.0	2.4	63.7	88.0	11.2
Czech Rep.	8.4	-8.4	62.9	45.3	7.0
Hungary	18.2	-4.2	44.6	32.2	11.0
Poland	16.7	-5.8	26.5	32.7	3.5
Romania	150.0	-4.6	29.7	27.6	9.8
Slovak Rep.	6.8	-10.1	64.0	56.2	11.2
Slovenia	9.3	-1.2	61.4	31.7	6.0

Source: Caisse des Dépôts et Consignations, *Emerging Regions Report* n°4, February 1998.

[8] The FEER is a real exchange rate, whereas the OCA refers to nominal pegs. However a real peg can be consistent with a nominal peg, even in the presence of high inflation, if nominal exchange rate variations are regular and compensate inflation differentials.

[9] Even if a third currency (the dollar) is used for invoicing foreign trade, competitiveness is defined against each partner rather than against the third country.

[10] The trade balance is influenced by the real exchange rate, while valuation effects are due to variations in the nominal exchange rate. But a transition economy can take world inflation as exogenous. The evolution of its real exchange rate basically depends on that of its nominal exchange rate compared to domestic inflation. While the external debt is influenced by the nominal exchange rate, the nominal GDP depends on domestic inflation. Hence, the debt ratio rises when the real exchange rate depreciates.

If debt is denominated in the same currencies as foreign trade, then pegging a trade-weighed basket remains the best way of targeting the foreign account because both the trade account and the debt service will remain stable. But this is not the case in the CEECs, as the country-distribution of foreign trade does not match the currency-distribution of the external debt, as shown in Table 7: in most countries, the US dollar is by far the most important currency of denomination for long-term debt, while the US never exceeds 4% of foreign trade. This mismatch raises the question of the pegging strategy: pegging the CEECs currencies in real terms to the euro is a good strategy for stabilising external competitiveness; but it can be painful when the dollar appreciates, because the debt is revalued. This intuition is used below to derive optimal basket pegs.

Table 7: The mismatch between the country-distribution of foreign trade and the currency-distribution of the external debt in selected CEECs, in 1995.

	% of exports to			% of imports from			% of the long-term debt (2) in			
	US	Euro zone (1)	CEECs	US	Euro zone (1)	CEECs	USD	DM+ FF	Yen	Other (3)
Bulgaria	3.1	27.6	3.7	2.2	29.6	4.4	67.2	8.2	7.8	16.8
Czech Rep	1.8	50.2	25.9	3.7	50.4	18.1	19.7	5.6	8.2	66.4
Hungary	3.2	58.0	11.0	3.1	55.3	7.9	10.5	30.6	35.1	23.8
Poland	2.7	60.1	6.0	3.9	53.9	6.1	45.9	23.3	3.6	27.1
Romania	2.5	48.3	4.2	4.0	45.2	5.7	35.2	16	2.8	46.1
Slovak Rep.	1.3	34.8	46.1	2.5	31.2	33.5	18.3	6.5	1.2	73.9
Slovenia	3.2	62.8	4.7	3.1	65.2	6.4	36.2	17.7	9.4	36.7

(1) Austria, Belgium-Luxembourg, France, Germany, Italy, Ireland, Netherlands, Finland, Portugal, Spain.
(2) The long-term debt accounts for 70.6 to 99.5% of the total external debt.
(3) Including multiple currency

Sources: IMF, Direction of Trade, and The World Bank, *World Debt Tables*.

3.2. Pegging to the euro as a non-cooperative strategy

3.2.1. The model

It is assumed here that the monetary authorities in two CEECs (i=A,B) wish to stabilise both their external competitiveness c_i and the real price of their external debt f_i:

$$\underset{e_{i\$}}{Min}\ L_i = \frac{1}{2}\left(c_i^2 + \beta\ f_i^2\right), \qquad i = A,B\ , \qquad \beta \geq 0 \tag{8}$$

This loss function can be derived from one in terms of the trade account (which depends on c_i) and the external debt burden (which is a function of f_i). Each country is assumed to control its bilateral exchange rate against the USD, $e_{i\$}$ [11]. The question is whether it is optimal to change $e_{i\$}$ when the euro moves against the dollar.

Both c_i and f_i are real, effective exchange rates, but the weights used to compute them differ. We write a_j for the weight of country j as a trade partner, and b_j for the weight of currency j for debt denomination. For the sake of simplicity, the same subscripts refer to countries and to currencies: \$ stands for the US dollar or for the US, E for the euro and for the euro-zone, and B for country B whose currency is not used for debt denomination.

