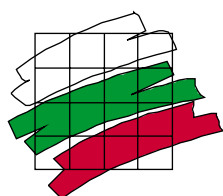


WORKING PAPER SERIES

THE BALASSA – SAMUELSON EFFECT IN THE BULGARIAN ECONOMY

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LIST OF ABBREVIATIONS

AEAF – Agency for Economic Analysis and Forecasting

CPI – Consumer Price Index

DGDP – Deflator of Gross Domestic Product

DGVA – Deflator of Gross Value Added

EU – European Union

GDP – Gross Domestic Product

GO – Gross Output

GVA – Gross Value Added

NSI – National Statistical Institute

NW – Nominal Wage

OECD – Organization for Economic Co-operation and Development

PPI – Producer Price Index

REER – Real Effective Exchange Rate

ULC – Unit Labor Cost

W – Wage

I. FOREWORD

This study attempts at exploring the Balassa-Samuelson (BS) effect on inflation in Bulgaria and its contribution to the real appreciation of the Bulgarian lev vis-à-vis the country's major trading partners. The impact of the BS effect on inflation in the 1990s has been assessed, estimated by the deflator of gross value added (GVA).

Section II focuses on the data and methodology of calculation, with 1991=100. The data have been purposely recalculated at 1996 basis to reveal the reinforced contribution of the BS effect to the country's inflation since the institution of the currency board arrangement. The real effective exchange rate of the Bulgarian lev vis-à-vis the currencies of Bulgaria's major trading partners has been estimated at 1995 basis. Section III gives an account of the calculations of the BS effect while the tables and figures given evidence the validity of the BS hypothesis for the Bulgarian economy. Furthermore, some conclusions as to the practical implications of the effect have been drawn, e.g. inflation forecasts based on the GVA deflator and the impact of the effect on the real effective exchange rate (REER). Section IV dwells on the calculations of the relative prices of tradables and non-tradables as CPI composites made by the Agency for Economic Analysis and Forecasting. The relative price growth in the sector of non-tradables to tradables is determined not only by the outstripping productivity rate in the latter but by an interplay of other factors as well that are highlighted in Section V. Section VI focuses on the conclusions derived from the REER estimations vis-à-vis the currencies of Bulgaria's major trading partners. The BS model itself rests on the assumption that the real appreciation of the national currency is triggered by the higher price growth rate of non-tradables.

Appendix 1 gives an account of the BS model while Appendix 2 provides a comparison between the price levels in the EU applicant countries and the 15 member states of the Union. Furthermore, Appendix 3 contains REER estimations for Bulgaria vis-à-vis its major trading partners.

The estimations made indicate that the effect of the BS model on the country's inflation and REER over the 1995-2000 period, as measured by the GVA deflator, amounted to 2.6 percentage points on an annual basis. About 74% of the total real overvaluation of the Bulgarian currency was due to the same effect.

II. DATA AND METHODOLOGY

Estimations of the BS effect on inflation and the REER in Bulgaria draw upon data on GVA, employment and wages (employment compensations) provided by the National Statistical Institute (NSI), the OECD¹ and the Russian Committee of Statistics. NSI data are annual (from 1991 to 2000) and quarterly (1996 to 2001). The statistics for the OECD countries and Russia are annual covering the 1995-2000 span.

Annual GVA data have been estimated at constant prices (1996=100). Ever since the same year, the NSI has been using a new branch classification under the GDP production account. The level of aggregation employed for the purposes of the analysis made data re-estimation from 1996 to 1991 basis possible by a change in the physical volumes of the branches. Quarterly GVA and quarterly price index (deflators) data for Bulgaria have been re-calculated at constant prices, with 1996 = 100. All deflators are implicit, i.e. they have been obtained by comparing GVA at current (ongoing prices) to GVA at constant prices.

Data on Bulgaria's REER, GVA and deflators have been rebased at 1995=100. Bulgarian trading partners' aggregate indices of GVA, deflators and composites thereof have been assessed by weighing the countries' average shares in Bulgaria's foreign trade over the 1995-2001 period.

The branches under the GDP production account have been re-grouped into two major sectors, viz. the sector of tradables and sector of non-tradables. Average labour productivity is estimated as the ratio of GVA (at constant prices) to the number of employed in both sectors (A_t and A_n).

The relative shares of labour α_t and α_n have been calculated as the ratio of employment compensations (wages + social security contributions) to the GVA in both sectors – the sector of tradables and non-tradables.

The formula² used in estimating the BS effect is as follows:

$$\frac{P_n}{P_t} = \frac{(A_t)^{\alpha_n}}{A_n} \quad (1),$$

where:

P_n and P_t are the relevant price indices of tradables and non-tradables,
 α_n and α_t are the respective share of labour in the sector of non-tradables and tradables,

¹ OECD, *National Accounts of OECD Countries, 2001, Vol. II.*

² The same formula is employed by the IMF in estimating the BS effect for Bulgaria. *IMF Staff Country Report # 00/54, p. 21.*

A_t and A_n are the index of productivity in the sector of tradables and non-tradables at constant prices.

By taking a logarithm we derive formula A1, given in Appendix 1.

The classification most frequently used in economic studies labels manufactures as tradables and services as non-tradables. A widely used measure of tradability defines a sector as tradable if more than 10% of total output there is exported³. According to the production account, total GVA is the sum total of value added generated in the three major sub-sectors, i.e. agriculture and forestry, the manufacturing sector and services.

Table 1

Agriculture and forestry
Agriculture
Forestry, hunting and fisheries
Manufacturing sector
Mining industry
Processing industry
Production and supply of electricity, gas and water
Construction
Services
Transport
Communications
Trade
Finance, credit and insurance
Other services

Mc Donald and Ricci (2001) define foreign trade as a sector of key importance having specific characteristics that set it apart from the other sectors of the economy which can be included in the sector of either tradables or non-tradables. Productivity in foreign trade comes to two effects. First, when trade supplies inputs, improvements in productivity lead to lower prices of tradables, higher relative wages and rising exchange rate what is actually the behaviour of productivity in the tradable sector as a whole. And second, where trade supplies finished products higher productivity leads to cheaper consumer prices of tradables, triggering a real exchange rate depreciation similar to the effect of higher productivity in the sector of non-tradables⁴.

The approach to the grouping of the sectors under the production account into

³ De Gregorio, Giovanni and Wolf (1993), *International Evidence on Tradables and Nontradables Inflation*, NBER, August 1993, WP 4438.

⁴ Mc Donald, R. and L. Ricci, *PPP and Balassa-Samuelson effect: The role of the distribution sector*, 2001, IMF WP/01/38.

tradables and non-tradables initially rested on the estimated share of exports in gross output in each of them. One of the groupings employed was as follows:

Table 2

Tradable	Non-tradable
Agriculture and forestry	Mining industries
Processing industries	Construction
Transport	Communications
Trade	Finance
Electricity, heating, gas, water	Other

Trade has often fallen under the heading of non-tradables as well. Likewise, some estimations treat electricity, heating, gas and water as non-tradables due to the administrative pricing applied to the same sector. Agricultural exports account for less than 10% of gross agricultural output but the sector has been nevertheless classified as tradable since food price dynamics (a CPI composite) in periods of low international prices and/or strong Deutsche mark (EUR) ran rather low, even negative in 1998 and 1999. On the whole, however, the estimations yielded unreliable results of little relevance as to the correlation between productivity and the relative prices of non-tradable goods and services.

The best results have been obtained where manufactures were treated as tradables and services as non-tradables (table 1). Initially, agriculture was excluded from the estimations, but later on re-grouped together with the manufacturing sector under the tradables heading to examine more accurately the correlation between productivity and the price level in the whole economy.

The real effective exchange rate was calculated based on the formula as follows:

$$REER = \frac{P}{eP_f} \quad (2),$$

where:

$REER$ is the real effective exchange rate,

P is the aggregate price GVA deflator for Bulgaria,

P_f is the aggregate price GVA deflator for Bulgaria's major trading partners,

e is the nominal effective exchange rate of BGN per unit of the national currencies of Bulgaria's trading partners.

To trace down the individual impact of the BS effect on the REER, the above formula has been decomposed in the following terms, taking the aggregate deflator to be the weighted geometric mean of the indices of tradables and non-

tradables:

$$P = P_T^\alpha P_N^{1-\alpha} \quad (3),$$

where:

P is the price deflator of GVA for Bulgaria,

P_T is the price index of tradables,

P_N is the price index of non-tradables,

α is the relative share of tradables in GVA for Bulgaria.

Similarly, the price index for the country's trading partners will be as follows:

$$P_f = P_{Tf}^\beta P_{Nf}^{1-\beta} \quad (4),$$

where:

β is the share of tradables in GVA for the other countries.

By substituting formula (2) for (3) and (4) and following a transformation we derive the following expansion⁵:

$$REER = \frac{P}{eP_f} = \frac{P_T}{eP_{Tf}} \left[\left(\frac{P_N}{P_T} \right) / \left(\frac{P_{Nf}}{P_{Tf}} \right) \right]^{(1-\alpha)} \left(\frac{P_{Nf}}{P_{Tf}} \right)^{(\beta-\alpha)} \quad (5).$$

The right-hand side terms of formula (5) are as follows:

- Tradable component – relative prices of tradables or the REER for tradables

$$\frac{P_T}{eP_{Tf}};$$

- Non-tradable component – relative prices of non-tradables in Bulgaria vis-

à-vis its major trading partners – $\left[\left(\frac{P_N}{P_T} \right) / \left(\frac{P_{Nf}}{P_{Tf}} \right) \right]^{(1-\alpha)}$;

- A component standing for the difference in the countries' weights

$$\left(\frac{P_{Nf}}{P_{Tf}} \right)^{(\beta-\alpha)}.$$

The classification of agriculture and the manufacturing sector as tradables and

⁵ Simon, A., A. Kovacs, *Components of the Real Exchange Rate in Hungary, 1998.*

services as non-tradables made it possible for the correlation between productivity and prices to be accurately traced down. As a result of the high relative share of administered prices (both goods and services) especially by the institution of the currency board arrangement, the hypothesis that the relative prices of non-tradables depend entirely on the difference in the productivity rate in both sectors as well as the share of labour in the non-tradables sector is refuted.

