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The Harrod-Balassa-Samuelson Effect: A Survey of Empirical Evidence


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Abstract

The paper surveys empirical evidence on the Harrod-Balassa-Samuelson effect. The survey encompasses the published empirical work on the phenomenon since its (re)discovery in 1964. In total, 58 empirical papers are examined within a specialized analytical framework. The body of empirical evidence is synthesized through four major elements. The analysis starts with the ongoing controversy related to the name of the theory. This is followed by a presentation of the evolution of the theoretical and econometric model. It ends with an analysis of the results of the surveyed empirical studies. Results of the survey indicate that growing body of evidence definitely points towards professional rethinking about the significance of the Harrod-Balassa-Samuelson effect.

Keywords

Harrod-Balassa-Samuelson effect, real exchange rate, purchasing power parity, productivity

JEL classification

E31, F31, F41

"It is curious how things get rediscovered in economics"
(Bela Balassa 1973, pp. 1,258)

1. Introduction

Over the last fifteen years, more than 45 empirical papers on the Harrod-Balassa-Samuelson (HBS) effect have been published. The empirical testing of the theory has become popular for several reasons. Firstly, the length of available time series data had made it possible to test the HBS theory by the mid 90s. Research has been stimulated even further by advances in econometric techniques, but the most important event to promote research on the HBS model has been the enlargement process of the EU.

European Union (EU) enlargement has created a controversy concerning the strength of the HBS effect in accession countries.[1] The dilemma about the magnitude of the effect of the productivity convergence of accession countries on the Maastricht criteria of European Monetary Union (EMU) emerged in the late nineties.[2] The idea of productivity induced inflation had simply not been accounted for by the designers of EMU and the likelihood of a trade-off between convergence and EMU enlargement resulted in numerous empirical papers.

The result of all these events has been a growing number of econometric tests of the hypothesis. In total, since it was (re)discovered in 1964, the theory has been tested 58 times in 98 countries in time series or panel analyses and in 142 countries in cross-country analyses (Table 1 - Table 2). In these analyzed estimates, country specific HBS coefficients have been estimated 164 times in total, and at least once for 65 different countries (Table 3 - Table 10).

Nevertheless, even today, the assertion of productivity biased purchasing power parity is considered an exotic and unconventional theory which is rarely used and almost never empirically confirmed. Textbooks on exchange rate economics usually only sporadically mention the theory (Anne Krueger 1983; Ronald McDonald and Mark Taylor 1992; Peter Isard 1995; Lucio Sarno and Taylor 2002) and even contemporary promoters of the theory and researchers in the field maintain the idea that the HBS theory is poorly and rarely tested. It is more than likely for an empirical paper on HBS to start with the conventionally accepted idea that it is a rare and old theory which is sporadically mentioned, rarely tested and almost never empirically confirmed.

The basic idea of this paper is to confront the widely accepted perception of the HBS theory with a survey of the empirical research on the topic. The emphasis will be to synthesize research on the effect and to examine the evolution of econometric studies of the model. Brief attention will be paid to the results of econometric studies and to the latest achievements in economic and econometric research into the HBS theory.

Two surveys of papers related to the HBS theory have already been published. A review of HBS studies to 1973 was given in 1976 by Lawrence Officer and a partial[3] review of follow-up studies to 1994 was given in 1994 by Kenneth Froot and Kenneth Rogoff. In this study, we concentrate on recent econometric tests as well as on ones surveyed in previous studies. This is a comprehensive survey of empirical evidence on the Harrod-Balassa-Samuelson effect.[4]

The paper is divided into four parts. Due to the fact that the theory was independently (re)discovered several times, at the beginning of the paper, a brief survey of controversies related to the name and genuine authorship of the model is discussed.

In the second part of the paper, the evolution of the theoretical HBS model is presented and analyzed in the context of the development of theoretical models and implications for empirical research.
In the third part, a comparative analysis of empirical papers is presented. The evolution of econometric models is analyzed separately for cross-country tests and panel data tests (time series tests). After this analysis of the evolution of econometric models, issues related to the choice of additional independent variables, the choice of tradable sectors and choice of productivity proxy are discussed.

[1] Accession countries - in 2004, eight transition countries, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Slovakia and Slovenia, joined the European Union (EU) and in 2006 Slovenia will join the European Monetary Union (EMU).
[2] The Maastricht rules of European Monetary Union do not allow members to exceed more than 2% of the average of the three lowest inflation rates among EMU members regardless of their productivity convergence rate.
[3] In their survey, Froot and Rogoff (1994) did not include Irving Kravis, Alan Heston and Robert Summers (1983), Kravis and Robert Lipsey (1983), Christopher Clague (1986; 1988), Richard Marston (1990) and Mohsen Bahmani-Oskooee (1992).
[4] Due to the nature of their tests, Margaret De Vries (1968) and Hollis Chenery and Moises Syrquin (1975) have been excluded from our analysis.

The fourth part of the paper briefly discusses the results of empirical studies. The results of cross-country studies are analyzed separately from the results of time series and panel data empirical tests. In addition, special reference is made to the results related to the empirical tests of the Maastricht controversy and other patterns observed in the surveyed papers.

At the end of the paper, a synthesis of the results of the survey of the empirical evidence of the HBS model is presented. Eight major conclusions about past research and recommendations for future researchers are highlighted.

2. The controversy about the name

The story about the productivity biased approach to PPP is an old one and well known. Balassa (1964) and Paul Samuelson (1964) independently arrived at the same syllogisms and conclusions in their reaction to the literal acceptance of Gustav Cassel's doctrine by Hendrick Houthakker. Therefore, in the seventies, the entire supply side approach to the real exchange rate was named after the two researchers. Clague and Vito Tanzi (1972, pp. 3) named the theory "Balassa's Theory", Joseph Grunwald and Jorge Salazar-Carrillo named the theory "Balassa's Proposition" (1972, pp. 259) while Paul David (1973, pp. 1,268) noticed that Samuelson (1964) had independently reached the same conclusion.

It was soon realized that David Ricardo (1911, pp. 187)[5] had also described the effect, and that Roy Harrod (1933) was actually the first one to fully formulate the model. Grunwald and Salazar-Carrillo (1972, pp. 262) realized that Harrod was the first while Kravis, Heston and Summers (1978, pp. 9) noticed Ricardo's comments about price of "home commodities". Much later, Samuelson (1994, pp. 206) acknowledged Ricardo's and Harrod's contribution and also drew attention to Jacob Viner (1937, pp. 315). As a result of the controversy, on the 30th anniversary of the (re)discovery, Samuelson (1994, pp. 201) suggested a new name for the theory: *the Ricardo-Viner-Harrod-Balassa-Samuelson-Penn-Bhagwati effect*. At present, two versions of the name are in general use and both of them are equally accepted. The older conventional version is *the Balassa-Samuelson effect* and the new one, which has became quite popular recently, is *the Harrod-Balassa-Samuelson effect*.

Two alternative names were also in use during the seventies: *productivity biased purchasing power parity* (Officer 1976) and *the rule of five eights* (David 1972). The first one is still sporadically in use (Bahmani-Oskooee 1992), while the second one has been used only by David (1992) and Balassa (1973) in his, quite vigorous, response to the author.

3. The evolution of the theoretical HBS model

The HBS model was not fully formulated in a mathematically rigorous way until the early nineties. Harrod (1933, pp. 53-75) and Samuelson (1964, pp. 147-148) only described the basic features of the model, and Balassa (1964) described and empirically tested relationship between productivity and price levels. Throughout seventies and eighties empirical papers on the phenomenon had been mostly based on quite simple linear relationships focusing exclusively on supply side, describing the relationship between the productivity level and price level.

Rogoff (1992) was the first to fully formulate the original HBS model within a general equilibrium framework. The basic model was built within a conceptual framework based on a standard production function with three factors of production: capital *K*, labor *L* and technology *A*; two types of domestically produced goods: tradable *T* and non-tradable *N*; and two production functions, one for each sector of an economy:

$$Y_T = A_T K_T^{\alpha} L_T^{1-\alpha} \quad (1)$$

$$Y_N = A_N K_N^{\beta} L_N^{1-\beta} \quad (2)$$

Under the assumption of perfect competition, perfect international capital mobility, perfect mobility of factors between sectors within the economy and the law of one price for tradables, it is trivial to prove that a change in relative price in the non-tradable sector is a function of a change in the relative productivity of sectors and/or relative factor intensities of sectors (Rogoff 1992, pp. 8-10):[6]

[5] Dent edition.
[6] Lowercase denotes log-differentiating.

(3) $$\frac{p^T}{p^N} = \frac{\beta}{\alpha} a^T - a^N$$

In addition, Rogoff (1992) also fully formulated the demand side of the economy, which opened the possibility for researchers to explore, not only the influence of relative productivities and intensities of factors on price levels, but also the effects of the demand side (government spending, preferences, etc.) on long-term relative price levels between countries.

Jose De Gregorio, Alberto Giovannini and Holger Wolf (1994) built on Rogoff's original (1992) model. They relaxed the extreme assumption of perfect competition with regard to goods and factors markets, perfect international capital mobility and the law of one price for tradable goods in order to incorporate demand side effects and terms of trade. The relaxation of these assumptions resulted in a non-zero slope of the relative supply curve. The model resulted in the fact that the net effect of the increase in government expenditure was an increase in demand for nontradables and relative prices in the non-tradable sector. The main implication of the model was the fact that the demand side of the economy can affect relative price levels in the long run. As a result of their research, most of the later empirical papers included certain proxies for the demand side of the economy and terms of trade.

Another significant contribution was made by Patrick Asea and Enrique Mendoza (1994). They incorporated the HBS theory within a long-run balanced growth neoclassical implication of a general-equilibrium model. Utility functions and the demand side of the economy were fully modeled, which resulted in the fact that relative prices were a function of the relative productivity of the tradable and nontradable sectors (supply side) and the marginal rate of substitution between the tradable and nontradable sectors (demand side).

Patrick Asea and Enrique Mendoza (1994) influenced researchers to include demand side proxies in their empirical papers as well, but the single most important contribution of their research was the proof that the ratio of sector output per capita levels and not the aggregate level of output per capita determines the relative price of nontradables.

The model, as developed by Asea and Mendoza (1994), cannot assess how aggregate output per capita relates to domestic relative prices (1994, pp. 251). As a result of their findings, the majority of later empirical tests were based on relative productivities between sectors. Together with Rogoff (1992), De Gregorio, Giovannini and Wolf (1994), Asea and Mendoza (1994) have influenced empirical research into the HBS model the most.

Maurice Obstfeld and Rogoff (1996, pp. 214-216) upgraded theoretical analyses of the HBS model even more. The basic model was expanded with a third factor of production in one case and the assumption of international capital mobility was abandoned in the other. In the model with three factors of production, the HBS result was confirmed by reasoning based on the well-known *factor-price equalization* idea of trade theory. However, the model with internationally immobile capital proved that there has to be a certain amount of capital mobility in order to explain wage differences that are bigger than the differences of returns on capital between poor and rich countries.

Today, contemporary research on the model is marked by imperfect competition models and endogenous tradability. Fabio Ghironi and Marc Melitz (2004) and Paul Bergin, Reuven Glick and Alan Taylor (2004) have created models with imperfect competition, a continuum of goods and endogenous tradability of products. The new framework of endogenous tradability has created a new and much more consistent environment for analysis and future research.

Together with the above-mentioned research that was carried out on the "standing on shoulders" principle, it is necessary to mention Jagdish Bhagwati's (1984) alternative explanation of the HBS theory. Bhagwati (1984) modeled the HBS phenomenon prior to Rogoff (1992), but since it was an alternative and not mainstream explanation of the model, it had a much smaller influence on empirical and further theoretical research.