The real, effective exchange rates (REER) c_A and f_A can be written:

$$\begin{cases} c_A = a_{\$}\ e_{A\$} + a_E\ e_{AE} + (1 - a_{\$} - a_E)\, e_{AB} \\ f_A = b_{\$}\ e_{A\$} + b_E\ e_{AE} + (1 - b_{\$} - b_E)\, e_{AB} \end{cases} \tag{9}$$

where e_{Aj} stands for the logarithm of the real exchange rate of currency A against j (j=\$,E,B) For simplicity, we assume that all trade is carried out with the US, the euro-zone and CEEC partners, and that the debt is denominated in dollars and euros only. These assumptions are not far from reality in most countries (Table 7), especially if "multiple currencies" are considered dollar-euro baskets. Knowing that $e_{ij} = e_{i\$} - e_{j\$}$, Equation (9) can be re-arranged as:

$$\begin{cases} c_A = e_{A\$} - a_E e_{E\$} - (1 - a_{\$} - a_E) e_{B\$} \\ f_A = e_{A\$} - b_E e_{E\$} - (1 - b_{\$} - b_E) e_{B\$} \end{cases} \tag{10}$$

Similar relations prevail for country B (both countries are assumed to be identical). If each country minimises its loss function without taking the reaction of its partner into account, we get the following Nash-equilibrium:

$$e_{A\$} = e_{B\$} = \frac{(a_E + \beta b_E)}{(a_{\$} + a_E) + \beta(b_{\$} + b_E)} e_{E\$} \tag{11}$$

Equation (11) provides the optimal reaction of each CEEC exchange rate against the USD to euro/USD variations. In the special case where $a_{\$} = a_E = b_{\$} = b_E = 0.5$, i.e. when all trade and capital flows are carried out equally with the US and with the euro-zone, then (11) becomes:

[11] Using the exchange rate against the euro as an instrument would lead to the same results.

$e_{A\$} = e_{B\$} = 0.5\, e_{E\$}$: when the euro appreciates by 1% against the dollar, each country appreciates its currency by 0.5% against the dollar, which means a 0.5% depreciation against the euro. This peg to a basket maintains the REER constant both in terms of trade weights and in terms of debt weights.

According to Table 7, however, the share of CEECs partners varies to a large extent across countries: from 4% in Bulgaria to 40% in the Slovak Republic (average of export and import shares). The weight of the euro zone lies between 29% in Bulgaria and 57% in Poland. Conversely, the US share is roughly the same across countries: 2-3%. After re-normalising, we get $a_\$$ = 0.03 (Slovak Rep.) to 0.08 (Bulgaria), and a_E = 0.44 (Slovak Republic) to 0.88 (Slovenia). For debt denomination, we have $b_\$$ = 0.26 (Hungary) to 0.89 (Bulgaria).

The optimal peg also depends on β. If $\beta \to \infty$, the monetary authorities of country A (B resp.) stabilise the financial REER by pegging their currencies to a basket containing a proportion of euros corresponding to the currency distribution of the debt. If β = 0, they stabilise the trade REER, and the share of the euro matches the share of the euro-zone in the country-distribution of trade. For intermediate values of β, they make a trade-off between stabilising c_i and stabilising f_i.

Except in the two polar cases where β = 0 or $\beta \to \infty$, the two countries would have an interest in co-operating, since they would stop trying to modify their bilateral competitiveness. This can be shown by deriving the co-operative equilibrium. Assuming both countries agree on the minimisation of $L = L_A + L_B$, the optimal exchange rate policy is:

$$e_{A\$} = e_{B\$} = \frac{\left(a_\$ + a_E\right)a_E + \beta\left(b_\$ + b_E\right)b_E}{\left(a_\$ + a_E\right)^2 + \beta\left(b_\$ + b_E\right)^2} e_{E\$} \qquad (12)$$

In the special case where $a_\$ = a_E = b_\$ = b_E = 0.5$, i.e. when all trade and capital flows are carried out equally with the US and with the euro-zone, (12) still leads to pegging the currency to a basket with the USD and the euro equally weighed.

Once again, the optimal peg depends on β. If β = 0 or $\beta \to \infty$, the co-operative equilibrium is exactly the same as the Nash equilibrium, because there is only one target that can be achieved whether or not the two countries co-operate. For intermediate values of β, the trade-off between stabilising c_i and f_i differs from that in the Nash case, because both countries understand that trying to stabilising c_i entails a useless loss in terms of f_i variability.