The exclusion of sectors where prices are administered would only make the analysis all the more complicated as there are not enough detailed GVA data by economic activity. Well until mid-1997, the prices of some basic food items, energy, most farm-gate prices, communication services, etc. were administratively set. At the same time, in some other sectors like education and health care there was no price liberalisation. Foreign trade in manufactures faced high duty rates, often subject to ever changing import and export licensing regimes that posed administrative barriers to most exports and imports.

The classification of agriculture and the manufacturing sector as tradables and services as non-tradables allows for a comparison of the data for Bulgaria vis-à-vis other countries. This grouping has been also employed in estimating the REER in Bulgaria relative to the national currencies of its major trading partners.

III. PRACTICAL IMPLICATIONS

Figures 1 and 2 show the dynamics of productivity by years in the sector of tradables vis-à-vis non-tradables as well as the relative price dynamics of non-tradables to tradables. While in Figure 1 tradables are represented by the manufacturing sector alone, Figure 2 covers both the manufacturing and agricultural sectors.

Productivity and Relative Price Indices of Non-tradables

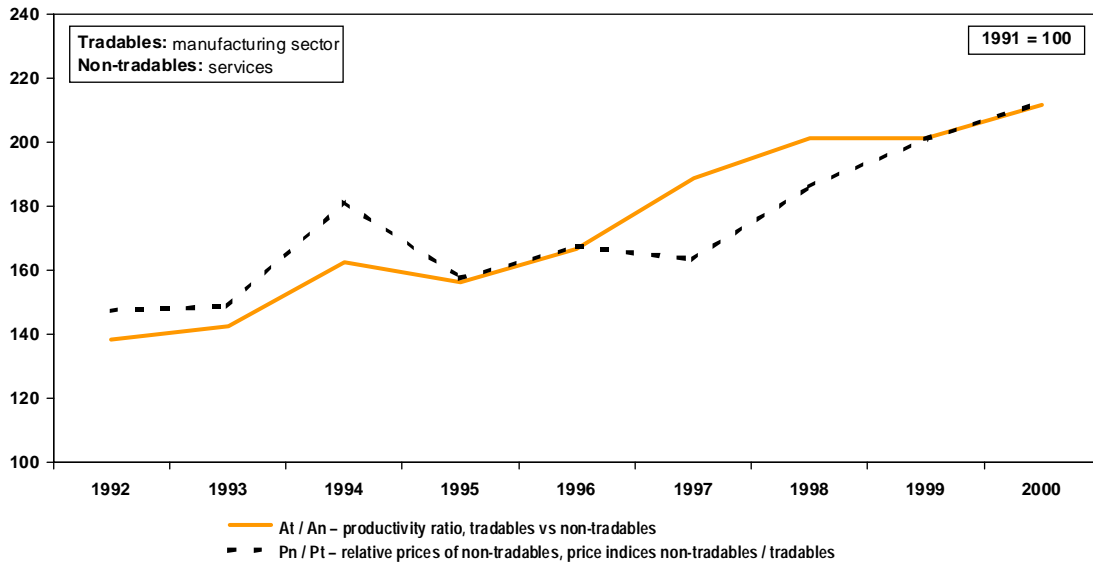


Fig. 1

Source: AEF

Productivity and Relative Price Indices of Non-tradables

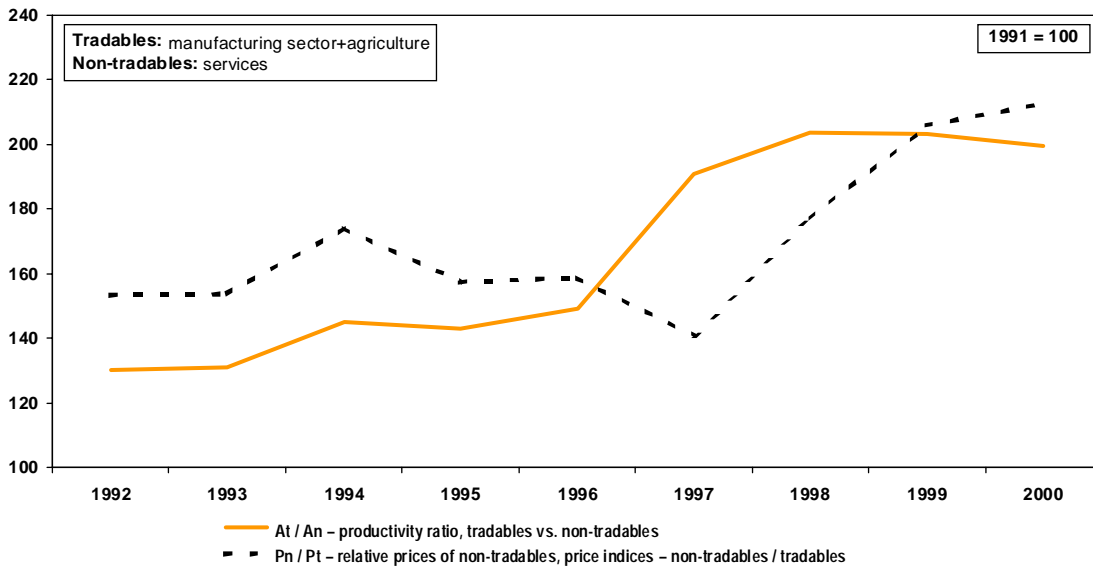


Fig. 2

Source: AEF

Both figures reveal a very close dynamics of relative prices and productivity, validating the existence of the BS effect in the Bulgarian economy.

As can be seen on the above figures, 1995 marked a turnaround in the continuous upward trend in relative productivity in the sector of tradables/non-tradables and in relative prices of non-tradables/tradables.

Also, 1995 witnessed a GVA decline in the manufacturing sector (at constant prices) that persisted well in 1996 and 1997. In 1997, prices in the manufacturing sector, agriculture in particular, reported a 9.8- and 12.1-fold increase respectively, running 9.5 times higher than the service price growth registered in the same period when the country suffered a grave political crisis and economic collapse. It is under such shocks that food price inflation rises at a most fast rate.

The impact of demand and supply side shifts in the transition to a market economy, together with the continuous nominal depreciation of the national currency (by the time the currency board was instituted in mid-1997) were the factors at work making the full manifestation of the BS effect in the economy impossible. By mid-1997, the Bulgarian government implemented hamstrung and abortive stabilisation policies that failed to produce the macroeconomic stabilisation achieved by other CEECs as early as mid-1990s, which in turn led to moderate inflation and outstripping price growth of non-tradables vis-à-vis tradables.

Overall, the results obtained can be said to be reliable, indicating in value terms the effect of the BS model on the economy. Over the 1991-2000 period, the average annual rate of 8.7%, as estimated by productivity, in the grouping excluding agriculture ran closer to the actual ratio of prices of non-tradables to tradables (8.8%). As for the second grouping including agriculture in the sector of tradables, the difference in average 12-month rates was greater but still modest at 8.0% against 8.7%.

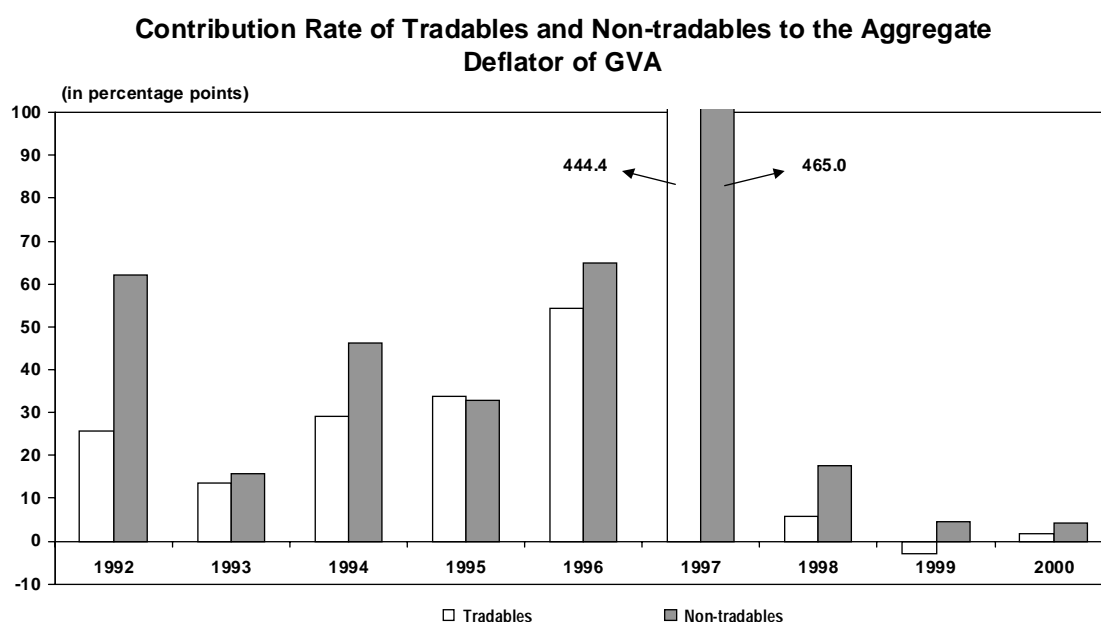


Fig. 3

Source: AEAf

Price growth in non-tradables was the main determinant, accounting for about 60%, of the aggregate GVA deflator over the 1991 – 2000 period, especially in the period following the institution of the currency board arrangement in mid-1997 when the contribution of non-tradables to the country's inflation stepped up significantly. Thus for instance, in 1999, due to the drastic price decrease in

agriculture (15%) and tepid increase of only one percentage point in the manufacturing sector the contribution of tradables to the aggregate deflator ran negative.

The post currency board arrangement period needs to be handled on its own due to the financial stabilization of the economy which implies a stronger and more distinct manifestation of the BS effect as part of inflation. Also, the exchange rate peg presupposes closer price dynamics of tradables in the local and foreign markets, in which case the difference in the inflation rate in Bulgaria and its major trading partners will be by and large due to the BS effect.

