Are Productivity Levels Higher in Some European Countries than in the United States?

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STUDIES HAVE SHOWN THAT hourly labour productivity, which is defined as the ratio of purchasing power parity-based GDP to aggregate hours worked, is currently higher in a number of continental European countries than in the United States.[2] If this is true, it would mean that these European countries are now setting the 'technical efficiency frontier', and it might also suggest, along with the relatively low average hours worked and employment rate levels in these countries compared to the United States, that the social preference to use this outstanding performance for promoting a leisure society is stronger in Europe than it is in the United States. However, we need a better understanding of the reasons behind the European countries' performance in order to assess the robustness of this hypothesis.

Our analysis is a preliminary investigation of macro-economic comparisons of hourly labour productivity levels in the leading industrialized countries. We should stress that international productivity and per capita GDP comparisons are inevitably subject to comparability problems. Some of the weaker statistical aspects of such comparisons are discussed in the appendix. Therefore, we only deem comparisons to be robust and worthy of comment when they show sizeable differences. An international comparison of per capita GDP and 'observed' hourly productivity is presented in the first section. It is based on estimates made by other researchers. The second section presents an interpretation of the relative performance of the major European countries with regard to the United States. Then, in the third section, a comparison of recalculated 'structural' hourly productivity levels, which are closer to the reality of technical efficiency, is proposed. The final section concludes.

Per Capita GDP Levels and 'Observed' Hourly Labour Productivity

Labour productivity is a key determinant of the level of per capita GDP. The latter variable can be decomposed entirely as the product of hourly labour productivity, average hours worked, the employment rate and the ratio of the working age population to the aggregate population. This simple equation shows that, all else being equal, per capita GDP increases as a function of each of the

1 This article reflects the opinions of the author and does not necessarily express the views of the Banque de France. Rémy Lecat's help in the compilation of data is gratefully acknowledged, as are the comments from the anonymous referees who reviewed this article.

2 For example: Schreyer and Pilat (2001), updated by the authors; Eurostat, in its structural indicator database; and the Groningen Growth and Development Centre and The Conference Board, Total Economy Database, February 2004 which is used by van Ark and McGuckin (2003).

Table 1
Per Capita GDP and Labour Productivity in 2002
(per cent of the United States)

	Per Capita GDP			Hourly Labour Productivity		
Country	Groningen [a]	Eurostat [b]	OECD [c]	Groningen [d]	Eurostat [e]	OECD [f]
Australia	79.9	na	78.0	83.2	na	78.4
Austria	80.9	80.3	79.8	101.7	87.4	88.3
Belgium	78.9	76.7	76.6	113.7	108.1	108.3
Canada	80.8	na	84.1	82.9	87.9	85.2
Denmark	82.9	80.5	80.8	98.5	89.4	93.5
Finland	76.8	74.8	73.2	91.7	83.3	81.9
France	78.1	74.2	77.7	119.8	106.0	113.2
Germany	73.6	71.5	71.5	101.7	92.4	92.5
Greece	54.1	51.0	50.7	64.7	65.2	64.6
Ireland	90.9	87.2	90.2	106.1	101.5	105.0
Italy	72.8	71.7	71.5	95.8	81.5	93.7
Japan	75.6	73.9	74.2	75.3	70.0	70.5
Netherlands	82.7	80.2	80.2	108.9	101.4	101.5
New Zealand	62.6	na	62.4	64.8	na	62.9
Norway	101.3	98.3	98.2	131.6	125.0	125.5
Portugal	52.8	50.4	50.9	53.9	53.5	53.3
Spain	64.4	62.2	60.9	76.9	76.7	74.2
Sweden	77.6	75.5	75.3	88.6	85.5	85.6
Switzerland	89.5	na	84.8	91.3	na	83.5
United Kingdom	78.7	77.4	77.2	90.5	84.8	79.3
United States	100.0	100.0	100.0	100.0	100.0	100.0

[a], [d]: PPP 1999; [b], [e]: PPP 2002; [c], [f]: PPP 2002.

Sources: [a], [d]: Groningen Growth and Development Centre and The Conference Board, Total Economy Database, February 2004; [b], [e]: Eurostat, Structural Indicators Database; [c], [f]: OECD, Schreyer and Pilat (2001), updated by the authors.

components, including output per hour worked.