3.2.2. Optimal baskets

What is the likely value of β ? If monetary authorities have a foreign account target, they will be indifferent between a 1% of GDP variation in the trade account and a 1% of GDP variation in debt service. The reaction of the trade account/GDP ratio to a 1% depreciation in c_i amounts to Δ_c%, where Δ_c is given by the Marshall-Lerner-Robinson formula (Robinson, 1947):

$$\Delta_c = \frac{X}{GDP}\left(\frac{X}{M}\left[1+\gamma_X(\varepsilon_X-1)\right]+\gamma_M(\varepsilon_M-1)\right) \quad (13)$$

where X stands for exports, M for imports, ε_X and ε_M are the price elasticities of exports and of imports, γ_X is the elasticity of export prices to domestic prices, and γ_M is the elasticity of import prices to supplier prices. The reaction of the debt service/GDP ratio to a 1% depreciation in f_i amounts to Δ_f%, with:

$$\Delta_f = \frac{DS}{GDP} \quad (14)$$

where DS stands for the debt service. If the authorities are indifferent between raising the trade account and reducing the debt service, then they should be indifferent between a 1% depreciation in c_i and a Δ_c/Δ_f % appreciation in f_i. This is because a 1% depreciation in c_i improves the trade account by Δ_c% of GDP, while a Δ_c/Δ_f % appreciation in f_i reduces the debt service by $\Delta_f.\Delta_c/\Delta_f = \Delta_c$ % of GDP. Hence, the optimal value of β should be:

$$\beta^* = \frac{\Delta_f^2}{\Delta_c^2} \quad (15)$$

β^* is calculated in Table 8 for each CEEC. Estimates of price elasticities of trade are not available for the CEECs, given the short period since the beginning of the transition. Hence, we use elasticities estimated by the Mimosa Team (1996) for Southern European countries. Other data are taken from Caisse des Dépôts et Consignations (1998).

Table 8: Calculating b^*

	Bulgaria	Czech Rep.	Hungary	Poland	Romania	Slovak Rep.	Slovenia
ε_X	0.70	0.70	0.70	0.70	0.70	0.70	0.70
ε_M	0.44	0.44	0.44	0.44	0.44	0.44	0.44
γ_X	0.21	0.21	0.21	0.21	0.21	0.21	0.21
γ_M	0.67	0.67	0.67	0.67	0.67	0.67	0.67
X/M	1.08	0.89	1.00	0.85	0.88	0.86	0.97
X/GDP	0.64	0.63	0.45	0.27	0.30	0.64	0.61
Δ_c	0.41	0.29	0.25	0.11	0.13	0.28	0.33
DS/GDP	0.11	0.07	0.11	0.04	0.10	0.11	0.06
Δ_f	0.11	0.07	0.11	0.04	0.10	0.11	0.06
β^*	0.08	0.06	0.19	0.10	0.54	0.17	0.03

Sources: authors' calculations based on CDC (1998) data and on Mimosa (1996) estimates.

b^* is always smaller than 1, meaning that stabilising c_i is more important than stabilising f_i as far as the foreign account target is concerned. However b^* varies across countries. It is higher in Romania because the debt service ratio is relatively high while the openness ratio is relatively low. It is smaller in Slovenia which is in the opposite situation. The subsequent optimal basket is calculated for each country in Table 9.

Table 9: Optimal share of the euro in CEECs' basket pegs

	Bulgaria	Czech Rep.	Hungary	Poland	Romania	Slovak Rep.	Slovenia
β^*	0.08	0.06	0.19	0.10	0.54	0.17	0.03
$a_\$$	0.08	0.04	0.05	0.05	0.06	0.03	0.04
a_E	0.81	0.67	0.82	0.86	0.85	0.44	0.88
$b_\$$	0.89	0.78	0.26	0.66	0.69	0.74	0.67
b_E	0.11	0.22	0.74	0.34	0.31	0.26	0.33
Nash equilibrium	0.85	0.89	0.91	0.89	0.70	0.76	0.93
Cooperative equilibrium	0.84	0.87	0.90	0.88	0.69	0.65	0.93
Welfare improvement %	0.10	0.83	0.29	0.08	0.21	10.31	0.02

Sources: authors' calculations.

In the Nash case, the share of the euro in the optimal basket always exceeds 70%. The highest value (93%) is obtained in Slovenia, where a very large share of trade is carried out with the euro zone while the relative weight of the financial REER in the loss function is specially low. The lowest value (70%) is obtained in Romania where the relative weight of the financial REER is specially high and the dollar is prominent in debt denomination.

Co-operation reduces the share of the euro in the baskets, because more attention is given to the financial REER which depends more heavily on the dollar. However there is little difference between the co-operative and the non-cooperative equilibria. This is because intra-CEECs trade flows are small. Thus, the absence of co-operation is not very damaging. The Slovak Republic is an exception, because a large part of foreign trade is carried out with the Czech Republic and the value of b^* is relatively high.