Table 3

Change in Productivity and Relative Prices in % (1996=100)

	1st grouping excl. agriculture		2nd grouping incl. agriculture	
	Productivity	Relative prices	Productivity	Relative prices
	Trad/non-trad. A_t / A_n	Non-trad/trad. P_n / P_t	Trad/non-trad. A_t / A_n	Non-trad/trad. P_n / P_t
1997	13.0	-2.4	28.1	-11.3
1998	20.7	11.2	36.8	11.6
1999	20.5	20.0	36.4	29.7
2000	26.8	27.0	33.9	34.0
Average annual growth rate	6.1	6.2	7.6	7.6

The comparison of the average annual growth rates over the 1991-2000 and 1996-2000 periods shows that the difference between relative productivity and relative prices tended to narrow.

The BS effect is taken to have a long-term impact, i.e. we can use the numbers – 6.1% (agriculture excluded) and 7.6% (for the whole economy) from Table 3 to estimate the relative price change in non-tradables vis-à-vis tradables.

$$\frac{P_n}{P_t} = 6.1\% \quad \text{or} \quad \frac{P_n}{P_t} = 7.6\% \quad (6)$$

As one of the underlying assumptions of the BS model is that productivity influences prices, we have used the productivity statistics from Table 3 for the purposes of the analysis to roughly estimate on the basis of the above ratios the aggregate deflator of GVA for the whole economy drawing upon tradables inflation forecasts, be they local or international. We have then used the same ratio to calculate the deflator for non-tradables (services) and employing the relative share of both sectors (tradables and non-tradables), assessed the aggregate deflator of GVA. Thus, for example, if tradable inflation (together with agriculture) is

projected at 1%, non-tradables (service) inflation forecasts for Bulgaria would amount to $101 \cdot 107.6 / 100 = 108.7$ or 8.7%. In 2000, the relative share of value added in the sectors of tradables and non-tradables ran at 44% and 56% respectively. Aggregate GVA deflator forecasts would then amount to $(1 \cdot 44 + 8.7 \cdot 56) / 100 = 5.3\%$, with the contribution of tradables being a bare 0.4% and that of non-tradables – some 4.9 percentage points. Given the higher tradables inflation according to the estimations, the aggregate deflator is expected to run higher than the GDP deflator projections, set in the country's macroeconomic framework over the next couple of years.

Furthermore, there arises an important question as to the reliability of the results obtained. The ratios in (3) can be used to evaluate the impact of productivity on the relative prices of non-tradables over time, i.e. over the period under review. There are also reasons to believe that this effect is weaker in actual fact, taking into account the tendency towards diminishing its contribution to overall inflation. All these, however, are secondary factors that will be dealt with in greater detail later in the paper and are essentially related to the structural adjustment process in the economy.

IV. THE IMPORTANCE OF THE BS EFFECT TO THE COUNTRY'S INFLATION IN THE 1990S

Twelve-month inflation in the countries of the former socialist block, now endeavouring to fulfil the EU membership criteria, runs higher than in the EU or EMU member states. One of the reasons for the higher inflation rate has to do with the relative price adjustments these countries are currently undergoing where the relative price of non-tradables (calculated as the ratio of the price indices of non-tradables to tradables) are typically rising. On the other hand, any rise in the prices of non-tradables is taken to be have been triggered by the BS effect in the economy.

Relative price adjustments are believed to gradually evolve into the convergence of the price level to the price levels in the EU and the USA.

Table 4

Relative Price Level Indices (PPP/official exchange rate)⁶ USA=100

	1990	1991	1992	1993	1994	1995	1996	1997	1998
Bulgaria	44.6	19.3	21.7	26.6	23.0	29.3	23.6	25.7	30.4

According to data of the European Comparison Programme, the 1999 relative price levels by countries vis-à-vis EU15 =100 ran as follows: Bulgaria – 25, Estonia – 40, Latvia – 41, Lithuania – 36, Poland – 44, Roumania – 29, Slovakia – 30, Slovenia – 63, Hungary – 39, and the Czech Republic – 37⁷.

The relative price levels by components of final GDP expenditures indicate lower values for the service group. At the same time, it is services that are expected to report a higher contribution to cumulative inflation in the long run (Appendix 2).

For those countries under a currency board arrangement, any growth in the prices of tradables is determined not by only by higher productivity in the sector but by the law of one price as well. By the same law, the same goods are supposed to be traded at the same prices across countries, provided there is a competitive market and no transportation costs or barriers to trade whatsoever. Price and trade liberalisation provides and ensures a close price dynamics of tradables across countries. But, more importantly, consumer price inflation remains higher in a currency board country compared to the EU member states.

Cumulative inflation in Bulgaria throughout the four-year period since the institution of the currency board arrangement to December 2001 amounted to 45.2%, with the month-on-month rise in the consumer price level averaging 0.7%. At the

⁶ According to NSI data.

⁷ Eurostat, *The European Comparison Programme*, Sept. 2001.

same time, it is noteworthy that price change differed across the consumer basket items as follows: service price inflation reported a most robust increase of 120.5% while food and non-food prices stepped up by 24.3% and 34.2% respectively.

The different price growth across the three basket items was mainly due to the relative price adjustments effected. The AEAF estimates the individual indices (groupings) on a regular basis to give a more accurate account of the inflation developments in the country. The relative price index (1992=100) is indicative of the price change in the above consumer basket items relative to overall inflation. By the institution of the currency board arrangement (mid-1997), relative price at 1992 basis had run as follows: food prices (100.7%); non-food items (89.7%) and services (107.8%), i.e. food and service price inflation ran 0.7% and 7.8% higher than overall inflation while non-food price inflation remained 10.3% lower than the country's inflation.

After four and a half years of currency board, relative price change in December 2001 (1992=100) amounted to as follows: food prices – -15.1%, non-food prices – -15.7% while the relative prices of services compared to overall inflation ran positive at 57%.

The higher service prices proved to be the main source of inflation after the institution of the currency board arrangement in the country. Services are basically non-tradables, i.e. they are not subject of any international trade and their prices are determined by local supply and demand.

The AEAF has been calculating the indices of tradables⁸, potential tradables⁹ and non-tradables that make up the CPI. For the purposes of this analysis potential tradables have been aggregated in the group of tradables.

The analysis of service price inflation should take into account the large contribution (as a relative share and growth rate) of the administered prices of services like electricity, water and heating supply, telephone and postal services. At the same time, the remainder of services the prices of which are free are much sought after in the domestic market. Thus for example, the prices of medical, dentist and tuition services have been following a distinct upward trend for several years now.

⁸ *The group of tradables includes all goods that do not face administrative barriers, transportation difficulties, etc. upon importation. Customs duties of and over 25% are said to be administrative barriers par excellence. All bulky goods of high transport cost or fresh unprocessed products whose quality is likely to perish quickly during transportation face transportation difficulties. Some of the commodities that fall under the tradables group are mainly food products – eggs, semi-processed meat products, citrus fruit, etc. as well as non-food products such as household appliances, cars and electronics. The overall weight of the group within the CPI amounts to 19%.*

⁹ *Potential tradables are said to be all goods which face administrative barriers upon importation. The group covers poultry and pork, dairy products, finished food products, clothing and footwear, natural gas, medicines, etc. Their overall weight within the CPI amounts to 36.6%.*

Consumer Price Indices of Tradables and Non-tradables

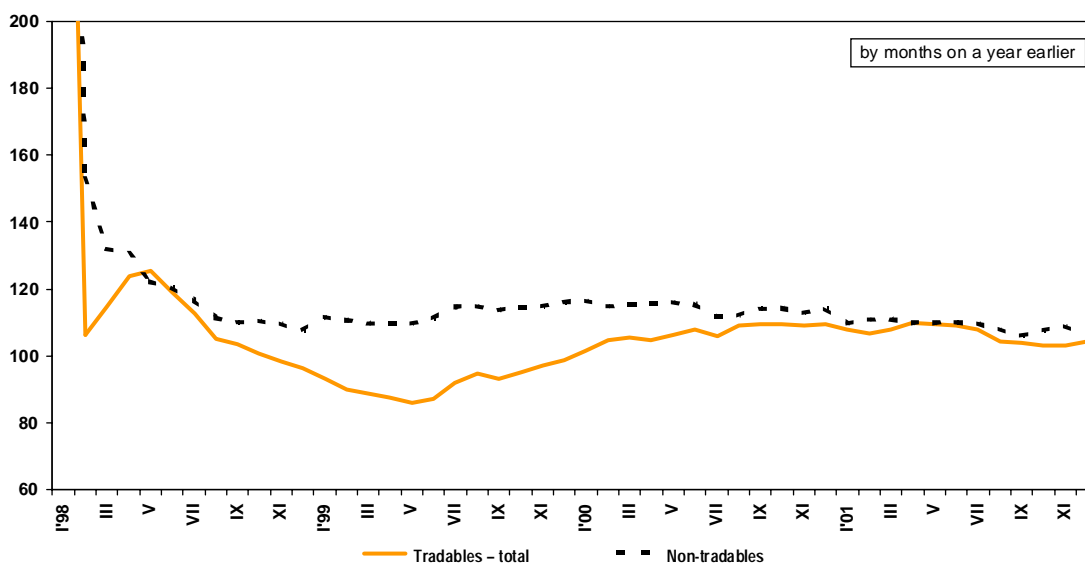


Fig. 4

Source: AEAF

As can be seen from Table 4, the relative prices of non-tradables calculated to tradables amounted to 8.6% on a yearly's average over the 1996-2000 period. However, this number cannot directly be compared to the result of 7.6% given in Table 3. Both numbers, however, indicate that non-tradables inflation ran higher than inflation in the sector of tradables, irrespective of the data, be they GVAD or CPI, handled. The results yielded in Section III give further evidence that the different productivity rate in both sectors is a source of inflation.