Bhagwati (1984) formulated an explanation of the HBS model within two elements of a general-equilibrium analysis: a Lerner diagrammatic technique and multifactor production functions with Hicks-neutral productivity differences internationally. Explanation of the phenomenon was achieved without resorting to a particular specification of a comparative-productivity ranking between countries in their traded and non-traded sectors. Bhagwati (1984) relaxed the unrealistic assumption of equal wage rental and capital labor ratios between developed countries and less developed countries and proved that a "poor"

(labor abundant) country will have lower prices of services due to specialization in labor intensive production.

4. The evolution of econometric models

The first empirical test of the HBS theory was carried out by Balassa (1964). It was a simple cross-country analysis of nine countries' data sets for 1955. Balassa (1964) made an OLS estimate with the ratio of purchasing power parity and nominal exchange rate as a dependent variable and GNP per capita as an independent variable:

$$PPP/E = f(Ypc) \tag{4}$$

Through the mid seventies, due to the lack of availability of sector data and time series data, output per capita as a productivity proxy, the ratio of PPP and the nominal exchange rate as a price level proxy together with cross-country analyses described the basic features of the models.

Follow-up studies evolved in various ways. Starting with Officer's (1976) experimental design, the evolution of empirical HBS theory tests evolved in various ways and theoretical dimensions. Various researchers experimented with quite large numbers of proxies for price level as well as productivity levels. Cross-country and time series data became available. Additional independent variables were included in tests in order to elucidate deviations unexplained by productivity levels. The enhancements in econometrics made it possible for basic OLS tests to be replaced by more advanced techniques. The availability of time series and sector data opened new controversies concerning the classification of tradable and nontradable sectors in an economy.

Balassa's (1964) test underwent several minor modifications during the seventies. David (1972) used output per capita in PPP dollars as a dependent variable and output per capita expressed in nominal exchange rate dollars as an independent variable. The model was estimated twice by David (1972, 1973) and once by Balassa (1973) in a reply to David's (1972)[7] research. Another interesting legacy of the debate is the fact that David (1972, 1973) expressed all variables relative to a numeraire country. Much later, expressing relative to a numeraire country has become a standard feature of cross-country empirical papers. Officer (1976) made another modification. Balassa's basic test was altered so that three different proxies (instead of one) for productivity were used. Officer (1976) estimated the level of productivity with output per capita, output per worker and the ratio of productivity in the tradable and nontradable sectors. This was the first time that the ratio of the tradable to the nontradable sector was used as a variable in testing the model.

Due to the failure of empirical confirmation of Officer's experimental design, it took six years for another empirical paper on HBS to be published. David Hsieh (1982) conducted the first time series test of the HBS model. The different nature of the model required different proxies in it. A relative real exchange rate (EP*/P) represented the dependent variable, while relative sector productivity represented the independent variable.

In the same way that Officer (1976) had introduced sector ratios, Hsieh (1982) introduced relative real exchange rates as a dependent variable. Both of these innovations became standard features of time series econometric models.

The time series econometric HBS model achieved its present shape in Marston's (1990) research. The independent variable in the model was Officer's (1976) ratio of sector productivity, while the dependent variable was Hsieh's (1982) relative real exchange rate and Marston's (1990) addition: the ratio of sector price levels. The introduction of relative sector prices came out of the fact that economists of the time could not econometrically confirm the stationarity of relative real exchange rates. It was reasonable to assume, based on the available knowledge of the time, that Hsieh's (1982) model was not going to work in the era of Richard Meese's and Rogoff's (1983) random walk exchange rates. Therefore, substitution of the real exchange rates with relative sector prices enabled Marston (1990) to separate *the power problem* (Jeffrey Frankel 1986) and the estimation of the HBS effect.

The shape of the time series econometric model of the HBS effect has remained the same until the present. Basically, the standard time series econometric test is divided into two or three steps. The first one is an estimation of the relationship between the productivity ratio and price ratio:

$$(p_t^N - p_t^T) - (p_t^N * - p_t^T *) = f((a_t^T - a_t^N) - (a_t^T * - a_t^N *)). \tag{5}$$

[7] David (1972) was not aware of the fact that the HBS model had already been discovered.

The second one is an estimation of the relationship between real exchange rates and relative prices:

(6) $$\varepsilon_t = f((p_t^N - p_t^T) - (p_t^{N*} - p_t^{T*})).$$

Occasionally, the effect is estimated internally, within a country:

(7) $$(p_t^N - p_t^T) = f(a_t^T - a_t^N).$$

After Hsieh's (1982) paper, a fast evolution of time series tests started, while cross-country models have not changed that much. Balassa's basic model with data expressed relative to a numeraire country was tested by Kravis and Lipsey (1983), Clague (1986, 1988), Bahmani-Oskooee (1992), Bahmani-Oskooee & Farhang Niroomand (1996), Bahmani-Oskooee and Abm Nasir (2001), Mark De Broeck and Torsten Slok (2001), Martin Cihak and Tomas Holub (2001) and Bergin, Glick and Taylor (2004).

Several other authors have made further modifications to the cross-country model. These modifications occurred mostly as a consequence of a shortage of data and all of them remained specific experiments in the history of the HBS model. Kravis, Heston and Summers (1983) introduced a ratio of sector productivity and Heston, Daniel Nuxoll and Summers (1994) introduced relative sector prices as a dependent variable. Much later, Laszlo Halpern and Charles Wyplosz (1998) and Kornelia Krajnyak and Jeromin Zettelmeyer (1998) used wages as a proxy for the price level in transition countries.

Over time, the basic cross-country empirical test, with the exception of the numeraire country modification, has not changed at all. The basic functional form remains the same even today:

(8) $$\frac{PPP_i}{PPP_{numeraire}} = f\left(\frac{Ypc_i}{Ypc_{numeraire}}\right)$$

The basic form of the cross-country model remained in general use even after Asea and Mendoza (1994) proved that the ratio of sector output per capita level and not the aggregate level of output determines the relative price of nontradables. The basic reason for the persistence of this manner of testing is the nature of empirical data series. Time series data are required in order to test the design which is implied by Asea and Mendoza (1994). Unfortunately, time series sector data are available only for a limited number of countries. Therefore, researchers simply ignore the conclusions reached by Asea and Mendoza (1994) in order to test the model in a large number of countries or if sector time series data is not available. They simply assume that growth of GDP per capita is a good proxy for the sector productivity ratio.

Econometric methods

Together with the development of the basic model, the HBS hypothesis has been tested in numerous papers using a whole range of different data and methodology. The first econometric test was a cross-section OLS analysis of price and income levels in 12 countries (Balassa 1964). In the early eighties, Hsieh (1982) used instrumental variable techniques, and later Hali Edison and Jan Klovland (1987) and Bahmani-Oskooee (1992) used Robert Engle and Clive Granger's (1987) cointegration technique (E/G technique). Nevertheless, OLS remained a mainstream econometric technique and the diffusion of new econometric techniques was quite slow.

In the early nineties, OLS was slowly crowded out by the seemingly unrelated regression technique. Five out of six surveyed papers published in 1994 used the SUR technique. The cointegration technique was quite rare until the late nineties.

Soren Johansen and Katarina Juselius' (1990) cointegration technique was used for the first time by Bahmani-Oskooee and Hyun-Jae Rhee (1996) and became one of the most popular techniques in the testing of the HBS theory (Menzie Chinn 1997; Ioannis Halikias, Phillip Swagel and William Allan 1999, Stephen Deloach 2001; Taylor and Sarno 2001; Balazs Egert 2002a; 2002b). Although, Johansen and Juselius' (1990) technique is much more sophisticated than the E/G technique, both of them are equally represented in the surveyed papers. It is quite common to encounter empirical papers based on the E/G technique published in the late nineties and even later (Matthew Canzoneri, Robert Cumby and Behzad Diba 1999; Egert, Imed Drine, Kirsten Lommatzsch and Christophe Rault 2003). Recently, the autoregressive distributed lag (ARDL) technique has become popular also (De Broeck and Slok 2001; Christoph Fischer 2002).

Regardless of the increasing number of papers with cointegration tests, the general choice of econometric techniques has become increasingly heterogeneous over time. Besides SUR and various cointegration techniques, many others techniques have also been used. Fully modified ordinary least

squares (Canzoneri, Cumby and Diba 1996; 1999; Egert 2002b; Egert, Drine, Lommatzsch and Rault 2002) as well as GLS (Bahmani-Oskooee and Nasir 2001; Halpern and Wyplosz 2001; Fabrizio Coricelli and Bostjan Jazbec 2001) have been used several times over the last decade. Nonlinear techniques were used in three surveyed papers (Chinn and Louis Johnson 1997; Chinn 2000; Taylor and Sarno 2001). Dynamic ordinary least squares (Ehsan Choudhri and Mohsin Khan 2004; Chinn 1997), the fixed effects panel model (Fischer 2002; Adriana Lojschova 2003) and the generalized method of moments (Halpern and Wyplosz 1998; Olga Arratibel, Diego Rodriguez-Palenzuela and Christian Thimann 2002) were used in two surveyed papers.

An interesting phenomenon is the fact that the ordinary least square technique survived throughout the entire observed period, both in cross-country analyses (Bergin, Glick and Taylor 2004) and time series and panel tests (Dubravko Mihaljek and Marc Klau 2003; Jazbec 2002). Strong advances in econometrics reduced the relative share of OLS tests, but in absolute terms OLS has survived. Seventeen empirical studies based on OLS were published prior to the boom in econometric techniques in 1996, and fifteen further studies after that.

Additional independent variables

Besides price levels and productivity, researchers experimented with additional independent variables in order to explain deviations in the standard models.

The mainstream econometric tests which were based on the original theoretical explanation and testing function were modified the first time by Hsieh (1982). In order to accommodate the problems with mark-ups and wage bargaining, Hsieh (1982) used ratios of wages among countries. After this, the mainstream model of time series and cross-country econometric tests were modified and expanded by a wide range of additional independent variables.

Edison and Klovland (1987) eased the assumption of the law of one price for tradable goods and introduced terms of trade as an independent variable. Clague (1988) introduced openness. Rogoff (1992) introduced oil prices and government consumption in order to accommodate the price taker position of oil importers and the biasness of government consumption toward nontradable goods. These four indicators, terms of trade, oil price, government consumption and openness represent the most important and most frequently used variables. In total, government consumption was used in 14 tests, terms of trade in 8 tests, oil prices in 7 tests and openness in 3 tests (Table 1).

The obvious motive behind additional variables was to adjust the model to a wide set of market imperfections, institutional frameworks, effects of the demand side of the economy, the effect of external shocks and the size of international linkages. Besides the above-mentioned variables, various proxies for monetary aggregates and inflation were used in order to estimate long-term effects of monetary policy and the demand side in general.

Several researchers attempted to accommodate their models to exchange rate regimes in order to account for the fact that many EU countries converged faster with EU members (usually the German Mark) compared to the USA. In transitional analyses of the HBS model, attempts were made to account for an exogenous difference between Central European and former Soviet Union countries.

The issue of additional independent variables was investigated further by Clague and Tanzi (1972), who developed a version of an alternative model and even an alternative explanation for international differences in price levels among countries. Productivity levels as explanatory variables were almost completely neglected. In order to explain price differences between countries, Clague and Tanzi (1972) used a ratio of exports to imports, tariffs and level of human capital. Much later, Clague (1986; 1988) expanded the alternative model with net exports, openness and sector data for tourism and mining.

Tradable and nontradable sectors

Theoretical papers on the HBS theory rely upon a precise division of commodities into tradables and nontradables. Unfortunately, few real world commodities fall easily into the nontradable category. In reality, virtually all commodities are tradable within some area determined by transportation cost, although a majority of economists would argue that certain commodities are in some sense inherently less tradable than others. Shifting from theoretical to empirical work requires a precise quantitative definition of categories.