4. CONCLUSION

In this paper, we applied two different approaches of optimal currency pegs to the CEECs. The first one draws from the theory of optimal currency areas. It shows that, over the past, CEECs' currencies deviated from a general OCA standard in the sense of too much nominal stability against the dollar. In fact, applying OCA criteria would entail nominal pegs to the euro rather than to the dollar. The second approach is based on foreign account targeting, which stems from financial constraints encountered by emerging countries. It shows that the euro should be prominent in the CEECs' optimal real basket pegs, whether or not these countries co-operate. Given the political will for integration into the European Union, it can be concluded that the euro will likely be chosen as a monetary anchor, or at least as the main currency of basket pegs.

Consequently, the European area of exchange rate stability will likely exceed the euro-zone. The implication of such an outcome is twofold. Firstly, the use of the euro for other functions will be enhanced. For instance, the CEECs will provide a supply for euro-denominated bonds, which would otherwise be missing for the development of the store-of-value function, given the saving/investment equilibrium of the euro-zone. Secondly, the use of the euro as an anchor currency could push the international monetary system towards a bipolar framework, which could have an impact on dollar variability against the euro and on international monetary co-operation.

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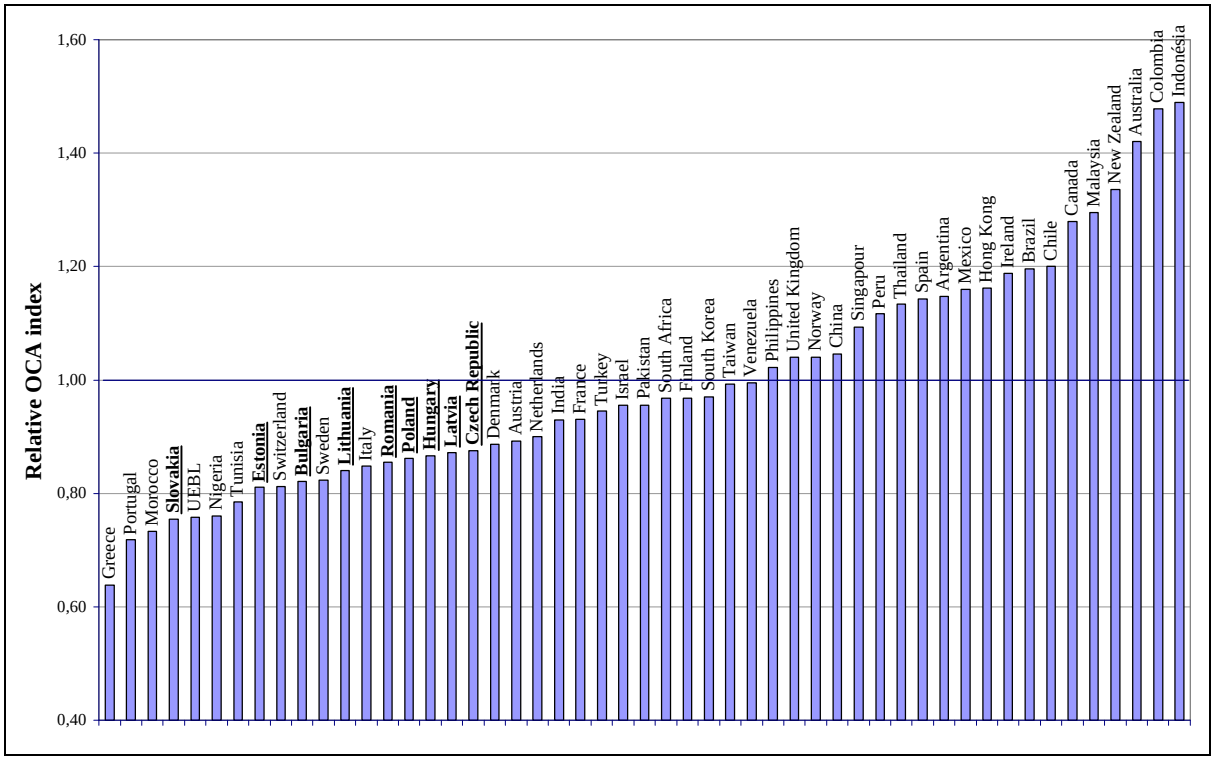
Relative OCA index
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1,20
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0,80
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0,40
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Morocco
Slovakia
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Sweden
Lithuania
Italy
Romania
Poland
Hungary
Latvia
Czech Republic
Denmark
Austria
Netherlands
India
France
Turkey
Israel
Pakistan
South Africa
Finland
South Korea
Taiwan
Venezuela
Philippines
United Kingdom
Norway
China
Singapour
Peru
Thailand
Spain
Argentina
Mexico
Hong Kong
Ireland
Brazil
Chile
Canada
Malaysia
New Zealand
Australia
Colombia
Indonésia