The study of the BS effect drawing upon quarterly GVA and deflator data also reveals a close dynamics of productivity and prices. The data in Figure 5 and 6 are given on a quarterly basis over the 1996 – 2001 (1st quarter) period. A major disadvantage of quarterly data is that employment statistics are not exhaustive but rather sample reliant. Therefore, productivity in a given year may come to different values when estimated on the basis of annual or quarterly employment data. But as the final results are given in relative numbers, i.e. in percent, the productivity-prices correlation can be accurately plotted based on quarterly data as well.

The ongoing structural reforms give the economy stronger chances of achieving sustainable growth by improving productivity. The achievement of higher growth under a currency board arrangement compared to the growth rate in the EU member states will trigger relative price adjustments resulting in higher CPI and GVA deflator.

As can be discerned in Appendix 2, out of the 10 transition economies, Bulgaria reported the lowest GDP and price level in 1999. Economic comparisons between countries take into account the widely acknowledged strong correlation between GDP per capita and the price level. As evidenced by the table given in

Productivity and Relative Price Indices – Non-tradables

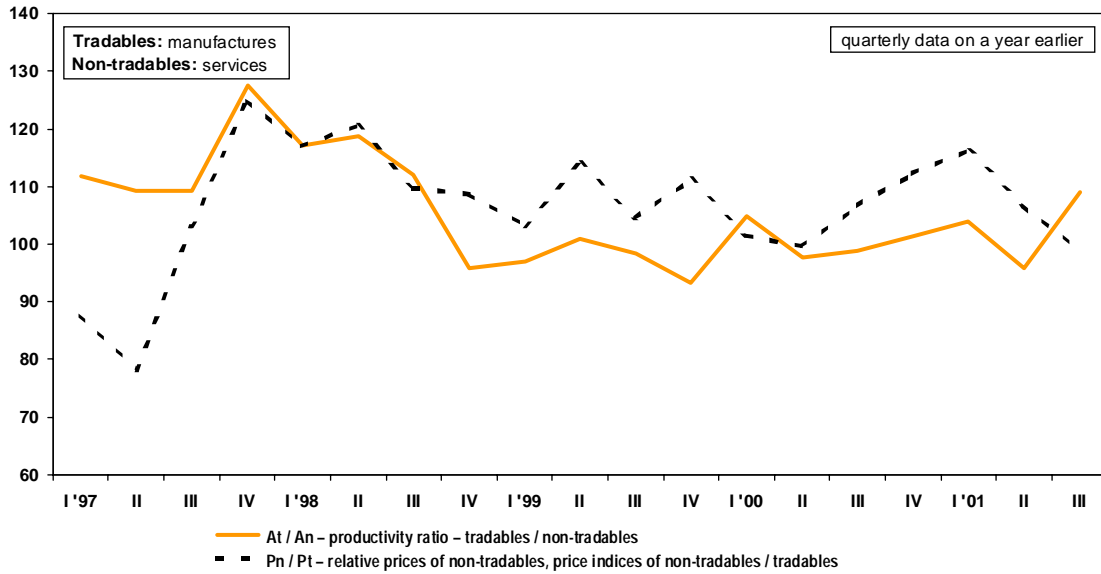


Fig. 5

Source: AEAf

Productivity and Relative Price Indices of Non-tradables

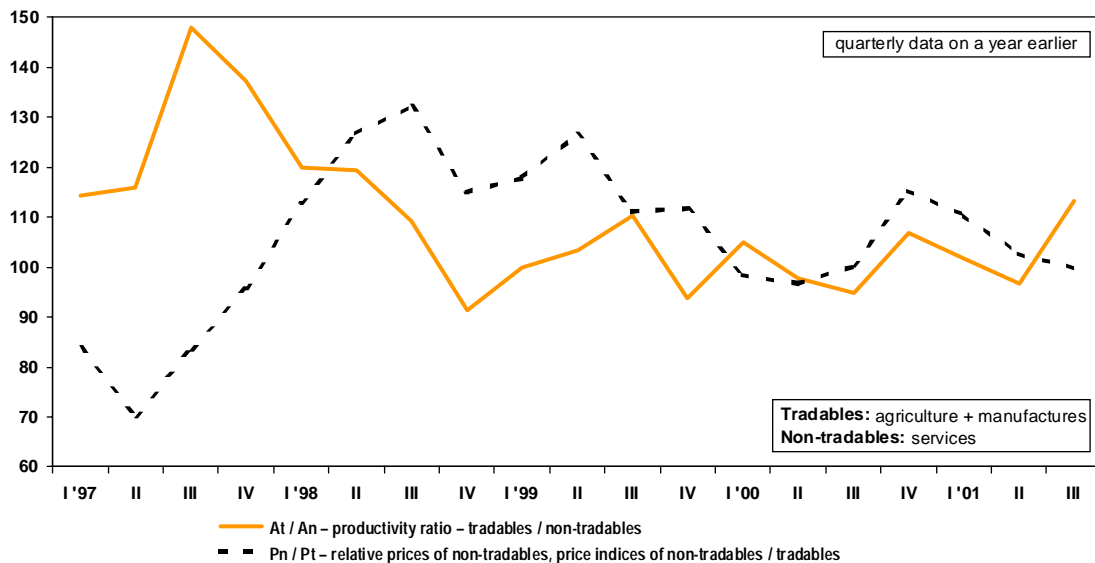


Fig. 6

Source: AEAf

Appendix 2, the lower GDP is, the lower the price level in a country. Productivity in the sector of tradables is then said to be a major determinant of real wages in the economy in the long run by the BS effect. Therefore, an economy reporting lower productivity in the sector of tradables will report a lower price level as well.

V. OTHER FACTORS AFFECTING THE PRICE DYNAMICS OF TRADABLES AND NON-TRADABLES

The productivity-prices correlation is indeed rather strong but the higher non-tradables inflation rate vis-à-vis tradables would be wrongly accounted for by means of the BS effect alone, i.e. by means of the higher productivity rate in the sector of tradables relative to non-tradables.

The BS effect rests on the assumption of wage equalization in the sector of tradables and non-tradables, which however is not the case of Bulgaria, though over the past few years wages have tended to level out.

Average wages in the manufacturing sector ran higher than wages in the service sector. Figure 7 shows relative wages in the sector of tradables vis-à-vis non-tradables. Nominal average wages in both sectors have been estimated on the basis of data on wage bills divided by the number of employees.

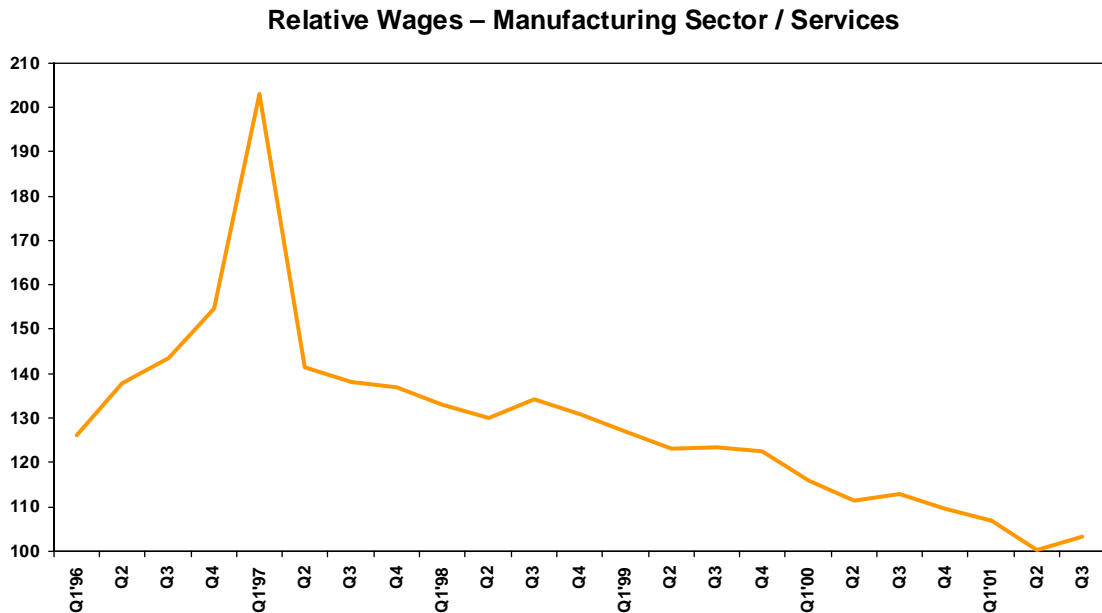


Fig. 7

Source: AEAF, NSI

Excluding the wide wage gap between the two sectors in the crisis period from 1996 to early 1997, nominal average wages in both sectors have ever since then tended to level out. Since the institution of the currency board arrangement in Bulgaria, the wage gap between the sectors has hovered around 25% against a moderate variation in the other CEECs of about 15%.¹⁰ The wider wage gap in Bulgaria has essentially stemmed from the structural reforms in the economy over the past four years.

Since mid-1997, the growth rate of nominal average wages (NAW) in the sector of non-tradables has been outstripping the rate in the tradables sector, manifest-

¹⁰ ECE, *Economic Survey of Europe*, 2001, 1, p. 232.

ing a pattern of dynamics that backed up the hypothesis that higher productivity in the tradables sector leads as a rule to higher relative price of non-tradables by nominal wage growth in the sector of non-tradables.