It should be pointed out that per capita GDP cannot be considered as the sole relevant indicator of a country's level of development and living standards. There are many other factors that influence living standards. For example, a drop in GDP resulting from a decrease in productivity could actually be associated with an improvement in living standards, if the decrease in productivity produces a more comfortable lifestyle or is perceived to do so by the population concerned. This can be the case, for example, if the workweek is shortened.

Various measurements relying on purchasing power parity-based calculations of GDP enable us to make international comparisons of per capita GDP and labour productivity.[3] Differences in these measurements stem from genuine statistical uncertainties and mean that we should focus on observations that seem robust. Thus the following, fairly usual, observations can be made (Table 1).

3 In this paper, I use productivity indicators only at the total economy level and not at the business-sector level for two reasons. The first reason is that I consider it to be more relevant for international comparison, as the business sector and government sector are not the same in different countries. For example, a larger proportion of education activities belongs to the business sector in the United States than in continental European countries. The second reason behind this choice is that it makes it more easy to link GDP per capita and productivity indicators: these two types of indicators thus have the same numerator (GDP) and differ only by their denominator (population or number of hours worked).

- The United States is the major industrialized country with the highest per capita GDP by a wide margin. The level of per capita GDP, in each of the four leading countries in the European Union, along with Japan, is much lower (by some 25 to 30 points) than it is in the United States.
- The countries that seem to have the highest hourly labour productivity are in Europe. France appears to perform particularly well, close to Belgium and slightly ahead of the Netherlands.[4] This observation suggests that the United States is not currently setting the 'technical frontier' and that it is now being set by certain European countries.
- Some European countries, such as Spain, or more particularly Portugal and Greece, have low productivity levels compared to the United States (25 to 50 percentage points below). The gaps are also wide in the United Kingdom (10 to 20 points), Canada (approximately 15 points) and Japan (25 to 30 points).

In accounting terms, the contrast between hourly labour productivity and per capita GDP that explains the European countries' situation compared to the United States can be attributed to fewer hours worked and/or a lower employment rate (Table 2).[5] For example, a substantial part of the gap (15 percentage points or more) in per capita GDP compared to the United States can be attributed to: fewer average hours worked in Belgium, Denmark, France, Germany, the Netherlands, Norway and Switzerland; the lower employment rate in Belgium, France, Greece, Ireland, Italy and Spain; and lower hourly labour productivity in Australia, Canada, Finland, Greece, Japan, New Zealand, Portugal, Spain, Switzerland and the United Kingdom. The lower number of hours worked may stem from differences in the working hours of full-time workers or from the proportion of part-time workers in total employment, or even a combination of these two factors, as is the case in the Netherlands. In accounting terms, a lower employment rate could be the result of a lower labour force participation rate or a higher unemployment rate. The respective contributions of each of these explanatory factors vary from one country to the next.

Thus, at first glance, these observations could be interpreted as follows: hourly labour productivity seems to be higher in several European countries than it is in the United States; these countries seem to have 'chosen' shorter working hours and a much lower employment rate than the United States has; and consequently, per capita GDP is lower in these countries than it is in the United States.

Hourly Labour Productivity is Influenced by Hours Worked and the Employment Rate

The explanation given above in accounting terms could be satisfactory, assuming constant returns to hours worked and the employment rate. However, this assumption appears questionable.

It is often assumed with regard to hours worked that the effects of fatigue and the ensuing diminishing returns to hours worked outweigh the effects of fixed costs, which produce increasing returns to hours worked. Such increasing returns stem, for instance, from peri-

4 The specific cases of small countries with very high productivity levels are not discussed further on in this article. The two countries are Ireland and Norway. In the case of Ireland, tax incentives have resulted in the location of the profits of multinational companies in this country. This boosts GDP (which, incidentally, is therefore some 20 per cent higher than GNP) and, consequently, productivity. The Norwegian economy, for its part, is relatively focused on three highly capital-intensive industries (oil, timber and fishing); this raises labour productivity.

5 Schreyer and Pilat (2001:168 in the French version) and OECD (2003b:34) show that the effect of differences in the ratio of working age population to the total population is negligible.