Starting with Officer's (1976) original paper, most researchers simply assume that manufacturing and/or industry are tradable sectors while the services sector is a nontradable part of an economy. This is just a basic draft of a mainstream division. It is probably much closer to the truth that there is not any general rule. Various researchers have added agriculture to tradables, and almost the same number of them have simply excluded it due to administered prices. Infrastructure, such as energy, and water management in early papers were considered tradables, while starting from the early nineties they were generally excluded from analysis. The choice between manufacturing and industry as a proxy for the tradable sector was equally distributed as well as the choice between services and "all others sectors" as a proxy for nontradables. In general, theoretical approaches did not converge over time and a convention of any kind has not been reached with respect to tradability.

Probably the most reliable means of identification of tradability is empirical testing. Unfortunately, throughout 58 surveyed empirical papers, the tradability of sectors has been tested only once. De Gregorio, Giovannini and Wolf (1994, pp. 1,230-1,232) empirically tested the tradability of various sectors of an economy. Their empirical work was based on an OECD international sector database, comprising 14 countries and 20 sectors between 1970 and 1985.

De Gregorio, Giovannini and Wolf (1994) used a ratio of exports to total production of sectors in order to estimate "tradedness". This "tradedness" was defined as the share of exports in the total production of a particular sector of an economy. According to their test, agriculture, mining and most manufacturing had a share in exports in total production of between 23.6 and 59.9 percent, agriculture having the lowest and metal manufacturing the highest shares. The only exception within these three sectors was the manufacturing of non-metallic minerals with a share of 13.7%. On the other hand, the share of exports of services was lower than 5%. Within services, the transport sector had a share of 27.8 percent, while other services had a share of exports in total production of 1.9 percent (De Gregorio, Giovannini and Wolf 1994, pp. 1,232).

De Gregorio, Giovannini and Wolf (1994) defined a sector as tradable if more than 10 percent of total production is exported. While the measure remained subjective in the selection of the particular threshold, it had the virtues of being based on sample data and being easily subjectable to sensitivity checks. With a threshold of 10 percent, agriculture and mining were classified as tradables, as well as manufacturing and transportation. The remaining services, accounting for about 50-60 percent of GDP, were treated as nontradables.

The sizeable differences between sector shares provided their measure with some local robustness: cutting the threshold to 5 percent would have no effect, raising it to 20 percent would shift the quantitatively small non-metal mineral products from tradables to nontradables.

The results provided by De Gregorio, Giovannini and Wolf (1994) resulted in quite a clear division between traded and nontraded sectors which represented more than useful guidelines for future empirical work. Nevertheless, their division of the economy did not become a standard for future research. In following papers, a sector division of the economy remained as heterogeneous as it was in preceding papers. A number of authors used only industry as being tradable (Arratibel, Rodriguez-Palenzuela and Thinman 2002; Egert 2002a; 2002b) and some of them used manufacturing (Chinn 1997; Philipp Rother 2000). Several authors added mining and agriculture to tradables (De Gregorio and Wolf 1994; Asea and Mendoza 1994; Chinn and Johnson 1997) and several authors have excluded one or both sectors from analysis (Halikias, Swagel and Allan 1999). The transport sector and construction sector were equally distributed between tradable (De Greogorio and Wolf 1994; Asea and Mendoza 1994) and nontradable sectors (Stefano Micossi and Gian Maria Milesi-Ferretti 1994; Takatoshi Ito, Isard and Steven Symansky 1997).

The basic reason for a lack of any convention in the papers that followed De Gregorio, Giovannini and Wolf (1994) was not so much a theoretical or empirical disagreement as a question of the nature of the available data. A standard empirical test of the HBS theory requires data on sector output, employment, prices and sometimes even capital. Bearing in mind the amount of scarcity of data in non-OECD countries, it is obvious that most studies had to rely on strong assumptions and a high level of sector aggregation.

Three basic issues related to the nature of the available data were quite common in empirical studies. First, several less developed countries do not have available disaggregated data. In such cases, researchers worked without sector ratios, assuming strong cointegration between aggregate and sector productivities and price levels (Drine and Rault 2003a; 2003b). Second, even when disaggregated data were

available, they were disaggregated on a basic sector level only. In such cases, it was not possible to extract transport out of the nontradable sector or construction out of the tradable sector (De Gregorio, Giovannini and Thomas Krueger 1994; Vladislav Flek, Lenka Markova and Jiri Podpiera 2002). Third, due to the length, or lack of length, of data series in transitional and/or accession countries it was not possible to acquire enough observations on yearly or even quarterly frequency. In such cases, researchers simply used industrial production as a productivity proxy and assumed zero productivity growth of the services sector (Chinn 1997; Egert 2002a; 2002b).

The productivity proxy issue

The choice of productivity proxy in testing the HBS theory has resulted in even greater controversy than the question of tradedness of sectors within an economy. The choice was basically down to total factor productivity or the average productivity of labor. Compared to tradedness, the controversy was not only a practical but also a theoretical issue.

The theoretical misunderstanding was rooted in the nature of indicators. The argument for TFP was the fact that compared to total factor productivity, average labor productivity grows much faster during economic slumps. Therefore, it is not a reliable indicator of sustainable productivity growth which can affect the economy in the medium or long term (De Gregorio and Wolf, pp. 8). On the other hand, it is possible to find four theoretical explanations in favor of average labor productivity. First, interpretation of movements of TFP as an exogenous supply shock is problematic in and of itself. The choice of TFP actually represents an *a priori* position on the relative importance of demand and supply shocks before testing. Second, TFP is a result of data on sector capital stocks, which are likely to be less reliable than data on sector employment and value added. Third, there is no need to rely on outside estimates of labor's share in production. Fourth, the HBS hypothesis holds for a broader class of technologies than the Cobb-Douglas production function (Canzoneri, Cumby and Diba 1996, pp. 3-4).

Although the theoretical discussion was never finished, most researchers selected TFP as the best productivity proxy and used average labor productivity in their empirical papers. The reason is more than obvious, data on sector, as well as aggregate productivity in less developed, accession and transition countries is scarce even today. Therefore, a wide number of researchers in the late nineties and later used average productivity instead of TFP on the grounds of availability of data (Coricelli and Jazbec 2001). Martson (1987) was the first one to use TFP as a productivity proxy and since 1987 it has been used only six more times (De Gregorio, Giovannini and Wolf 1994; De Gregorio and Wolf 1994; Chinn and Johnson 1997; Halikias, Swagel and Allan 1999; Vikas Kakkar 2002; Lojschova 2003).

5. The results of empirical studies

Empirical evidence has resulted in quite homogeneous results with regard to the strength of the HBS effect in the analyzed countries and time spans. A huge majority of papers have resulted in statistically significant coefficients and theoretically predicted signs for the majority of analyzed countries.
The strongest empirical support in favor of the relationship between productivity and price levels can be found in the cross-section empirical studies in the style of the original Balassa (1964) paper. All of the cross-section studies surveyed in this paper, with the exception of Officer's (1976) experimental design and Clague's (1986; 1988) alternative model[8], have resulted in theoretically correct signs and statistically significant coefficients.

Starting with the Gilbert *et al* data set (Balassa 1964), all the way to the Penn World Table 6.1, the number of countries included in cross-section analyses constantly increased; from 12 countries in Balassa (1964) all the way to 142 countries in Bergin, Glick and Taylor (2004). Therefore, it is possible to use large samples as a strong argument in favor of the HBS model and its implication on economic policy. On the other hand, it is possible to highlight several disadvantages with regard to the implications of the results in cross-country analyses.

Asea and Mendoza (1994, pp. 251) stated that the HBS theory within a framework of general equilibrium cannot assess how aggregate output per capita relates to domestic relative prices. Therefore, a positive relationship between purchasing power parities and GDP per capita levels in cross-country

[8] Asea and Mendoza (1994) also did not econometrically confirm all of the theoretical implications of their general equilibrium model.

analyses can only be conditionally accepted as proof of the HBS theory. In order to find definitive proofs, sector analyses are a much better way of testing the theory.

Another quite interesting disadvantage of cross-country analyses are the findings of Bergin, Glick and Taylor (2004). Historical analysis of the phenomenon from the 15th century up until today has shown that the strength of the relationship between price levels and GDP per capita levels has oscillated quite dramatically (Bergin, Glick and Taylor 2004). Therefore, even if we ignore the findings of Asea and Mendoza (1994), it is quite questionable if it is possible at all to find explicit proof of the HBS model at that level of aggregation or within a framework of exogenous (assumed) tradability of sectors.

In addition, as Rogoff (1996, pp. 660) has already noticed, inspection of the Penn World data sets, as well as other samples, indicates that the relationship between income and price levels is quite striking over a full data set, but is far less impressive when one looks at either developed or developing countries as a group. Unfortunately, Kravis, Heston and Summers (1983) and Bhagwati (1984) are the only ones who have tried to discuss the issue of the HBS theory within various income groups.

Bearing in mind all the problems related to the nature of large scale cross-country empirical analyses based on the Penn World Table data sets, it is obvious that it is much wiser to seek solid empirical confirmation of the HBS phenomenon within groups of tests based on a sector approach and time series or panel data analyses.

The panel data analyses surveyed in this paper have resulted in 100 estimated coefficients for 65 different countries (Table 3 - Table 10). The overwhelming majority of the coefficients were significant and of a correct theoretical sign. Furthermore, four out of five time series analyses which were carried out on single countries and/or pairs of countries also resulted in confirmatory results (Edison and Klovland 1987; Marston 1987; Bahmani-Oskooee and Rhee 1996; Rother 2000)[9].

Starting with Hsieh (1982) and Marston (1990) most of the studies implemented a sector approach to the testing of the HBS theory. Usually, the HBS theory is tested in three different ways: internally between domestic sector relative prices and domestic sector relative productivities (equation 7); externally between relative sector prices *vis a vis* a numeraire country and relative sector productivities *vis a vis* a numeraire country (equation 5); and externally with relative nontradable sector prices and real exchange rates (equation 6).

The results have indicated that there is a substantial amount of evidence for a strong relationship between relative prices and relative productivities within countries (internally). A slightly weaker relationship is found between relative prices and productivities *vis a vis* a numeraire country. The relationship between movements of real exchange rates and relative productivities *vis a vis* a numeraire country results in a weaker body of evidence.

The choice of numeraire country exhibits quite a strong influence on the results. OECD countries (mostly EMU and/or EU members) exhibit a stronger relationship *vis a vis* the real exchange rate of Germany compared to the real exchange rate of the USA. Nevertheless, even in the case of the real exchange rate of Germany, the relationship is much weaker compared to other tests (equations 7 and 5).

The weaker result for the relationship between relative prices and real exchange rates is a result that is in line with the theory. It is more than obvious that in the surveyed papers there is not any time series long enough to account for *the power problem* (Frankel 1986). It is quite unreasonable to expect solid proof for the HBS as a determinant of real exchange rates in such short time series data. It is much more reasonable to look for confirmation of the model internally and externally *vis a vis* a numeraire country. The assumption of the law of one price for the tradable sector is something which simply cannot be assumed or confirmed by such a short time series (Frankel 1986).