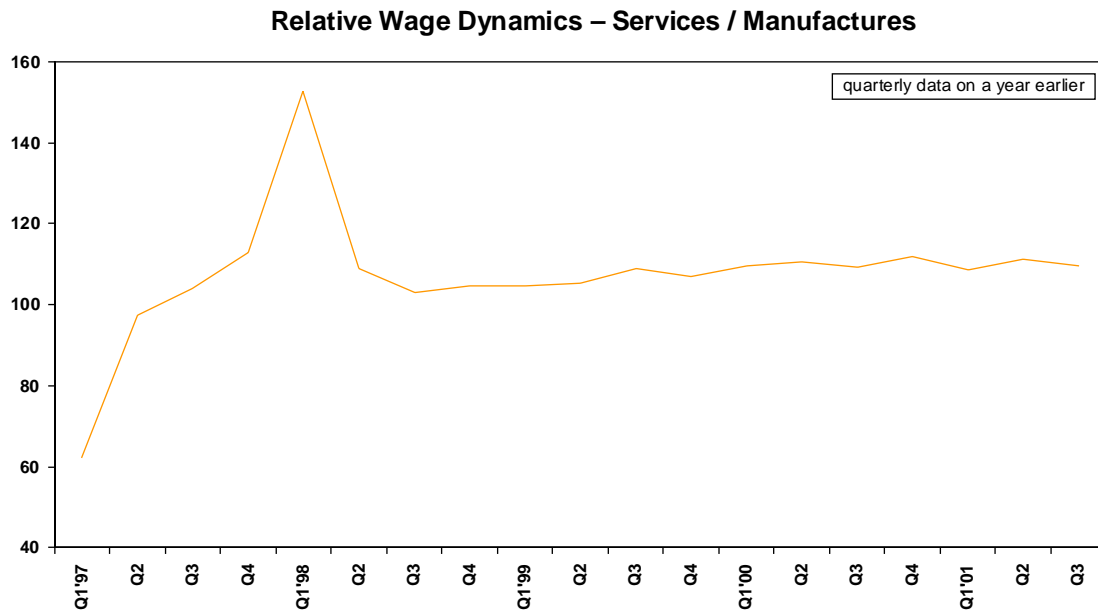


Fig. 8

Source: AEAF, NSI

As the relative share of GVA in the service sector tended to rise¹¹, the faster NAW growth rate in the same sector (non-tradables) was due not only to the BS effect. Given the higher productivity rate in the sector of tradables, supply in the non-tradable sector was supposed to decrease as a result of the outflow of workforce and flight of capital from the sector. At the same time, the share of non-tradables increased, implying that there were other demand side factors at work bringing about higher wage growth in the same sector. The growing weight of services in gross output (GO) and GVA was triggered by the initially low share of services within total supply in the early 1990s. Lower productivity and higher demand for workforce in the service sector led to higher nominal wage growth and hence higher inflation, a tendency which in the case of Bulgaria gave rise to wage equalisation between the manufacturing and service sectors consistent with the rationale of the BS effect.

The wages – inflation relationship can also be examined on the basis of unit labour cost (ULC) estimations. The indicator has been estimated as the nominal-term change in average wages is divided by the productivity rate by sectors – tradables and non-tradables. Therefore, a source of inflation will occur in the economy whenever wage growth in the tradable sector outstrips productivity in the same sector. Over the past four years the mechanisms of wage formation have performed rather satisfactorily.

¹¹ Comparing the manufacturing and service sectors only, the upward trend in the share of services in GVA is not as distinctly detectable and pronounced as when comparing their share in relation to manufactures and agriculturals. The relative share of the agricultural sector within GVA has gone on the decrease.

Change in Unit Labour Cost (ULC) and Tradables Inflation

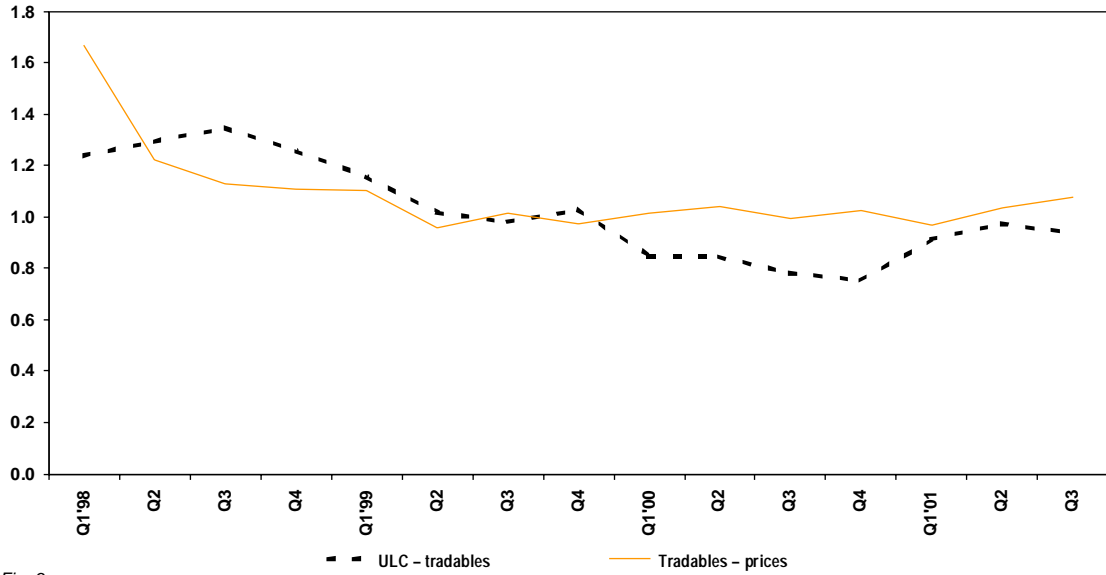


Fig. 9

Source: AEAf

Change in Unit Labour Cost and Non-tradables inflation

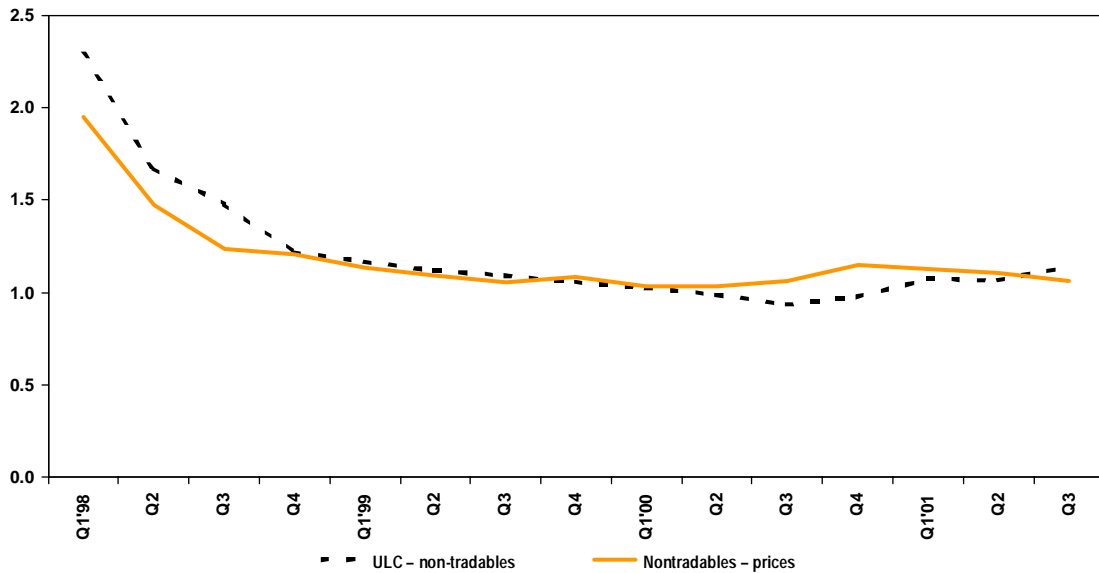


Fig. 10

Source: AEAf

As can be seen from Figure 9, the ULC factor is not a source of inflation for tradables. By mid-1999 tradables inflation lagged behind ULC. Ever since then there has been a turnaround in the ULC upward trend, with prices now rising at a faster rate which was largely due to the initial rebound of the price levels worldwide. Thus in 1999 and 2000, the average 12-month rate of the PPI ran higher than the CPI.

As for non-tradables, the ULC-prices correlation is much stronger. The coefficients of correlation between ULC and inflation over the 1998 – 2001(3rd quarter) period amounted to 0.56% (tradables) and 0.97 (non-tradables) respectively.

Performance of the Indicators on a Period's Average (1998 – 2001)

	Productivity	Wages	ULC	Inflation
Tradables	10.7	11.6	0.8	7.8
Non-tradables	4.2	23.3	18.3	17.0

In Bulgaria price and wage levels (the sector of tradables included) remain well below the EU benchmark. It is therefore important that wage growth, especially in the sector of tradables, is tied up to productivity so that any income and price convergence to the levels in the developed countries takes place without compromising competitiveness in the economy.

Prices in some sectors of the economy like the production and supply of electricity, heating, gas and water as well as communications are still administratively set by the government. In early 1990s, administrative price setting was also applied to some basic food products of vital importance to the living standard of the population and the country's economy.

Administrative pricing holds the price level artificially stable for some time while checking the full manifestation of the BS hypothesis. Instead of being governed by the arbitrage of the one price law, prices in these sectors come under the administered depressing impact of strong government control. Some studies of the transition economies ignore the above sectors in estimating the BS effect. This, however, as pointed out earlier, attempts at exploring economy-wide developments.

Since mid-1997, administrative pricing has been applied to a limited number of goods and services where price adjustments relate almost entirely to consumer prices rather than producer and industrial consumer prices. Producer prices of electricity go on the increase whenever there is a hike up in industrial consumer prices due to the higher costs calculated as a result of the increase, i.e. the prices of tradables step up sacrificing much of the competitiveness of Bulgarian goods. Since electricity prices in early 2002 remained about 20% lower than the EU levels, there cannot be expected any significant rise in the industrial consumer prices of electricity in the future. Any rise by a couple of percent then is not expected to result in a serious loss of competitiveness or high inflation.

Before liberalising the energy market, price policies should ensure all the conditions for covering exploitation costs and funding the sector's investment programme. The Energy Committee's 1998-2001 Action Plan for restructuring of the sector, removal of subsidies and recovery of the SOEs in the sector provided for a price equalisation of electricity for household and industrial purposes. In March 2000, in an update of the Bulgaria 2001 Programme, the Kostov admin-

istration adopted a decision to freeze electricity and heating prices due to the high social cost burden households would have to shoulder over the 1997 – 2000 period putting off electricity price equalization for household and industrial purposes to a later date. In October 2001, the new government initiated the first of a series of stepwise increases in the prices of electricity for household needs, intending to effect the price equalization proper in 2002.