Table 2
Hours Worked and the Employment Rate in 2002

Country	**Average Annual Hours Worked** In hours	**Part-time Employment** per cent of total employment	**Employment Rate** per cent of population aged 15-64	**Labour Force Participation Rate** per cent of population aged 15-64	**Standardized Unemployment Rate** per cent of labour force
Australia	1824	27.5	62.1	66.0	6.4
Austria	1567	13.5	61.1	64.0	4.3
Belgium	1547	17.2	51.1	55.4	7.3
Canada	1731	18.7	66.8	71.9	7.7
Denmark	1462	16.2	72.6	75.9	4.6
Finland	1686	11.0	66.1	72.7	9.1
France	1459	13.7	55.8	62.1	8.8
Germany	1443	18.8	58.8	64.2	8.6
Greece	1928	5.6	42.7	50.2	10.0
Ireland	1666	18.1	55.2	57.3	4.4
Italy	1599	11.9	42.0	47.9	9.0
Japan	1798	25.1	56.5	59.7	5.4
Netherlands	1338	33.9	65.9	67.9	2.7
New Zealand	1816	22.6	65.4	69.1	5.2
Norway	1342	20.6	73.9	76.7	3.9
Portugal	1697	9.6	60.8	65.0	5.1
Spain	1813	7.6	44.9	53.7	11.3
Sweden	1581	13.8	73.4	77.1	4.9
Switzerland	1510	24.7	71.6	73.9	3.2
United Kingdom	1692	23.0	66.3	69.3	5.1
United States	1800	13.1	66.1	70.1	5.8

Part-time employment: less than 30 hours worked per week on average.
Source: OECD (2004).

ods of time included in hours worked that are not directly productive and hard to shorten.[6] Given the seemingly limited benefits of mitigating the effects of such fixed costs with a longer working day relative to the offsetting negative effects of fatigue, returns to hours worked are assumed to be diminishing in the aggregate.

The assumption of constant returns to the employment rate could be accepted if we assume that changes in the employment rate affect all categories of workers with differing productivity levels in the same way. Yet a closer look at the employment rate gap between European countries and the United States shows that this hypothesis should be rejected (Table 3). If we break the working age population down into gender groups and three age groups (young, adults and older), we see that the differences in the employment rates are not considerable (except for women in Greece, Italy and Spain, where they are above 10 percentage points) for adult men and women. The biggest differences – with an employment rate gap with the United States that is above 10 points – are in the young age group in Belgium, France, Greece, Ireland, Italy, Japan and Spain and in the older age group in Australia, Austria, Belgium, Finland, France, Germany, Greece, Ireland, Italy, the Nether-

6 For example, if the length of the working day of a person is eight hours, and if within these eight hours this work requires two hours per day to get information and to read messages, an increase in the length of the working day of 12.5 per cent (one hour/eight hours) would increase the proportion of productive hours in total work hours – and hence hourly productivity – by 3.7 per cent (from six productive hours/eight working hours to seven productive hours/nine working hours).

Table 3
Employment Rates in 2002
(per cent)

	Population aged 15-64	Population aged 15-24	Population aged 25-54			Population aged 55-64
Country	Total	Total	Total	Men	Women	Total
Australia	62.1	59.6	77.1	85.8	68.4	48.2
Austria	61.1	51.7	82.7	89.5	75.8	28.1
Belgium	51.1	28.5	76.6	86.2	66.8	25.8
Canada	66.8	57.3	80.2	85.3	75.2	50.4
Denmark	72.6	64.0	84.7	88.7	80.8	57.3
Finland	66.1	39.4	81.6	84.0	79.1	47.8
France	55.8	24.1	79.4	87.4	71.6	39.3
Germany	58.8	44.8	78.8	85.6	71.8	38.6
Greece	42.7	27.0	71.5	89.0	54.7	39.2
Ireland	55.2	45.3	76.6	87.6	65.6	48.0
Italy	42.0	26.7	70.1	86.0	54.0	28.9
Japan	56.5	41.0	78.0	92.0	63.9	61.6
Netherlands	65.9	70.5	82.9	92.0	73.5	42.0
New Zealand	65.4	56.8	79.7	88.0	71.8	63.4
Norway	73.9	55.9	84.4	88.1	80.6	68.4
Portugal	60.8	41.9	81.5	89.4	74.0	50.9
Spain	44.9	36.6	70.1	85.8	54.2	39.7
Sweden	73.4	46.5	84.2	85.9	82.4	68.3
Switzerland	71.6	65.3	86.0	93.8	78.1	64.8
United Kingdom	66.3	61.0	80.6	87.2	73.8	53.3
United States	66.1	55.7	79.3	86.6	72.3	59.5

Source: OECD (2004).

lands and Spain. The productivity of younger and older people who are not in employment can be considered to be lower than that of adults in employment. The gap stems from younger persons' lack of working experience and the loss of human capital incurred by older persons who are not in employment. Older persons still in employment are bound to have maintained or even increased their human capital more than those who are no longer in employment. In continental European countries, the foreseeable increase in the average employment rate will mainly concern these two age groups and this means that the returns to the employment rate will be diminishing.