The issue of interference of the HBS theory and Maastricht rules in accession countries has resulted in much vaguer results. A consensus with regard to the strength of the effect in relation to Maastrciht rules has not been reached yet. Three surveyed papers have suggested that there is interference between EMU rules and the Harrod-Balassa-Samuelson effect (Halpern and Wyplosz 2001; De Broeck and Slok 2001; Lojschova 2003). Six surveyed papers have suggested that there is a substantial amount of evidence of cointegration between productivity and price levels, but that there is not any evidence of interference between convergence induced inflation and EMU rules (Marco Cipriani 2001; Coricelli and Jazbec 2001; Egert 2002a; 2002b; Egert, Drine, Lommatzsch and Rault 2003; Mihaljek and Klau 2003). Two surveyed

[9] Rogoff (1992) did not find evidence of the HBS theory in an empirical study of the USA and Japan.

papers have not found any evidence of the HBS effect in transition countries (Fischer 2002; Arratibel, Rodriguez-Palenzuela and Thimann 2002).

Finally, it is possible to highlight the fact that there is a substantial amount of evidence that speaks in favor of the theory. Out of the 58 surveyed empirical papers, only 6 papers had coefficients with wrong signs and/or insignificant statistics (Table 1 - Table 10). Officer (1976) completely dismissed the proposal in his cross-country econometric test for all years between 1950 and 1973. Rogoff (1992) highlighted an alternative explanation for exchange rate movements. Chinn's (1997) test resulted in wrong signs and Chinn and Johnson (1997) estimated a majority of coefficients with wrong signs. In the context of transitional countries, Fischer (2002) explained real exchange rate movements by investment demand and Arratibel, Rodriguez-Palenzuela and Thinman (2002) rejected the HBS proposal in their paper.

The remaining 49 papers[10] confirmed the model in all cross-section and time series empirical papers. Econometric analyses based on panel data analysis provided confirmatory results for panels and for the majority of country specific estimates. It is more than obvious that it is quite difficult to ignore the growing body of evidence in favor of the HBS theory regardless of our initial stand (Table 1 - Table 10).

6. Conclusion

We have surveyed research on the HBS effect to synthesise its main findings and to convey the evolving structure of related research. Our readings of the extant literature on the HBS theory suggest the following conclusions:

(I) The controversy related to the name of the model still continues. The older conventional version of the name (Balassa-Samuelson) is still widely in use, while a new version (Harrod-Balassa-Samuelson) of the name has become quite widely accepted recently. Alternative names of the model (Productivity biased approach, etc.) still appear in professional literature, although rarely and rather sporadically.

(II) The premise of endogenous tradability of sectors has opened up an entirely new avenue for future research. The connection between productivity of sectors and their tradability has not been investigated in the 58 surveyed papers, which represents quite a large opportunity for future research.

(III) The sector approach combined with panel data analysis and/or cointegration has become a benchmark for empirical tests. Consensus has been reached on the testing of internal and external HBS effects (*vis a vis a numeraire country*) with a strong reservation against the PPP assumption in the tradable sector.

(IV) The issue of additional variables has been addressed quite systematically and analysis has indicated that most researchers have included several variables in order to account for market imperfections, institutional frameworks, effects of the demand side of the economy, the effect of external shocks, size of international linkages, and long-term effects of monetary policy and the demand side in general.

(V) De Gregorio, Giovannini and Wolf's (1994, pp. 1,230-1,232) test of tradability of sectors remains the only empirical work on the tradability of sectors. A majority of later and previous researchers did not follow their conclusions or logic and the division of sectors was much more influenced by data availability or assumptions than the genuine or measured tradability of sectors.

(VI) Similar findings can be found on the quandary between average labor productivity and total factor productivity as a proxy for productivity. Although there is a wide range of theoretical pros and cons, it is more than obvious that most researchers used average labor productivity due to the fact that capital data are unavailable and the production function form is unknown or demands additional assumptions.

(VII) Over time, the HBS model has evolved quite dramatically. Panel data and time series techniques have crowded out old cross-section tests, demand side and terms of trade variables have emerged as explanatory variables, new econometric methodologies have replaced old ones, and recent improvements with endogenous tradability have provided direction for future researchers.

(VIII) Analysis of empirical evidence shows that the vast majority of the evidence supports the HBS model. A deeper analysis of the empirical evidence shows that the strength of the results is strongly influenced by the nature of the tests and set of countries analyzed. Almost all cross-section tests confirmed the model, while panel data results confirmed the model for the majority of countries included in the tests.

[10] Clague and Tanzi (1972), and later Clague (1986; 1988) never confirmed their alternative theory. However, since it was a counterproposal to the HBS theory, rejection of their theory can be interpreted as conditional confirmation of an alternative HBS proposal.

The growing body of evidence makes it difficult to ignore the HBS theory and definitely points towards professional rethinking about the contemporary significance of the Harrod-Balassa-Samuelson theory.

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Table 1: Samples, data range, frequency, variables and methods in surveyed empirical papers

Author(s)	Number of Countries	Period	Data Freq.	Dependent variable	Independent variables	Statistical method
Balassa (1964)	12	1960	na	PPP/E	Ypc	OLS
Clague & Tanzi (1972)	31	1960;avg1960-2	na	PPP/E	Ypc;M/X;Tariffs;EI;H	OLS
David (1972)	12	1950,55,65	na	PPPYpc	EYpc	OLS
Grunwald & Salazar-Carrillo (1972)	11	1968	na	PPP/E	Ypc	rank correlation coefficient
Balassa (1973)	12	1960	na	PPPYpc	EYpc	OLS
David (1973)	18	avg1960-2	na	PPPYpc	EYpc	OLS
Officer (1976)	15	1950-1973	Y	PPP/E	Ypc;Y/L;AT/ANT	OLS
Hsieh (1982)	2	1954-1976	Y	EP*/P	AT/AN;W/W*	OLS; IV
Kravis & Lipsey (1983)	34	1970;73;75	na	PPP;PN/PT	Ypc;Open;E;M	OLS
Kravis, Heston & Summers (1983)	20	1975	na	AN/AT	Ypc	OLS
Clague (1986)	34	1975	na	PPP	Y;NX;min;tour;H;M;LDC	OLS
Edison & Klovland (1987)	Nor vs UK	1874-1971	Y	P	A;Tot; AT;AN	E/G
Marston (1987)	Jap vs US	1970-1983	Y	EP*/P;EP*T/PT	AT/AN;A*T/A*N;PT/PN;P*T/P*N	OLS
Clague (1988)	20	1970	na	PPP/E	Y;min;tour;H;NX;Open	OLS
Marston (1990)	5	1973-1986	Y	EP*/P;PN/PT	AN/AT	OLS
Rogoff (1992)	Jap vs US	1975:1-1990:3	Q	EP*/P	A;G;Oil;Debt;CA	OLS
Bahmani-Oskooee (1992)	7	1960-1988	Y	PPP/E	A	E/G
Heston, Nuxoll & Summers (1994)	85	1970;75;80;85	Y	PT/PN	Ypc	OLS
De Gregorio, Giovannini & Wolf (1994)	14	1970-1985	Y	PN/PT	AT/AN;G;Y;d_p	SUR
De Gregorio & Wolf (1994)	14	1970-1985	Y	PN/PT;EP*/P	AT;AN;PX;PM;G	SUR
Asea & Mendoza (1994)	14	1970-1985	Y	PN; EP*/P	KYT;K/YNT;I/YNT;PNT	OLS; SUR
De Gregorio, Giovannini & Krueger (1994)	5	1960-1991	Y	PT/PN	AT/AN;G;C	OLS; SUR
Micossi & Milesi-Ferretti (1994)	7	1961-1991	Y	PT/PN;EP*/P	AT/AN;pi;Y;EMS	SUR
Bahmani-Oskooee & Rhee (1996)	Korea vs 4	1979-1993	Q	P/P*	A/A*	Johansen VAR
Bahmani-Oskooee & Niroomand (1996)	101	1974-1989	Y	PPP/E	Ypc	OLS
Canzoneri, Cumby & Diba (1996)	13	1970-1991	Y	PN/PT;EP*/P	AT/AN;P*T/PT	E/G; OLS; FMOLS
Chinn (1997)	4	1974:I:1993:III	Q	EP*/P	AT;AT*;AT*/AT; G; OIL	Johansen VAR; DOLS
Chinn & Johnson (1997)	14	1970-1991	Y	EP*/P	AT;AN;G;TOT;OIL;GDPpc	E/G; SUR+NL-ECM
Ito, Isard & Symansky (1997)	15	1973-1992	Y	EP*/P	Y	OLS
Halpern & Wyplosz (1998)	85	1970-1995	Y	W	Ypc;G;Open;Age;Fin;Dem	OLS;GMM

Author(s)	Number of Countries	Period	Data Freq.	Dependent variable	Independent variables	Statistical method
Krajnyak & Zettelmeyer (1998)	85	1990-1995	Y	W	Y;Agr;H;CEE;FSU	OLS
Canzoneri, Cumby & Diba (1999)	13	1960-1993	Y	PN/PT;EP*/P	AT/AN;PT*/PT	E/G; OLS; FMOLS
Halikias, Swagel & Allan (1999)	12	1960-1996	Y	P	A;W	Johansen VAR
Rother (2000)	Slovenia	1993-1998	Q	PN/PT	A;M;G	OLS
Chinn (2000)	10	1970-1992	Y	EP*/P	AT/AN;PN/PT;TOT;OIL;G	OLS;NLS;SE-ECM
Bahmani-Oskooee & Nasir (2001)	69	1960-1990	Y	PPP/E	Y/L	Pooled OLS;GLS
Deloach (2001)	10	1957-1994	Y	PT/PN	Y;OIL	Johansen VAR
Halpern Wyplosz (2001)	9	1991-1998	Y	PN/PT	AT;E;AN;Ypc;pi	OLS; GLS
Cipriani (2001)	10	1995-1999	Q	PN/PT	AT/AN	OLS
Coricelli & Jazbec (2001)	19	1990-1998	Y	PT/PN	AT/AN;G;LT/LN	GLS
Taylor & Sarno (2001)	9	1992:1-1997:12	M	EP*/P	r;t	Johansen VAR; NLS ESTR
De Broeck & Slok (2001)	25	1999;1991-1998	Y	PPP/E;EP*/P	Ypc;AT;AN;M;G;Open;Tot;OIL	OLS;ARDL ECM
Cihak & Holub (2001)	22	1999	Y	PPP	Ypc	OLS
Flek , Markova & Podpiera (2002)	9	1970-1997	Y	PN/PT	AT/AN	unbalanced panel
Jazbec (2002)	19	1990-1998	Y	PT/PN	A;G;CT/C	OLS
Arratibel, Rodriguez-Palenzuela & Thimann (2002)	10	1995-2001	Y	PT;PN	A;def;G;Ypc;regime;U;OIL;Tot	GMM
Egert (2002a)	5	1995:6-2000:12	M	PN/PT;EP*/P	AT/AN;PN/PT	Johansen VAR
Egert (2002b)	5	1991:I-2001:II	Q	PN/PT;EP*/P	AT/AN;PN/PT	Johansen VAR; FMOLS
Fischer (2002)	10	93-99;94:I-00:IV	Y;Q	PN	AT;AN;PT;r;ToT;C;G	SUR Fixed effects; ARDL
Canzoneri et. al. (2002)	10	1970-1997	Y	Im's panel unit root test of price diferential for home and for traded goods		
Kakkar (2002)	14	1970-1992	Y	K/L	A	CCR
Egert et. al. (2003)	9	1995:I-2000:IV	Q	PN/PT	AT/AN	E/G; FMOLS
Lojschova (2003)	4	1995:I-2000:IV	Q	PN/PT	AT/AN	OLS; fixed effects panel
Mihaljek & Klau (2003)	6	1993:I-2002:I	Q	P/P*	E;(AT*/AT)/(AN*/AN);W	OLS
Drine & Rault (2003a)	20	1960-1999	Y	EP*/P	Y	Im/Pedroni urt/cointegration
Drine & Rault (2003b)	16	1960-1999	Y	EP*/P	Y	Im/Pedroni urt/cointegration
Bergin, Glick & Taylor (2004)	142	1500-1995	Y	PPP	Ypc	OLS
Choudhri & Khan (2004)	16	1976-1994	Y	EP*/P;PN/PT	PN/PT;AT/AN;Tot	Pedroni; DOLS

Source: Sources are listed in the first column of the table.