Consumer prices of electricity in Bulgaria have been significantly lagging behind the EU's average price level¹². According to a Report of the European Bank for Reconstruction and Development of November 2001, Eastern European countries should set on a double-fold rise in electricity prices to avoid reckless energy waste and attract strategic foreign investors. As can be seen from Appendix 2, the price level of electricity, gas and other fuel has remained 7.7 times lower vis-à-vis the EU-15.

In the short-run any increase in the consumer prices of energy will carry on influencing significantly the CPI dynamics and is likely to result in a price rise of tradables (as part of GVA deflator) by way of workers' demands for higher wages in the energy sector. A wage rise in the sector of tradables may then pass onto non-tradables and hence, inflation.

Over the 1998-2000 period, tradables inflation ran lower than the GVA deflator. Even in 1999 and 2000, the GVA deflator in the sector of tradables lagged behind the growth rate of productivity in the same sector. The achievement of a low tradables inflation rate will prove decisive to the competitiveness of the Bulgarian economy and exchange rate stability.

¹² The average EU consumer price level of electricity amounted to EUR 0.0942/kWh in 2000. In October 2001, average electricity prices in Bulgaria ran at EUR 0.043 (USD 0.04), or 2.2 times lower than prices in the EU.

VI. THE BS EFFECT AND THE REAL EXCHANGE RATE OVER THE 1995 – 2000 PERIOD

As already emphasised, higher productivity growth in the sector of tradables vis-à-vis non-tradables leads to higher relative prices of non-tradables and hence higher country's inflation compared to the EU.

Theoretically, the BS effect leads to real overvaluation of the local currency. The decomposition of formula 5 into three terms has allowed us to identify the overvaluation-inducing component.

Some studies, Cihak and Holub (2001) for example, maintain that the tradable component as part of the real effective exchange rate has no contribution to the real overvaluation of a national currency, since tradables should follow the same price dynamics in the local and foreign markets under the one price law. The assumption has been respected in so much as it highlights and reinforces the contribution of the non-tradable component to the REER.

The REER in Bulgaria has been analysed in great detail drawing upon data on the three sectors in the GVA, viz. agriculture, manufactures and services in Bulgaria and its trading partners. It is noteworthy that the assumption made in the case of Bulgaria that agriculture and the manufacturing sector comprise tradables, and services – non-tradables, applies to the country's major trading partners as well.

The real effective exchange rate for Bulgaria has been estimated resting on a sample of 16 countries, which over the 1995-2000 period accounted for 70.5% of Bulgaria's foreign trade (see Appendix 3)¹³.

The real effective exchange rate appreciated by 19.1%, with the tradable and non-tradable components rising by 5.7% and 13.8% respectively.

¹³ The following conclusions can be drawn in the case of Bulgaria vis-à-vis its trading partners over the 1995-2000 period from Appendix 3:

- Bulgaria reported the highest (31.6-fold) nominal-term depreciation of its national currency to the USD, implying that the Bulgarian lev tended to depreciate in nominal terms vis-à-vis the national currencies of all countries surveyed.
- Bulgaria reported the highest inflation rate (29.9 times higher) compared to the other countries on the sample, as measured by the aggregate GVA deflator).
- Out of all sampled countries, Russia enjoyed the highest share in Bulgaria's foreign trade turnover of 16.6%, followed by Italy (9.8%), Germany (11.7%), Greece (6.3%), and Turkey (5.2%). The sample covered 9 EU member states, accounting for 42.3% of Bulgaria's total turnover, while all EU-15 countries are responsible for some 51.7% of the country's turnover total.
- Over the same period, the Bulgarian currency had gained ground to the currencies of its trading partners by 19.1% in real terms. The Bulgarian lev appreciated to the currencies of almost all trading partners (1995=100), but Great Britain, the USA, Turkey and Poland.
- As for tradables, the Bulgarian economy has, too, reported the highest (25.4-fold) inflation rise.
- As evidenced by the first term of formula (5), the real effective appreciation of the national currency, as estimated by the price indices of tradables, amounted to 5.7%.
- The relative prices of non-tradables to tradables in Bulgaria over the 1995-2000 period had stepped up by 35.1%, ranking second only after Poland (42.7%) in the sample. Overall for the country's trading partners, the relative prices of non-tradables amounted to 8%.
- The effect of the relative prices of non-tradables on the REER in Bulgaria amounted to 13.8%, based on calculations of the second term of formula (5).
- Calculations of the third term of formula (5) are given in tables 10-11 of the Appendices. Running at -0.5%, the component failed to produce any significant effect on the country's REER.

In giving the data as indices, the third term of the formula (derived as the residual term of total REER and the other two terms) is estimated to have changed by -0.1%, differing insignificantly from the direct calculations of -0.5%, cited above. We can then calculate that over the 1995-2000 period the REER appreciated by 3.6% on average, with the contributions of the tradable and non-tradable components and the third term of the formula amounting to 1.1%, 2.6% and -0.2% respectively.

Table 6

REER relative to Bulgaria's Major Trading Partners (1995=100)

	REER	Tradable component	Non-tradable component	Weight difference
1996	-22.8	-22.9	0.2	-0.1
1997	-11.4	-5.3	-5.8	-0.7
1998	12.1	10.5	2.2	-0.7
1999	24.1	17.2	8.1	-2.1
2000	19.1	5.7	13.8	-1.0
Average 12-month rate	3.6	1.1	2.6	-0.2

Section III focuses on the BS effect on inflation in Bulgaria, revealing a rather close productivity rate in the sector of tradables/non-tradables and relative price dynamics of non-tradables/tradables. Given the 1995 basis, the average 12-month growth rate of relative productivity and relative price of non-tradables in Bulgaria amounted to 6.9% and 6.2% against 2.5% and 1.6% respectively in the country's major trading partners.

Table 7

BS Effect and the REER in Bulgaria (1995=100)

	Productivity Tradables/non-tradables			Relative Prices Non-tradables/tradables			Bulgaria/Major trading partners (weighted)
	Bulgaria	Trading partners	Bulgaria/Trading partners	Bulgaria	Trading partners	Bulgaria/Trading partners	
1996	4.2	1.4	2.8	0.8	0.5	0.3	0.2
1997	33.4	5.6	26.3	-10.6	2.0	-12.4	-5.8
1998	42.6	6.4	34.0	12.5	7.8	4.4	2.2
1999	42.1	10.1	29.1	30.8	13.7	15.0	8.1
2000	39.6	13.1	23.4	35.1	8.0	25.1	13.8
Average 12-month rate	6.9	2.5	4.3	6.2	1.6	4.6	2.6

The ratios for Bulgaria calculated vis-à-vis its trading partners amounted to 4.3% and 4.6% respectively. The contribution of non-tradables to the country's REER, given in the last column of Table 7, has been calculated, using the second term of formula (2). Due to the higher share of tradables within GVA in Bulgaria vis-à-vis the EU member states, the contribution of the non-tradable component of REER amounted to 2.6%.

The same number can be used to generalize the BS effect on inflation and the REER over 1995-2000 period. Given the 4.3% productivity growth rate in the sector of tradables vis-à-vis non-tradables (against Bulgaria's trading partners), the REER appreciated by 2.6% due to the BS effect. Because of the BGN exchange rate peg, any change in the REER was mainly due to the differences in the inflation rate in Bulgaria and abroad. Therefore, the BS effect-triggered appreciation of the REER can be also taken to be the contribution of the effect to inflation in Bulgaria, estimated by the GVA deflator.

Employing the CPI and the PPI, the REER over the 1995-2000 period amounted to 32.4% and 42%, while using the GDP deflator it ran at 23.2%.

The individual components of the REER can be assessed on the basis of the calculations above made. The bulk of the national currency's overvaluation was due to the non-tradable component, i.e. the relative prices of non-tradables to tradables, the growth of which was spurred by the faster productivity rate in the sector of tradables vis-à-vis non-tradables. The faster growth rate in tradables in Bulgaria relative to its trading partners has led to real appreciation of the REER. According to Halpern and Wyplosz (2001)¹⁴, productivity growth in the manufacturing sector in the transition economies results in real appreciation while higher productivity in the service sector leads to real depreciation of the local currency.

Therefore, in countries under a currency board arrangement, the REER may only depend on the differences in the inflation rate locally and abroad. The higher real-term appreciation of the national currencies of these countries would then be reliant not only on the BS effect, but the very fact that the nominal exchange rate cannot be undervalued. According to a study of the European Commission¹⁵ covering the 1995-2000 period, out of all EU accession countries, Lithuania reported the most robust real-term national currency's appreciation of over 80% due to its peg to the USD. The assessments of the European Commissions as to Bulgaria pointed to a 40% REER appreciation (based on CPI) vis-à-vis the EU, which is consistent with our estimates of 38.6% when reducing the number of trading partners to the EU member states alone.

¹⁴ Halpern and Wyplosz, *Economic Transformation and Real Exchange Rates in 2000s: „The Balassa-Samulson Connection“*, Economic Survey of Europe, 2001, 1.

¹⁵ European Commission, *Real Convergence in Candidate Countries*, 16 November 2001, ECFIN/708/01-EN.

The prices of tradables influence competitiveness in an economy directly. Since the institution of the currency board, the price growth in tradables lagged behind the country's inflation (GVA deflator). Hence, the REER (tradables) had risen by only 5.7% in real terms while improving significantly in 2000 when it reported a 9.8% real-term depreciation on a year earlier. In 1999 and 2000, the REER (tradable component) pointed to improved terms of trade with most Bulgaria's trading partners due mainly to the growth speed-up in the world economy and the rebound in the price level of tradables that favoured the Bulgarian economy.

The BS effect exerted a significant influence on the real-term appreciation of the Bulgarian lev over the 1995-2000 period, with the impact of the BS model and the upward trend in the exchange rate being all the more pronounced and stronger following the institution of the currency board. The Bulgarian currency reported the highest real-term appreciation in 1997 and 1998 while depreciating in real terms in 2000 on a year earlier. The 2000 real depreciation was due to the 15.6% nominal-term depreciation of the Bulgarian currency to the USD.