Table 2: Productivity proxies, sector division of economy and panel and/or cross section coefficients in surveyed empirical studies

Author(s)	Productivity proxy	Tradable sector	Nontradable sector	Panel or single cross section coefficient	Teo Sign
Balassa (1964)	Ypc	analysis without sectors		0,025	(+)
Clague & Tanzi (1972)	Ypc	analysis without sectors			
David (1972)f	Ypc	analysis without sectors		0,4-0,5	(+)
Grunwald & Salazar-Carrillo (1972)	Ypc	analysis without sectors		-0,27	(+)
Balassa (1973)	Ypc	analysis without sectors		0,4-0,9	(+)
David (1973)	Ypc	analysis without sectors		0,5-0,7	(+)
Officer (1976)	Ypc;Y/L;AT/ANT	agr,min,man	others	-1,9-0,5	(+)
Hsieh (1982)	Y/(L*hour)	manufacturing	others	country specific only	(+)
Kravis & Lipsey (1983)	Ypc	analysis without sectors		0,5-1,0	(+)
Kravis, Heston & Summers (1983)	na	analysis without sectors		-0,3	(-)
Clague (1986)	Y	analysis without sectors		-0,4-(-0,6)	(+)
Edison & Klovland (1987)	Y/L	man;agr;cnstr;electr;water	distribution and other serv.	0,057-0,164	(+)
Marston (1987)	TFP	man; agr	cnstr,whole trans;g;fin;RE	0,543-1,035	(+)
Clague (1988)	Y	analysis without sectors		0,4-0,9	(+)
Marston (1990)	Y/L	10 sectors vs manufacturing		country specific only	(-)
Rogoff (1992)	Y/L	analysis without sectors		unsignificant	(+)
Bahmani-Oskooee (1992)	A	analysis without sectors		long run relat. for 3 countr.	
Heston, Nuxoll & Summers (1994)	Ypc	analysis without sectors		-0,2-(-0,3)	(-)
De Gregorio, Giovannini & Wolf (1994)	TFP	agr,min,man,trans	others (exl agr,pa,def,ss)	0,2-0,4	(+)
De Gregorio & Wolf (1994)	TFP	agr,min,man,trans	others (exl agr,pa,def,ss)	-0,05-0,06; 0,1-0,2	(+)
Asea & Mendoza (1994)	I/Y;K/Y	agr,min,man,trans	others (exl agr,pa,def,ss)	0,2; -0,3; 0,1; 0,0; 0,3	(-)
De Gregorio, Giovannini & Krueger (1994)	TFP	man,energy (ger+constr)	services (fra&ita+nmserv)	-0,03	(-)
Micossi & Milesi-Ferretti (1994)	Y/L	man	services	-0,7	(-)
Bahmani-Oskooee & Rhee (1996)	Y/L	analysis without sectors		1942,7-6019,9	(+)
Bahmani-Oskooee & Niroomand (1996)	Ypc	analysis without sectors		significance tests only	
Canzoneri, Cumby & Diba (1996)	Y/L	man,agr	others (exl agr,pa,def,ss)	significant	(+)
Chinn (1997)	Y/L	man	services; dA=0	country specific only	(-)
Chinn & Johnson (1997)	TFP	agr,min,man,trans	others (exl agr,pa,def,ss)	-0,8-(-0,2)	(-)
Ito, Isard & Symansky (1997)	Y	manufacturing	others (exl agr,pa,def,ss)	0,2-0,4	(+)
Halpern & Wyplosz (1998)	Ypc	analysis without sectors		0,72-0,84	(+)

Author(s)	Productivity proxy	Tradable sector	Nontradable sector	Panel or single cross section coefficient	Teo Sign
Krajnyak & Zettelmeyer (1998)	Ypc	analysis without sectors		0,4-1,1	(+)
Canzoneri, Cumby & Diba (1999)	Y/L	man,agr	others (exl agr,pa,def,ss)	significant	(+)
Halikias, Swagel & Allan (1999)	TFP	man,min	others (exl agr,pa,def,ss)	country specific only	(+)
Rother (2000)	Y/L	man	others	0,4-0,5	(+)
Chinn (2000)	Y/L	ind,min,trans,agr	others (exl agr,pa,def,ss)	-0,2-(-0,6)	(-)
Bahmani-Oskooee & Nasir (2001)	Y/L	analysis without sectors		-0,1-0,8	(+)
Deloach (2001)	Y	CPI	PPI	country specific only	(+)
Halpern Wyplosz (2001)	Y/L	industry	services	0,2	(+)
Cipriani (2001)	Y/L	country specific	country specific	0,6-0,8	(+)
Coricelli & Jazbec (2001)	Y/L	ind,min,constr,infra	other	-0,6-(-0,9)	(-)
Taylor & Sarno (2001)	T	analysis without sectors		-0,002-(-0,018)	(-)
De Broeck & Slok (2001)	Y/L	ind,constr	other (exl. agr)	0,4; 0,2-0,9	(+)
Cihak & Holub (2001)	Ypc	analysis without sectors		1,0	(+)
Flek , Markova & Podpiera (2002)	Y/L	man; agr	cnstr, trans	0,36-0,65	(+)
Jazbec (2002)	Y/L	industry	services	-0,868	(-)
Arratibel, Rodriguez-Palenzuela & Thimann (2002)	Y/L	HICPtradable	HICPnontradable	-0,01; -0,08	(0;+)
Egert (2002a)	Y/L	industry	services; dA=0	country specific only	(-;+)
Egert (2002b)	Y/L	industry	services; dA=0	0,7-1,3	(+)
Fischer (2002)	Y/L	industry	services (agr.)	0,6-1,7; 0,8-1,5	(+)
Canzoneri et. al. (2002)	Y/L	man, agr	serivces	traded=stat.; nontrade.<>stat.	
Kakkar (2002)	TFP	agr,min,man,trans	others (exl agr,pa,def,ss)	K/L & TFP are coint.	
Egert et. al. (2003)	Y/L	ind,agr (exl. constr)	services	0,4-1,0; 0,3-1,1	(+)
Lojschova (2003)	TFP	industry	services	-0,2-2,0	(+)
Mihaljek & Klau (2003)	Y/L	man,min,trans,comm,tour	others (exl agr,pa,def,ss)	country specific only	(+)
Drine & Rault (2003a)	GDP	analysis without sectors		country specific only	(+)
Drine & Rault (2003b)	GDP	analysis without sectors		country specific only	(+)
Bergin, Glick & Taylor (2004)	Ypc	analysis without sectors		-0,47-0,83	(+)
Choudhri & Khan (2004)	Y/L	man,agr	all others	0,287-1,217	(+)

Source: Sources are listed in the first column of the table.

Table 3: Countries included in analyses and country specific HBS coefficients

Author(s)	Balassa (1964)	Clague & Tanzi (1972)	David (1972)	Grunwald & Salazar-Carrillo (1972)	Balassa (1973)	David (1973)
Theoretical Sign	**(+)**		**(+)**	**(+)**	**(+)**	**(+)**
Albania	-	-	-	-	-	-
Algeria	-	-	-	-	-	-
Argentina	-	incl.	-	incl.	-	incl.
Armenia	-	-	-	-	-	-
Australia	-	-	-	-	-	-
Austria	-	-	-	-	-	-
Azerbaijan	-	-	-	-	-	-
Bahrain	-	-	-	-	-	-
Belgium	incl.	incl.	incl.	-	incl.	-
Belize	-	-	-	-	-	-
Belarus	-	-	-	-	-	-
Bolivia	-	incl.	-	incl.	-	incl.
Brazil	-	incl.	-	incl.	-	incl.
Bulgaria	-	-	-	-	-	-
Cameron	-	-	-	-	-	-
Canada	incl.	incl.	incl.	-	incl.	-
Chile	-	incl.	-	incl.	-	incl.
China	-	-	-	-	-	-
Colombia	-	incl.	-	incl.	-	incl.
Costa Rica	-	incl.	-	-	-	incl.
Croatia	-	-	-	-	-	-
Czech Rep.	-	-	-	-	-	-
Denmark	incl.	incl.	incl.	-	incl.	-
Dominican Rep.	-	incl.	-	-	-	incl.
Ecuador	-	incl.	-	incl.	-	incl.
Egypt	-	-	-	-	-	-
Estonia	-	-	-	-	-	-
Finland	-		-	-	-	-
France	incl.	incl.	incl.	-	incl.	-
Georgia	-	-	-	-	-	-
Germany	incl.	incl.	incl.	-	incl.	-
Greece	-	-	-	-	-	-
Guatemala	-	incl.	-	-	-	incl.
Guyana	-	-	-	-	-	-
Haiti	-	incl.	-	-	-	incl.
Honduras	-	incl.	-	-	-	incl.
Hungary	-	-	-	-	-	-
India	-	-	-	-	-	-
Indonesia	-	-	-	-	-	-
Iran	-	-	-	-	-	-
Iraq	-	-	-	-	-	-
Ireland	-	-	-	-	-	-
Italy	incl.	incl.	incl.	-	incl.	-
Japan	incl.	incl.	incl.	-	incl.	-
Jordan	-	-	-	-	-	-
Kazakhstan	-	-	-	-	-	-
Kenya	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-
Kyrgyzstan	-	-	-	-	-	-
Latvia	-	-	-	-	-	-
Lebanon	-	-	-	-	-	-

Author(s)	Balassa (1964)	Clague & Tanzi (1972)	David (1972)	Grunwald & Salazar-Carrillo (1972)	Balassa (1973)	David (1973)
Theoretical Sign	**(+)**		**(+)**	**(+)**	**(+)**	**(+)**
Libya	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-
Macedonia	-	-	-	-	-	-
Malaysia	-	-	-	-	-	-
Mexico	-	incl.	-	incl.	-	incl.
Moldova	-	-	-	-	-	-
Mongolia	-	-	-	-	-	-
Morocco	-	-	-	-	-	-
Netherlands	incl.	incl.	incl.	-	incl.	-
New Zealand	-	-	-	-	-	-
Nicaragua	-	incl.	-	-	-	incl.
Norway	incl.	incl.	incl.	-	incl.	-
Oman	-	-	-	-	-	-
Panama	-	incl.	-	-	-	incl.
Papua New Guinea	-	-	-	-	-	-
Paraguay	-	incl.	-	incl.	-	-
Peru	-	incl.	-	incl.	-	incl.
Philippines	-	-	-	-	-	-
Poland	-	-	-	-	-	-
Portugal	-	-	-	-	-	-
R. Korea	-	-	-	-	-	-
Romania	-	-	-	-	-	-
Russia	-	-	incl.	-	-	-
S. Arabia	-	-	-	-	-	-
Salvador	-	incl.	-	-	-	incl.
Singapore	-	-	-	-	-	-
Slovakia	-	-	-	-	-	-
Slovenia	-	-	-	-	-	-
South Africa	-	-	-	-	-	-
Spain	-	-	-	-	-	-
Surinam	-	-	-	-	-	-
Sweden	incl.	incl.	-	-	incl.	-
Switzerland	-	-	-	-	-	-
Syria	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tajikistan	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tunisia	-	-	-	-	-	-
Turkey	-	-	-	-	-	-
UAE	-	-	-	-	-	-
UK	incl.	incl.	incl.	-	incl.	-
Ukraine	-	-	-	-	-	-
Uruguay	-	incl.	-	incl.	-	incl.
US	incl.	incl.	incl.	-	incl.	-
Uzbekistan	-	-	-	-	-	-
Venezuela	-	incl.	-	b	-	-
Yemen	-	-	-	-	-	-