In so far as the REER is an indicator of competitiveness, the expensive Bulgaria currency pointed to some deterioration. The deepening trade and current account deficit in the period after the institution of the currency board arrangement coincided with the real overvaluation of the national currency as a trend. As the current account deficit may be aggravated by a number of other factors, the exchange rate peg cannot be identified as a serious impediment to competitiveness.

VII. CONCLUSION

The higher productivity rate in the sector of tradables in Bulgaria makes the income and wage convergence to the EU possible, a process that due to the BS effect will go on generating higher inflation vis-à-vis the EU, further reinforced by price liberalisation and the harmonisation of the excise duty rates.

The BS model maintains that the stability of the price level is only possible if the exchange rate appreciates as a result of the non-tradable component of the REER, with the appreciation being induced by higher productivity in the sector of tradables vis-à-vis non-tradables. Then any price growth in non-tradables is unlikely to result in a loss of competitiveness but a speedup in relative price inflation only.

As the contribution of the BS effect on inflation and hence the REER has tended to decrease, the real effective exchange rate is expected to appreciate at a lower rate than the period's average surveyed.

Other transition economies are also going through real overvaluation of their currencies caused by the higher growth rate of productivity in the sector of tradables, a development which cannot be treated as a problem of the transition to EU accession. These are essentially relative price adjustments that cannot be subject to price administration or intervention on the part of the government. □

APPENDIX 1

The Balassa – Samuelson Model

Higher productivity in the tradables sector implies real wage growth in the same sector. Price growth in tradables is restricted by the arbitrage of the one price law without leading to a loss of competitiveness in the economy. At the same time, wage growth in the sector of tradables is passed on to non-tradables to avoid any likely outflow of workforce from the non-tradables sector to tradables, i.e. there should exist perfect labour force mobility.¹⁶ Therefore, wages in the sector of non-tradables may only rise by raising the nominal prices of the goods and services produced there, leading to higher relative prices of non-tradables. This hypothesis is known in theory as the Balassa – Samuelson effect.

Balassa (1964) and Samuelson (1964) maintain that faster productivity growth in the sector of tradables to non-tradables leads, via wage equalization between the sectors, to lower relative price of tradables.

The BS equation of the mechanism of relative price adjustment of non-tradables is derived from the production function of Cobb-Douglas for a small open economy.

In some studies¹⁷ the correlation between productivity and price dynamics of non-tradables is given as follows:

$$\log P_n - \log P_t = \frac{\alpha_n}{\alpha_t} * \log A_t - \log A_n \quad (A1),$$

where:

P_n and P_t are the price indices of non-tradables and tradables,

α_n and α_t are the respective share of labour in the sector of non-tradables and tradables,

A_t and A_n are the productivity indices in the sector of tradables and non-tradables.

In the production function of Cobb-Douglas¹⁸, α is given as a constant value ranging between 0 and 1, measuring the share of labour in income while $(1-\alpha)$ is the share of income generated by capital. Therefore, α denotes labor income defined in theoretical terms as employment compensation the value of which remains relatively constant to total income in the long run.

¹⁶ Free movement of work force across the different regions in a country, different sectors of the economy and across occupations.

¹⁷ De Gregorio, Giovanni and Wolf, International evidence on tradables and nontradables inflation, NBER, August 1993, WP 4438.

¹⁸ $Y = A * L^\alpha * K^{1-\alpha}$

Productivity A relates to total factor productivity, which in this particular case has been substituted for labour productivity due to the unavailability of capital (stock) data.

The supposition of BS is that if the share of labour in both sectors, i.e. tradables and non-tradables, is equal ($\alpha_n = \alpha_t$), productivity growth in the sector of tradables is proportional to the increase in the relative prices of non-tradables. Then if $\alpha_n > \alpha_t$, the relative prices of non-tradables will go on the rise again, even the same productivity $A_t = A_n$ given.

Higher productivity in the sector of tradables leads to real appreciation of the national currency, as the higher prices of non-tradables result in higher domestic prices or inflation speedup. \square

Relative Price Level Indices (EU15=100)

	EU15	BG	CZ	EE	HU	LV	LT	PL	RO	SK	SI
1 Final household consumption	100	25	37	40	39	41	36	44	29	30	63
2 Food and beverages	100	42	49	61	53	67	59	55	43	50	95
3 Food	100	42	48	60	52	66	58	53	42	49	94
4 Bread and cereals	100	15	41	48	49	49	43	53	33	43	98
5 Meat and meat products	100	49	42	62	43	62	56	43	36	44	99
6 Fish and fishery products	100	77	54	67	74	81	71	57	61	55	87
7 Milk, cheese and eggs	100	65	50	59	63	71	66	51	57	52	90
8 Vegetable oil, and fats	100	66	61	78	56	82	79	60	49	61	92
9 Fruit, vegetables and potatoes	100	45	51	62	50	72	55	59	40	52	86
10 Other food products	100	72	57	69	64	84	71	65	52	57	105
11 Soft drinks	100	48	63	71	66	76	78	80	69	64	99
12 Alcoholic drinks and tobaccos	100	33	58	62	55	77	66	62	42	44	64
13 Alcoholic drinks	100	46	82	112	75	134	117	95	60	53	87
14 Tobacco	100	25	42	31	40	36	23	39	27	37	48
15 Clothing and footwear	100	40	58	65	57	85	65	58	25	45	74
16 Clothing and clothing-related services	100	39	57	63	54	90	68	62	24	49	76
17 Footwear and services	100	46	64	70	70	74	62	48	27	35	66
18 Rents, fuel and energy	100	20	26	28	32	17	21	31	28	19	60
19 House rents	100	20	16	23	24	8	13	23	32	14	56
20 Housing maintenance services	100	55	35	55	41	28	53	39	23	22	57
21 Electricity, gas and other energy	100	13	65	30	51	35	32	52	25	33	80
22 Furniture, furnishing and maintenance	100	27	54	57	55	60	54	59	32	48	65
23 Furniture, carpeting, upholstery	100	28	69	58	63	61	54	52	34	50	61
24 Household appliances and repair	100	36	39	43	46	53	49	85	28	40	72
25 Other household goods and services	100	26	54	66	54	66	60	56	34	52	68
26 Health care	100	23	23	30	23	23	23	36	19	16	46
27 Medicines and medical equipment	100	133	45	77	47	63	53	78	41	49	62
28 Medical services	100	13	19	23	18	17	18	27	13	11	42
29 Transport	100	44	57	57	71	69	55	64	47	44	76
30 Personal vehicles	100	82	84	87	85	100	88	80	111	75	89
31 Maintenance of vehicles	100	53	71	59	89	68	61	75	42	73	79
32 Transport services rendered	100	13	20	28	33	45	27	37	18	14	53
33 Communications	100	12	85	60	76	202	39	71	37	48	40

	EU15	BG	CZ	EE	HU	LV	LT	PL	RO	SK	SI
34 Culture, entertainment and leisure	100	23	41	46	40	48	46	53	36	32	69
35 Leisure facilities and equipment	100	26	62	53	60	72	61	92	57	55	84
36 Entertainment/leisure and cultural services	100	18	33	33	32	31	31	40	23	23	56
37 Books, newspapers, magazines	100	40	36	85	39	91	84	44	28	32	94
38 Education	100	8	20	19	20	17	16	21	11	17	47
39 Restaurants, cafes, hotels	100	29	42	58	46	64	47	59	43	39	64
40 Other goods and services	100	29	36	40	33	38	36	41	23	29	62
41 Tourism (net)	100	100	100	100	100	100	100	100	100	100	100
42 Collective consumption	100	12	29	25	29	23	23	31	14	21	50
43 Gross capital formation	100	39	58	74	63	71	68	61	41	57	77
44 Machinery and equipment	100	61	79	89	79	84	82	82	66	78	91
45 Non-electric machinery	100	49	75	92	81	90	82	78	53	70	84
46 Electric machinery	100	77	82	90	75	74	81	90	71	93	107
47 Transportation means	100	77	85	85	77	85	78	82	110	79	87
48 Construction	100	25	40	63	52	59	58	45	27	41	65
49 House buildings	100	26	34	69	51	58	55	36	22	34	59
50 Non-housing buildings	100	25	44	73	51	62	58	47	26	43	63
51 Other construction	100	24	44	47	55	57	60	54	36	51	81
52 Other	100	57	87	77	69	83	77	78	44	67	84
53 Inventory change	100	50	65	71	68	78	69	70	50	61	88
54 Net exports (balance)	100	100	100	100	100	100	100	100	100	100	100
55 Gross domestic product	100	25	40	43	42	43	39	46	29	33	65

Table A1

Nominal Exchange Rate – national currency of Bulgaria and its trading partners per USD (1995 = 100)

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia	Bulgaria	
1995	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996	94.7	105.0	103.9	102.5	105.0	101.6	101.1	105.0	105.0	177.6	100.0	115.6	111.2	102.3	103.2	112.3		264.8
1997	104.6	121.0	117.9	116.9	121.3	117.4	96.4	121.1	121.5	331.3	100.0	128.6	135.2	119.4	113.1	126.9		2504.4
1998	106.6	122.8	127.6	118.2	123.1	119.8	95.3	122.8	123.5	568.7	100.0	139.2	143.3	121.6	118.6	212.9		2621.1
1999	111.6	128.1	138.1	123.3	128.4	125.3	97.5	128.1	128.8	913.5	100.0	121.1	163.6	130.2	139.2	540.0		2734.0
2000	129.0	148.1	159.7	142.6	148.5	144.8	104.1	148.1	149.0	1363.8	100.0	114.6	179.2	145.4	154.9	617.0		3160.9

Table A2

Nominal Exchange Rate – BGN per unit of national currency of Bulgaria's trading partners (1995 = 100)