Source: Balassa (1964); Clague & Tanzi (1972); David (1972); Grunwald & Salazar-Carrillo (1972); Balassa (1973); David (1973)

Table 4: Countries included in analyses and country specific HBS coefficients

Author(s)	Officer (1976)	Hsieh (1982)	Clague (1988)	Marston (1990)	Bahmani-Oskooee (1992)	De Gregorio, Giovannini & Wolf (1994)
Theoretical Sign	**(+)**	**(+)**	**(+)**	**(-)**	-	**(+)**
Albania	-	-	-	-	-	-
Algeria	-	-	-	-	-	-
Argentina	-	-	incl.	-	-	-
Armenia	-	-	-	-	-	-
Australia	incl.	-	-	-	-	incl.
Austria	incl.	-	-	-	-	-
Azerbaijan	-	-	-	-	-	-
Bahrain	-	-	-	-	-	-
Belgium	incl.	-	-	-	-	incl.
Belize	-	-	-	-	-	-
Belarus	-	-	-	-	-	-
Bolivia	-	-	incl.	-	-	-
Brazil	-	-	incl.	-	-	-
Bulgaria	-	-	-	-	-	-
Cameron	-	-	-	-	-	-
Canada	incl.	-	-	-	incl.	incl.
Chile	-	-	incl.	-	-	-
China	-	-	-	-	-	-
Colombia	-	-	b	-	-	-
Costa Rica	-	-	-	-	-	-
Croatia	-	-	-	-	-	-
Czech Rep.	-	-	-	-	-	-
Denmark	incl.	-	-	-	-	incl.
Dominican Rep.	-	-	-	-	-	-
Ecuador	-	-	incl.	-	-	-
Egypt	-	-	-	-	-	-
Estonia	-	-	-	-	-	-
Finland	incl.	-	-	-	-	incl.
France	incl.	-	incl.	-1,2;-0,8	incl.	incl.
Georgia	-	-	-	-	-	-
Germany	-	0,3-0,6	incl.	-1,2;-0,8	incl.	incl.
Greece	-	-	-	-	-	-
Guatemala	-	-	-	-	-	-
Guyana	-	-	-	-	-	-
Haiti	-	-	-	-	-	-
Honduras	-	-	-	-	-	-
Hungary	-	-	incl.	-	-	-
India	-	-	incl.	-	-	-
Indonesia	-	-	-	-	-	-
Iran	-	-	-	-	-	-
Iraq	-	-	-	-	-	-
Ireland	-	-	-	-	-	-
Italy	incl.	-	incl.		coint.	incl.
Japan	-	0,5	incl.	-0,8;-0,9	coint.	incl.
Jordan	-	-	-	-	-	-
Kazakhstan	-	-	-	-	-	-
Kenya	-	-	incl.	-	-	-
Kuwait	-	-	-	-	-	-
Kyrgyzstan	-	-	-	-	-	-
Latvia	-	-	-	-	-	-
Lebanon	-	-	-	-	-	-

Author(s)	Officer (1976)	Hsieh (1982)	Clague (1988)	Marston (1990)	Bahmani-Oskooee (1992)	De Gregorio, Giovannini & Wolf (1994)
Theoretical Sign	**(+)**	**(+)**	**(+)**	**(-)**	-	**(+)**
Libya	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-
Macedonia	-	-	-	-	-	-
Malaysia	-	-	-	-	-	-
Mexico	-	-	incl.	-	-	-
Moldova	-	-	-	-	-	-
Mongolia	-	-	-	-	-	-
Morocco	-	-	-	-	-	-
Netherlands	incl.	-	-	-	-	incl.
New Zealand	incl.	-	-	-	-	-
Nicaragua	-	-	-	-	-	-
Norway	incl.	-	-	-	-	incl.
Oman	-	-	-	-	-	-
Panama	-	-	-	-	-	-
Papua New Guinea	-	-	-	-	-	-
Paraguay	-	-	incl.	-	-	-
Peru	-	-	incl.	-	-	-
Philippines	-	-	-	-	-	-
Poland	-	-	-	-	-	-
Portugal	-	-	-	-	-	-
R. Korea	-	-	-	-	-	-
Romania	-	-	-	-	-	-
Russia	-	-	-	-	-	-
S. Arabia	-	-	-	-	-	-
Salvador	-	-	-	-	-	-
Singapore	-	-	-	-	-	-
Slovakia	-	-	-	-	-	-
Slovenia	-	-	-	-	-	-
South Africa	-	-	-	-	-	-
Spain	-	-	-	-	-	-
Surinam	-	-	-	-	-	-
Sweden	incl.	-	-	-	-	incl.
Switzerland	incl.	-	-	-	-	-
Syria	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tajikistan	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tunisia	-	-	-	-	-	-
Turkey	-	-	-	-	-	-
UAE	-	-	-	-	-	-
UK	incl.	-	incl.	-0,9;-0,9	coint.	incl.
Ukraine	-	-	-	-	-	-
Uruguay	-	-	incl.	-	-	-
US	incl.	-	incl.	b;-1,0	b	incl.
Uzbekistan	-	-	-	-	-	-
Venezuela	-	-	incl.	-	-	-
Yemen	-	-	-	-	-	-

Source: Officer (1976); Hsieh (1982); Clague (1988); Marston (1990); Bahmani-Oskooee (1992); De Gregorio, Giovannini & Wolf (1994)

Table 5: Countries included in analyses and country specific HBS coefficients

Author(s)	De Gregorio & Wolf (1994)	Asea & Mendoza (1994)	De Gregorio, Giovannini & Krueger (1994)	Micossi & Milesi-Ferretti (1994)	Canzoneri, Cumby & Diba (1996)	Chinn (1997)
Theoretical Sign	**(+)**	**(-)**	**(-)**	**(-)**	**(+)**	**(-)**
Albania	-	-	-	-	-	-
Algeria	-	-	-	-	-	-
Argentina	-	-	-	-	-	-
Armenia	-	-	-	-	-	-
Australia	incl.	-2,3	-	-	-	-
Austria	-	-	-	-	1	-
Azerbaijan	-	-	-	-	-	-
Bahrain	-	-	-	-	-	-
Belgium	incl.	-2,3	-	-0,2-(-0,3)	0,8	-
Belize	-	-	-	-	-	-
Belarus	-	-	-	-	-	-
Bolivia	-	-	-	-	-	-
Brazil	-	-	-	-	-	-
Bulgaria	-	-	-	-	-	-
Cameron	-	-	-	-	-	-
Canada	incl.	-0,7	-	-	0,4	1,0
Chile	-	-	-	-	-	-
China	-	-	-	-	-	-
Colombia	-	-	-	-	-	-
Costa Rica	-	-	-	-	-	-
Croatia	-	-	-	-	-	-
Czech Rep.	-	-	-	-	-	-
Denmark	incl.	-2,3	-	-0,3-(-0,4)	0,5	-
Dominican Rep.	-	-	-	-	-	-
Ecuador	-	-	-	-	-	-
Egypt	-	-	-	-	-	-
Estonia	-	-	-	-	-	-
Finland	incl.	-2	-	-	1	-
France	incl.	-1	-0,1	-0,3-(-0,4)	0,8	-
Georgia	-	-	-	-	-	-
Germany	incl.	-1	0,1-(-0,3)	-0,2-(-0,4)	1	2,2
Greece	-	-	-	-	-	-
Guatemala	-	-	-	-	-	-
Guyana	-	-	-	-	-	-
Haiti	-	-	-	-	-	-
Honduras	-	-	-	-	-	-
Hungary	-	-	-	-	-	-
India	-	-	-	-	-	-
Indonesia	-	-	-	-	-	-
Iran	-	-	-	-	-	-
Iraq	-	-	-	-	-	-
Ireland	-	-	-	-	-	-
Italy	incl.	-0,9	-0,4-(-0,6)	0,01-0,1	0,9	-
Japan	incl.	-0,9	-	-	1	-0,8
Jordan	-	-	-	-	-	-
Kazakhstan	-	-	-	-	-	-
Kenya	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-
Kyrgyzstan	-	-	-	-	-	-
Latvia	-	-	-	-	-	-
Lebanon	-	-	-	-	-	-

Author(s)	De Gregorio & Wolf (1994)	Asea & Mendoza (1994)	De Gregorio, Giovannini & Krueger (1994)	Micossi & Milesi-Ferretti (1994)	Canzoneri, Cumby & Diba (1996)	Chinn (1997)
Theoretical Sign	**(+)**	**(-)**	**(-)**	**(-)**	**(+)**	**(-)**
Libya	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-
Macedonia	-	-	-	-	-	-
Malaysia	-	-	-	-	-	-
Mexico	-	-	-	-	-	-
Moldova	-	-	-	-	-	-
Mongolia	-	-	-	-	-	-
Morocco	-	-	-	-	-	-
Netherlands	incl.	-0,6	-	-0,5-0,6	-	-
New Zealand	-	-	-	-	-	-
Nicaragua	-	-	-	-	-	-
Norway	incl.	-2	-	-	-	-
Oman	-	-	-	-	-	-
Panama	-	-	-	-	-	-
Papua New Guinea	-	-	-	-	-	-
Paraguay	-	-	-	-	-	-
Peru	-	-	-	-	-	-
Philippines	-	-	-	-	-	-
Poland	-	-	-	-	-	-
Portugal	-	-	-	-	-	-
R. Korea	-	-	-	-	-	-
Romania	-	-	-	-	-	-
Russia	-	-	-	-	-	-
S. Arabia	-	-	-	-	-	-
Salvador	-	-	-	-	-	-
Singapore	-	-	-	-	-	-
Slovakia	-	-	-	-	-	-
Slovenia	-	-	-	-	-	-
South Africa	-	-	-	-	-	-
Spain	-	-	-0,1-0,2	-	0,9	-
Surinam	-	-	-	-	-	-
Sweden	incl.	-1,9	-	-	0,6	-
Switzerland	-	-	-	-	-	-
Syria	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tajikistan	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tunisia	-	-	-	-	-	-
Turkey	-	-	-	-	-	-
UAE	-	-	-	-	-	-
UK	incl.	-1,2	-0,03-0,2	-0,4-(-0,7)	0,7	0,9
Ukraine	-	-	-	-	-	-
Uruguay	-	-	-	-	-	-
US	incl.	-0,9	-	-	0,9	-
Uzbekistan	-	-	-	-	-	-
Venezuela	-	-	-	-	-	-
Yemen	-	-	-	-	-	-

Source: De Gregorio & Wolf (1994); Asea & Mendoza (1994); De Gregorio, Giovannini & Krueger (1994); Micossi & Milesi-Ferretti (1994); Canzoneri, Cumby & Diba (1996); Chinn (1997)

Table 6: Countries included in analyses and country specific HBS coefficients

Author(s)	Chinn & Johnson (1997)	Ito, Isard & Symansky (1997)	Canzoneri, Cumby & Diba (1999)	Halikias, Swagel & Allan (1999)	Chinn (2000)	Deloach (2001)
Theoretical Sign	**(-)**	**(+)**	**(+)**	**(+)**	**(-)**	**(+)**
Albania	-	-	-	-	-	-
Algeria	-	-	-	-	-	-
Argentina	-	-	-	-	-	-
Armenia	-	-	-	-	-	-
Australia	5,2-28,2	incl.	-	-	-	-
Austria	-	-	1	-	-	-
Azerbaijan	-	-	-	-	-	-
Bahrain	-	-	-	-	-	-
Belgium	-1,4-4,0	-	0,8	0,9	-	-
Belize	-	-	-	-	-	-
Belarus	-	-	-	-	-	-
Bolivia	-	-	-	-	-	-
Brazil	-	-	-	-	-	-
Bulgaria	-	-	-	-	-	-
Cameron	-	-	-	-	-	-
Canada	-0,4-(-0,2)	incl.	0,7	-	-	0,2-0,4
Chile	-	incl.	-	-	-	-
China	-	incl.	-	-	incl.	-
Colombia	-	-	-	-	-	-
Costa Rica	-	-	-	-	-	-
Croatia	-	-	-	-	-	-
Czech Rep.	-	-	-	-	-	-
Denmark	2,4-4,1	-	0,6	1	-	-
Dominican Rep.	-	-	-	-	-	-
Ecuador	-	-	-	-	-	-
Egypt	-	-	-	-	-	-
Estonia	-	-	-	-	-	-
Finland	2,9-5,0	-	0,8	1,2	-	0,6-0,7
France	0,9-2,6	-	0,8	0,8	-	-
Georgia	-	-	-	-	-	-
Germany	3,2-3,7	-	1,1	0,4	-	0,1
Greece	-	-	-	0,6	-	-
Guatemala	-	-	-	-	-	-
Guyana	-	-	-	-	-	-
Haiti	-	-	-	-	-	-
Honduras	-	-	-	-	-	-
Hungary	-	-	-	-	-	-
India	-	-	-	-	-	-
Indonesia	-	incl.	-	-	incl.	-
Iran	-	-	-	-	-	-
Iraq	-	-	-	-	-	-
Ireland	-	-	-	-	-	-
Italy	0,1-4,2	-	0,9	1,5	-	0,4-1,4
Japan	-3,0-3,6	incl.	1,2	-	incl.	0,4-0,7
Jordan	-	-	-	-	-	-
Kazakhstan	-	-	-	-	-	-
Kenya	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-
Kyrgyzstan	-	-	-	-	-	-
Latvia	-	-	-	-	-	-
Lebanon	-	-	-	-	-	-

Author(s)	Chinn & Johnson (1997)	Ito, Isard & Symansky (1997)	Canzoneri, Cumby & Diba (1999)	Halikias, Swagel & Allan (1999)	Chinn (2000)	Deloach (2001)
Theoretical Sign	**(-)**	**(+)**	**(+)**	**(+)**	**(-)**	**(+)**
Libya	-	-	-	-	-	-
Lithuania	-	-	-	-	-	-
Macedonia	-	-	-	-	-	-
Malaysia	-	incl.	-	-	incl.	-
Mexico	-	incl.	-	-	-	-
Moldova	-	-	-	-	-	-
Mongolia	-	-	-	-	-	-
Morocco	-	-	-	-	-	-
Netherlands	-0,6-1,1	-	-	0,2	-	-
New Zealand	-	incl.	-	-	-	-
Nicaragua	-	-	-	-	-	-
Norway	1,8-5,9	-	-	-	-	0,2-0,4
Oman	-	-	-	-	-	-
Panama	-	-	-	-	-	-
Papua New Guinea	-	incl.	-	-	-	-
Paraguay	-	-	-	-	-	-
Peru	-	-	-	-	-	-
Philippines	-	incl.	-	-	incl.	-
Poland	-	-	-	-	-	-
Portugal	-	-	-	1,2	-	-
R. Korea	-	incl.	-	-	incl.	-
Romania	-	-	-	-	-	-
Russia	-	-	-	-	-	-
S. Arabia	-	-	-	-	-	-
Salvador	-	-	-	-	-	-
Singapore	-	incl.	-	-	incl.	-
Slovakia	-	-	-	-	-	-
Slovenia	-	-	-	-	-	-
South Africa	-	-	-	-	-	-
Spain	-	-	0,9	-	-	0,6-0,7
Surinam	-	-	-	-	-	-
Sweden	2,7-3,4	-	0,6	-	-	-
Switzerland	-	-	-	-	-	-
Syria	-	-	-	-	-	-
Thailand	-	-	-	-	incl.	-
Tajikistan	-	-	-	-	-	-
Thailand	-	incl.	-	-	incl.	-
Tunisia	-	-	-	-	-	-
Turkey	-	-	-	-	-	-
UAE	-	-	-	-	-	-
UK	1,8-3,5	-	0,4	1,9	-	0,1
Ukraine	-	-	-	-	-	-
Uruguay	-	-	-	-	-	-
US	b	incl.	0,9	-	incl.	0,4
Uzbekistan	-	-	-	-	-	-
Venezuela	-	-	-	-	-	-
Yemen	-	-	-	-	-	-

Source: Chinn & Johnson (1997); Ito, Isard & Symansky (1997); Canzoneri, Cumby & Diba (1999); Halikias, Swagel & Allan (1999); Chinn (2000); Deloach (2001)

Table 7: Countries included in analyses and country specific HBS coefficients

Author(s)	Halpern & Wyplosz (2001)	Cipriani (2001)	Coricelli & Jazbec (2001)	Taylor & Sarno (2001)	De Broeck & Slok (2001)	Cihak Holub (2001)
Theoretical Sign	**(+)**	**(+)**	**(-)**	**(-)**	**(+)**	**(+)**
Albania	-	-	-	-	-	incl.
Algeria	-	-	-	-	-	-
Argentina	-	-	-	-	-	-
Armenia	-	-	incl.	-	incl.	-
Australia	-	-	-	-	-	-
Austria	-	-	-	-	-	incl.
Azerbaijan	-	-	incl.	-	incl.	-
Bahrain	-	-	-	-	-	-
Belgium	-	-	-	-	-	-
Belize	-	-	-	-	-	-
Belarus	-	-	incl.	-	incl.	incl.
Bolivia	-	-	-	-	-	-
Brazil	-	-	-	-	-	-
Bulgaria	-	1,28	incl.	incl.	incl.	incl.
Cameron	-	-	-	-	-	-
Canada	-	-	-	-	-	-
Chile	-	-	-	-	-	-
China	-	-	-	-	-	-
Colombia	-	-	-	-	-	-
Costa Rica	-	-	-	-	-	-
Croatia	-	-	incl.	-	incl.	incl.
Czech Rep.	incl.	0,6	incl.	incl.	incl.	incl.
Denmark	-	-	-	-	-	incl.
Dominican Rep.	-	-	-	-	-	-
Ecuador	-	-	-	-	-	-
Egypt	-	-	-	-	-	-
Estonia	incl.	0,55	incl.	-	incl.	incl.
Finland	-	-	-	-	-	incl.
France	-	-	-	-	-	incl.
Georgia	-	-	-	-	incl.	-
Germany	-	-	-	-	-	incl.
Greece	-	-	-	-	-	incl.
Guatemala	-	-	-	-	-	-
Guyana	-	-	-	-	-	-
Haiti	-	-	-	-	-	-
Honduras	-	-	-	-	-	-
Hungary	incl.	0,36	incl.	incl.	incl.	incl.
India	-	-	-	-	-	-
Indonesia	-	-	-	-	-	-
Iran	-	-	-	-	-	-
Iraq	-	-	-	-	-	-
Ireland	-	-	-	-	-	incl.
Italy	-	-	-	-	-	incl.
Japan	-	-	-	-	-	-
Jordan	-	-	-	-	-	-
Kazakhstan	-	-	incl.	-	incl.	-
Kenya	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-
Kyrgyzstan	-		incl.	-	incl.	-
Latvia	incl.	0,78	incl.	incl.	incl.	incl.
Lebanon	-	-	-	-	-	-

Author(s)	Halpern & Wyplosz (2001)	Cipriani (2001)	Coricelli & Jazbec (2001)	Taylor & Sarno (2001)	De Broeck & Slok (2001)	Cihak Holub (2001)
Theoretical Sign	**(+)**	**(+)**	**(-)**	**(-)**	**(+)**	**(+)**
Libya	-	-	-	-	-	-
Lithuania	incl.	0,99	incl.	incl.	incl.	incl.
Macedonia	-	-	-	-	incl.	incl.
Malaysia	-	-	-	-	-	-
Mexico	-	-	-	-	-	-
Moldova	-	-	-	-	incl.	incl.
Mongolia	-	-	-	-	incl.	-
Morocco	-	-	-	-	-	-
Netherlands	-	-	-	-	-	incl.
New Zealand	-	-	-	-	-	-
Nicaragua	-	-	-	-	-	-
Norway	-	-	-	-	-	incl.
Oman	-	-	-	-	-	-
Panama	-	-	-	-	-	-
Papua New Guinea	-	-	-	-	-	-
Paraguay	-	-	-	-	-	-
Peru	-	-	-	-	-	-
Philippines	-	-	-	-	-	-
Poland	incl.	0,69	incl.	incl.	incl.	incl.
Portugal	-	-	-	-	-	incl.
R. Korea	-	-	-	-	-	-
Romania	incl.	2,55	incl.	incl.	incl.	incl.
Russia	incl.	-	-	-	incl.	incl.
S. Arabia	-	-	-	-	-	-
Salvador	-	-	-	-	-	-
Singapore	-	-	-	-	-	-
Slovakia	-	0,29	incl.	incl.	incl.	incl.
Slovenia	incl.	0,38	incl.	incl.	incl.	incl.
South Africa	-	-	-	-	-	-
Spain	-	-	-	-	-	incl.
Surinam	-	-	-	-	-	-
Sweden	-	-	-	-	-	incl.
Switzerland	-	-	-	-	-	incl.
Syria	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tajikistan	-	-	-	-	incl.	-
Thailand	-	-	-	-	-	-
Tunisia	-	-	-	-	-	-
Turkey	-	-	-	-	incl.	-
UAE	-	-	-	-	-	-
UK	-	-	-	-	-	incl.
Ukraine	-	-	incl.	-	incl.	-
Uruguay	-	-	-	-	-	-
US	-	-	-	-	-	-
Uzbekistan	-	-	incl.	-	incl.	-
Venezuela	-	-	-	-	-	-
Yemen	-	-	-	-	-	-

Source: Halpern & Wyplosz (2001); Cipriani (2001); Coricelli & Jazbec (2001); Taylor & Sarno (2001); De Broeck & Slok (2001); Cihak Holub (2001)

Table 8: Countries included in analyses and country specific HBS coefficients

Author(s)	Flek , Markova & Podpiera (2002)	Jazbec (2002)	Arratibel, Rodriguez-Palenzuela & Thimann (2002)	Egert (2002a)	Egert (2002b)	Fischer (2002)
Theoretical Sign	**(+)**	**(+)**	**(0;+)**	**(-;+)**	**(+)**	**(+)**
Albania	-	-	-	-	-	-
Algeria	-	-	-	-	-	-
Argentina	-	-	-	-	-	-
Armenia	-	-	-	-	-	-
Australia	-	-	-	-	-	-
Austria	-	-	-	-	-	-
Azerbaijan	-	-	-	-	-	-
Bahrain	-	-	-	-	-	-
Belgium	incl.	-	-	-	-	-
Belize	-	-	-	-	-	-
Belarus	-	-	-	-	-	-
Bolivia	-	-	-	-	-	-
Brazil	-	-	-	-	-	-
Bulgaria	-	-	incl.	-	-	incl.
Cameron	-	-	-	-	-	-
Canada	-	-	-	-	-	-
Chile	-	-	-	-	-	-
China	-	-	-	-	-	-
Colombia	-	-	-	-	-	-
Costa Rica	-	-	-	-	-	-
Croatia	-	-	-	-	-	-
Czech Rep.	incl.	-	incl.	-0,4; 1,4-3,1	0,3-1,5	incl.
Denmark	incl.	-	-	-	-	-
Dominican Rep.	-	-	-	-	-	-
Ecuador	-	-	-	-	-	-
Egypt	-	-	-	-	-	-
Estonia	-	-	incl.	-	-	incl.
Finland	incl.	-	-	-	-	-
France	-	-	-	-	-	-
Georgia	-	-	-	-	-	-
Germany	incl.	-	-	-	-	-
Greece	-	-	-	-	-	-
Guatemala	-	-	-	-	-	-
Guyana	-	-	-	-	-	-
Haiti	-	-	-	-	-	-
Honduras	-	-	-	-	-	-
Hungary	-	-	incl.	-0,8-(-1,2)	0,6-1,2	incl.
India	-	-	-	-	-	-
Indonesia	-	-	-	-	-	-
Iran	-	-	-	-	-	-
Iraq	-	-	-	-	-	-
Ireland	-	-	-	-	-	-
Italy	incl.	-	-	-	-	-
Japan	-	-	-	-	-	-
Jordan	-	-	-	-	-	-
Kazakhstan	-	-	-	-	-	-
Kenya	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-
Kyrgyzstan	-	-	-	-	-	-
Latvia	-	-	incl.	-	-	incl.
Lebanon	-	-	-	-	-	-