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia
1995	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996	279.6	252.2	254.9	258.4	252.2	260.7	262.0	252.2	252.2	149.1	264.8	229.0	238.2	258.9	256.7	235.8
1997	2395.3	2069.8	2124.7	2141.7	2063.8	2132.8	2598.4	2068.8	2060.9	756.0	2504.4	1947.0	1852.0	2096.9	2213.6	1973.8
1998	2459.1	2134.7	2054.7	2217.7	2128.7	2187.6	2750.5	2134.6	2121.6	460.9	2621.1	1883.3	1828.9	2155.0	2210.4	1231.3
1999	2450.4	2134.3	1980.3	2216.5	2128.6	2182.8	2802.9	2134.1	2122.3	299.3	2734.0	2257.6	1671.2	2099.1	1964.0	506.3
2000	2450.0	2133.9	1979.9	2216.1	2128.2	2182.4	3036.0	2133.7	2121.9	231.8	3160.9	2758.9	1763.7	2173.5	2040.2	512.3

Table A3

Aggregate GVA Deflator (1995 = 100)

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia	Bulgaria	
1995	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996	105.3	100.8	107.3	101.0	101.3	103.4	103.1	101.2	100.6	182.4	101.9	99.3	119.2	107.6	104.7	149.1		219.2
1997	107.4	101.4	113.7	102.3	102.1	105.6	105.9	101.7	102.3	331.9	103.7	99.5	137.3	116.5	111.8	172.6		2229.4
1998	109.6	102.0	119.2	103.2	104.1	107.9	108.2	102.4	104.2	590.2	104.7	99.3	154.1	129.5	117.3	203.3		2750.6
1999	111.3	102.0	122.6	103.7	105.1	110.5	110.1	103.4	105.9	912.7	105.9	97.8	163.8	131.9	124.7	354.3		2808.3
2000	113.4	101.1	128.5	104.7	106.5	114.3	112.1	104.6	110.0	1347.1	108.1	97.2	175.3	133.1	132.7	461.0		2989.8

Table A4

Weights of Bulgaria's Major Trading Partners, 1995 – 2000 period's average

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia	Bulgaria
Weights	9.8	11.7	6.3	4.0	2.3	1.7	2.5	2.0	1.9	5.2	3.2	0.7	0.9	1.0	0.4	16.6	70.5

Table A5

Real Effective Exchange Rate – Bulgaria relative to its Trading Partners (1995 = 100)

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia	Trading Partners, overall
1995	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996	74.4	86.2	80.2	84.0	85.8	81.3	81.1	85.9	86.4	80.6	81.2	96.4	77.2	78.6	81.6	62.3	77.2
1997	86.7	106.3	92.3	101.7	105.8	99.0	81.0	106.0	105.8	88.8	85.9	115.1	87.7	91.2	90.0	65.4	88.6
1998	102.0	126.3	112.4	120.2	124.2	116.5	92.4	125.8	124.4	101.1	100.2	147.0	97.6	98.6	106.1	109.9	112.1
1999	103.0	128.9	115.7	122.2	125.6	116.4	91.0	127.2	125.0	102.8	96.9	127.2	102.6	101.4	114.7	156.6	124.1
2000	107.6	138.6	117.5	128.9	131.9	119.9	87.8	133.9	128.1	95.8	87.5	111.5	96.7	103.4	110.4	126.6	119.1

Estimations of Component 1 of the REER Formula

Table A6

Deflator of Tradables (1995 = 100)

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia	Bulgaria
1995	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996	103.7	101.9	105.7	99.6	98.7	102.2	104.4	100.3	101.0	180.5	100.6	94.7	113.4	105.9	106.3	150.8	218.2
1997	104.3	101.3	109.2	100.2	97.6	102.9	105.1	100.2	103.5	318.5	100.5	98.0	123.5	113.0	111.0	176.7	2347.8
1998	106.0	102.5	112.6	100.2	97.8	103.3	104.4	101.2	103.9	563.6	99.7	98.7	132.1	128.9	114.5	185.7	2595.4
1999	106.6	102.1	116.5	100.2	95.6	104.3	105.0	101.6	103.0	845.6	99.4	96.0	138.3	130.2	120.8	295.0	2437.6
2000	108.6	101.9	121.0	101.6	96.5	107.5	108.5	102.5	109.2	1260.2	99.9	95.0	143.9	132.9	128.3	432.3	2540.6

Table A7

Real Effective Exchange Rate, as estimated by the deflator of tradables by countries and overall for Bulgaria's trading partners (1995 = 100)

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia	Trading Partners, overall
1995	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996	75.3	84.9	81.0	84.8	87.7	81.9	79.8	86.3	85.7	81.0	81.9	100.7	80.8	79.6	79.9	61.4	77.1
1997	94.0	111.9	101.2	109.4	116.6	107.0	85.9	113.3	110.1	97.5	93.2	123.0	102.6	99.1	95.6	67.3	94.7
1998	99.6	118.6	112.2	116.8	124.7	114.8	90.4	120.1	117.8	99.9	99.3	139.7	107.4	93.4	102.5	113.5	110.5
1999	93.3	111.8	105.7	109.7	119.7	107.1	82.8	112.5	111.5	96.3	89.7	112.4	105.5	89.2	102.7	163.2	117.2
2000	95.5	116.9	106.0	112.8	123.8	108.3	77.1	116.1	109.6	87.0	80.5	96.9	100.1	87.9	97.1	114.7	105.7

Estimations of Component 2 of the REER Formula

Table A8

Relative Prices – Non-tradables to Tradables (1995 = 100)

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia	Bulgaria	Trading Partners, overall
1995	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996	102.5	98.5	102.2	102.1	103.8	101.8	98.2	101.4	99.5	102.0	102.2	107.4	109.6	103.1	97.1	98.0	100.8	100.5
1997	104.6	100.1	106.2	103.0	106.7	104.1	101.1	102.3	98.4	107.8	105.5	102.3	121.2	105.9	101.3	95.9	89.4	102.0
1998	105.3	99.2	108.5	104.3	109.2	106.8	105.4	101.8	100.5	108.9	108.8	101.0	132.0	100.8	104.1	116.6	112.5	107.8
1999	106.8	99.9	107.7	104.8	114.2	109.2	107.1	102.8	103.9	114.5	111.7	102.7	134.9	102.3	105.4	136.2	130.8	113.7
2000	106.9	98.8	109.7	104.2	115.1	109.8	104.8	103.1	101.0	112.5	114.8	103.4	142.7	100.2	105.8	112.2	135.1	108.0

Table A9

Relative Prices – Non-tradables to Tradables (Bulgaria/Trading Partners, 1995 = 100)

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia	Trading Partners, overall
1995	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996	98.4	102.3	98.7	98.8	97.2	99.1	102.7	99.4	101.4	98.9	98.6	93.9	92.0	97.8	103.8	102.9	100.2
1997	85.4	89.3	84.2	86.8	83.8	85.9	88.4	87.4	90.9	82.9	84.8	87.4	73.7	84.4	88.2	93.2	94.2
1998	106.9	113.4	103.7	107.9	103.0	105.3	106.8	110.5	111.9	103.4	103.4	111.4	85.3	111.6	108.1	96.5	102.2
1999	122.5	130.9	121.4	124.8	114.5	119.8	122.2	127.3	125.9	114.2	117.1	127.3	96.9	127.9	124.1	96.0	108.1
2000	126.4	136.7	123.2	129.7	117.4	123.1	129.0	131.0	133.7	120.1	117.7	130.7	94.7	134.9	127.7	120.4	113.8

Estimations of Component 3 of the REER Formula

Table A10

Relative Share of Tradables in GVA by Countries

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia	Bulgaria	Trading Partners, overall	Difference in weights
1995	0.36	0.33	0.32	0.30	0.30	0.34	0.34	0.33	0.31	0.48	0.41	0.35	0.46	0.47	0.45	0.45	0.46	0.38	-0.08
1996	0.35	0.33	0.31	0.29	0.29	0.34	0.33	0.33	0.31	0.47	0.41	0.33	0.44	0.48	0.45	0.45	0.46	0.37	-0.08
1997	0.34	0.32	0.31	0.28	0.30	0.34	0.32	0.33	0.30	0.45	0.41	0.34	0.43	0.47	0.42	0.43	0.55	0.36	-0.18
1998	0.34	0.32	0.30	0.28	0.29	0.33	0.31	0.34	0.29	0.45	0.41	0.33	0.41	0.45	0.40	0.43	0.50	0.36	-0.14
1999	0.33	0.31	0.31	0.28	0.28	0.33	0.30	0.34	0.29	0.43	0.41	0.32	0.40	0.43	0.40	0.45	0.44	0.36	-0.08
2000	0.33	0.31	0.31	0.28	0.28	0.33	0.30	0.34	0.29	0.43	0.41	0.33	0.43	0.44	0.39	0.46	0.42	0.36	-0.06

Table A11

Labor Productivity Dynamics – Tradables to Non-tradables by Countries (1995 = 100)

	Italy	Germany	Greece	France	Belgium	Spain	GB	Austria	Netherlands	Turkey	USA	Japan	Poland	Czech Rep.	Slovakia	Russia	Bulgaria	Trading Partners, overall
1995	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0	100.0
1996	101.5	100.0	98.5	101.0	104.8	101.4	100.0	105.7	101.1	99.3	102.8	102.6	101.8	111.3	102.9	102.3	104.2	101.4
1997	102.0	102.6	102.3	103.4	112.4	101.7	95.9	114.7	97.7	101.3	106.8	103.3	112.9	112.3	96.7	113.0	133.4	105.6
1998	102.6	102.6	103.7	106.6	112.0	101.7	98.2	115.9	99.0	105.1	110.2	101.9	120.6	100.4	98.3	112.6	142.6	106.4
1999	105.6	103.3	106.2	108.5	114.0	101.0	100.3	117.4	100.1	101.8	113.3	102.6	120.7	100.6	106.8	124.0	142.1	110.1
2000	108.0	105.9	107.8	111.0	115.1	101.3	102.1	122.1	102.1	107.3	116.4	103.2	126.5	104.3	109.4	127.9	139.6	113.1

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