Author(s)	Flek , Markova & Podpiera (2002)	Jazbec (2002)	Arratibel, Rodriguez-Palenzuela & Thimann (2002)	Egert (2002a)	Egert (2002b)	Fischer (2002)
Theoretical Sign	**(+)**	**(+)**	**(0;+)**	**(-;+)**	**(+)**	**(+)**
Libya	-	-	-	-	-	-
Lithuania	-	-	incl.	-	-	incl.
Macedonia	-	-	-	-	-	-
Malaysia	-	-	-	-	-	-
Mexico	-	-	-	-	-	-
Moldova	-	-	-	-	-	-
Mongolia	-	-	-	-	-	-
Morocco	-	-	-	-	-	-
Netherlands	incl.	-	-	-	-	-
New Zealand	-	-	-	-	-	-
Nicaragua	-	-	-	-	-	-
Norway	-	-	-	-	-	-
Oman	-	-	-	-	-	-
Panama	-	-	-	-	-	-
Papua New Guinea	-	-	-	-	-	-
Paraguay	-	-	-	-	-	-
Peru	-	-	-	-	-	-
Philippines	-	-	-	-	-	-
Poland	-	-	incl.	-0,3-(-0,5)	0,5-1,9	incl.
Portugal	-	-	-	-	-	-
R. Korea	-	-	-	-	-	-
Romania	-	-	incl.	-	-	incl.
Russia	-	-	-	-	-	-
S. Arabia	-	-	-	-	-	-
Salvador	-	-	-	-	-	-
Singapore	-	-	-	-	-	-
Slovakia	-	-	incl.	-2,3-(-11,6)	0,6-3,9	incl.
Slovenia	-	1,47-1,74	incl.	-2,6-(-7,6); 3,4	0,5-3,4	incl.
South Africa	-	-	-	-	-	-
Spain	-	-	-	-	-	-
Surinam	-	-	-	-	-	-
Sweden	-	-	-	-	-	-
Switzerland	-	-	-	-	-	-
Syria	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tajikistan	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tunisia	-	-	-	-	-	-
Turkey	-	-	-	-	-	-
UAE	-	-	-	-	-	-
UK	incl.	-	-	-	-	-
Ukraine	-	-	-	-	-	-
Uruguay	-	-	-	-	-	-
US	-	-	-	-	-	-
Uzbekistan	-	-	-	-	-	-
Venezuela	-	-	-	-	-	-
Yemen	-	-	-	-	-	-

Source: Flek, Markova & Podpiera (2002); Jazbec (2002); Arratibel, Rodriguez-Palenzuela & Thimann (2002); Egert (2002a); Egert (2002b); Fischer (2002)

Table 9: Countries included in analyses and country specific HBS coefficients

Author(s)	Canzoneri et. al. (2002)	Kakkar (2002)	Egert et. al. (2003)	Lojschova (2003)	Mihaljek & Klau (2003)	Drine & Rault (2003a)
Theoretical Sign			**(+)**	**(+)**	**(+)**	**(+)**
Albania	-	-	-	-	-	-
Algeria	-	-	-	-	-	-
Argentina	-	-	-	-	-	0,97
Armenia	-	-	-	-	-	-
Australia	-	-	-	-	-	-
Austria	incl.	incl.	-	-	-	-
Azerbaijan	-	-	-	-	-	-
Bahrain	-	-	-	-	-	-
Belgium	incl.	-	-	-	-	-
Belize	-	-	-	-	-	0,13
Belarus	-	-	-	-	-	-
Bolivia	-	-	-	-	-	0,61
Brazil	-	-	-	-	-	0,43
Bulgaria	-	-	-	-	-	-
Cameron	-	-	-	-	-	-
Canada	-	incl.	-	-	-	-
Chile	-	-	-	-	-	0,79
China	-	-	-	-	-	-
Colombia	-	-	-	-	-	0,64
Costa Rica	-	-	-	-	-	-
Croatia	-	-	incl.	-	0,1-0,6	-
Czech Rep.	-	-	incl.	-0,03-2,4	0,1	-
Denmark	incl.	incl.	-	-	-	-
Dominican Rep.	-	-	-	-	-	-
Ecuador	-	-	-	-	-	0,53
Egypt	-	-	-	-	-	-
Estonia	-	-	incl.	-	-	-
Finland	incl.	incl.	-	-	-	-
France	incl.	incl.	-	-	-	-
Georgia	-	-	-	-	-	-
Germany	incl.	incl.	-	-	-	-
Greece	-	-	-	-	-	-
Guatemala	-	-	-	-	-	0,51
Guyana	-	-	-	-	-	0,51
Haiti	-	-	-	-	-	-
Honduras	-	-	-	-	-	0,6
Hungary	-	-	incl.	0,4-2,9	0,3-0,9	-
India	-	-	-	-	-	-
Indonesia	-	-	-	-	-	-
Iran	-	-	-	-	-	-
Iraq	-	-	-	-	-	-
Ireland	-	-	-	-	-	-
Italy	incl.	incl.	-	-	-	-
Japan	-	-	-	-	-	-
Jordan	-	-	-	-	-	-
Kazakhstan	-	-	-	-	-	-
Kenya	-	-	-	-	-	-
Kuwait	-	-	-	-	-	-
Kyrgyzstan	-	-	-	-	-	-
Latvia	-	-	incl.	-	-	-
Lebanon	-	-	-	-	-	-

Author(s)	Canzoneri et. al. (2002)	Kakkar (2002)	Egert et. al. (2003)	Lojschova (2003)	Mihaljek & Klau (2003)	Drine & Rault (2003a)
Theoretical Sign			**(+)**	**(+)**	**(+)**	**(+)**
Libya	-	-	-	-	-	-
Lithuania	-	-	incl.	-	-	-
Macedonia	-	-	-	-	-	-
Malaysia	-	-	-	-	-	-
Mexico	-	-	-	-	-	0,53
Moldova	-	-	-	-	-	-
Mongolia	-	-	-	-	-	-
Morocco	-	-	-	-	-	-
Netherlands	-	incl.	-	-	-	-
New Zealand	-	-	-	-	-	-
Nicaragua	-	-	-	-	-	0,65
Norway	-	-	-	-	-	-
Oman	-	-	-	-	-	-
Panama	-	-	-	-	-	0,28
Papua New Guinea	-	-	-	-	-	-
Paraguay	-	-	-	-	-	0,49
Peru	-	-	-	-	-	0,75
Philippines	-	-	-	-	-	-
Poland	-	-	incl.	0,4-3,4	0,3-1,2	-
Portugal	-	-	-	-	-	-
R. Korea	-	-	-	-	-	-
Romania	-	-	-	-	-	-
Russia	-	-	-	-	-	-
S. Arabia	-	-	-	-	-	-
Salvador	-	-	-	-	-	0,7
Singapore	-	-	-	-	-	-
Slovakia	-	-	incl.	-0,1-2,9	0,1-0,5	-
Slovenia	-	-	incl.	-	0,2-0,7	-
South Africa	-	-	-	-	-	-
Spain	incl.	-	-	-	-	-
Surinam	-	-	-	-	-	0,97
Sweden	incl.	incl.	-	-	-	-
Switzerland	-	-	-	-	-	-
Syria	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tajikistan	-	-	-	-	-	-
Thailand	-	-	-	-	-	-
Tunisia	-	-	-	-	-	-
Turkey	-	-	-	-	-	-
UAE	-	-	-	-	-	-
UK	incl.	incl.	-	-	-	-
Ukraine	-	-	-	-	-	-
Uruguay	-	-	-	-	-	0,91
US	incl.	incl.	-	-	-	-
Uzbekistan	-	-	-	-	-	-
Venezuela	-	-	-	-	-	0,78
Yemen	-	-	-	-	-	-

Source: Canzoneri et. al. (2002); Kakkar (2002); Egert et. al. (2003); Lojschova (2003); Mihaljek & Klau (2003); Drine & Rault (2003a)

Table 10: Countries included in analyses and country specific HBS coefficients

Author(s)	Drine & Rault (2003b)	Choudhri & Khan (2004)
Theoretical Sign	**(+)**	**(+)**
Albania	-	-
Algeria	2,46	-
Argentina	-	-
Armenia	-	-
Australia	-	-
Austria	-	-
Azerbaijan	-	-
Bahrain	6,14	-
Belgium	-	-
Belize	-	-
Belarus	-	-
Bolivia	-	-
Brazil	-	-
Bulgaria	-	-
Cameron	-	incl.
Canada	-	-
Chile	-	incl.
China	-	-
Colombia	-	incl.
Costa Rica	-	-
Croatia	-	-
Czech Rep.	-	-
Denmark	-	-
Dominican Rep.	-	-
Ecuador	-	incl.
Egypt	4,37	-
Estonia	-	-
Finland	-	-
France	-	-
Georgia	-	-
Germany	-	-
Greece	-	-
Guatemala	-	-
Guyana	-	-
Haiti	-	-
Honduras	-	-
Hungary	-	-
India	-	incl.
Indonesia	-	-
Iran	0,26	-
Iraq	2,61	-
Ireland	-	-
Italy	-	-
Japan	-	-
Jordan	0,46	incl.
Kazakhstan	-	-
Kenya	-	incl.
Kuwait	-0,02	-
Kyrgyzstan	-	-
Latvia	-	-
Lebanon	1,12	-

Author(s)	Drine & Rault (2003b)	Choudhri & Khan (2004)
Theoretical Sign	**(+)**	**(+)**
Libya	0,59	-
Lithuania	-	-
Macedonia	-	-
Malaysia	-	incl.
Mexico	-	incl.
Moldova	-	-
Mongolia	-	-
Morocco	1,38	incl.
Netherlands	-	-
New Zealand	-	-
Nicaragua	-	-
Norway	-	-
Oman	-0,36	-
Panama	-	-
Papua New Guinea	-	-
Paraguay	-	-
Peru	-	-
Philippines	-	incl.
Poland	-	-
Portugal	-	-
R. Korea	-	incl.
Romania	-	-
Russia	-	-
S. Arabia	-0,07	-
Salvador	-	-
Singapore	-	incl.
Slovakia	-	-
Slovenia	-	-
South Africa	-	incl.
Spain	-	-
Surinam	-	-
Sweden	-	-
Switzerland	-	-
Syria	1,02	-
Thailand	-	-
Tajikistan	-	-
Thailand	-	-
Tunisia	0,16	-
Turkey	-	incl.
UAE	-0,45	-
UK	-	-
Ukraine	-	-
Uruguay	-	-
US	-	-
Uzbekistan	-	-
Venezuela	-	incl.
Yemen	1,47	-

Source: Drine & Rault (2003b); Choudhri & Khan (2004)