Thus, increasing hours worked and the employment rate in continental European countries would narrow the per capita GDP gap with regard to the United States, but it would also lower the comparative level of hourly labour productivity. In other words, many European countries' strong hourly productivity performance compared to the United States cannot be attributed solely to good causes. Their performance is boosted by the fact that average hours worked are much fewer than in the United States and that employment is strongly concentrated in the most productive segment of the population. The less productive segments, which are younger and older persons in this case, are voluntarily or involuntarily excluded from employment.[7]

A recent analysis by Belorgey, Lecat and Maury (2004) proposes a measurement of returns to hours worked and the employment rate. The analysis is based on econometric

7 Giuliani (2003) also agrees with this finding. Without going into detail, Wasmer (1999) also assumes that the labour force structure has a positive effect on productivity.

estimates using the Generalized Method of Moments (GMM) technique proposed by Arellano and Bond (1991) on a panel of 25 industrial countries over the period from 1992 to 2000. The equations explain changes in output per worker at the total economy level using an autoregressive term, along with variations in: the ratio of information and communications technology (ICT) production to GDP; the ratio of ICT expenditure to GDP; the ratio of investment expenditure to GDP; the capacity utilization rate; average annual hours worked per person employed; and the employment rate of the working age population. The analysis shows that the long-term output per worker elasticity is about 0.65 with regard to hours worked and -0.50 with regard to the employment rate (for the employment rate, it is more precisely a semi-elasticity). The output per worker elasticity of about 0.65 with regard to hours worked corresponds to an hourly labour productivity elasticity of approximately -0.35 with regard to hours worked. This finding is in line with those of earlier analyses.[8] The productivity semi-elasticity of -0.5 with regard to the employment rate shows that the productivity of working-age persons currently out of employment, but who would be the first to be affected by an increase in the employment rate, is on average half that of persons currently in employment.

An Evaluation of 'Structural' Hourly Labour Productivity Levels

On the basis of the estimates of returns to hours worked and the employment rate discussed above, it is possible to estimate a 'structural' hourly labour productivity level for each country in comparison to the United States. This 'structural' hourly productivity level is the one that would be observed if hours worked and the employment rate in each country were the same as in the United States, and is calculated for each country using the elasticities discussed above to account for the effects of diminishing returns to hours worked and the employment rate. The results of the calculation are shown in Table 4.

In all countries, the level of 'structural' hourly productivity compared to the United States is lower than the level of 'observed' hourly productivity. The higher levels of 'structural' hourly productivity in the United States (except compared to Norway) show that the United States does indeed set the 'technical frontier' for productive efficiency and that the other countries lag behind it to varying degrees. In six European countries (Belgium, France, Germany, Italy, the Netherlands and Spain), shorter hours worked and lower employment rates jointly boost relative 'observed' hourly productivity by over 10 percentage points. The impact appears to be less than 10 points but higher than 5 points in four other countries: Austria, Greece, Ireland and Norway.

This measurement of the relative 'structural' hourly productivity levels changes the interpretation of the gaps between many countries' per capita GDP and that of the United States. This is particularly true for the European countries. The lower level of per capita GDP in continental European countries stems from a combination of shorter hours worked, a lower employment rate *and* lower 'structural' hourly productivity levels.

8 Based on a study conducted by INSEE on microeconomic data, Malinvaud (1973) states that since there are no better indicators than those of the type mentioned above, a coefficient of 0.50 should be applied to measure the impact that a reduction in hours worked has on hourly productivity. In view of the lesser effects of fatigue due to the decrease in average hours worked over recent decades, more recent research now applies a coefficient of 0.33 or 0.25 (Cette and Gubian, 1997).

Table 4
Observed and 'Structural' Hourly Productivity in 2002

	Observed Hourly Productivity per cent of the United States			Effect (per cent) of the Gap with the United States ...		Structural Hourly Productivity per cent of the United States		
Country	Groningen [a]	Eurostat [b]	OECD [c]	...in hours worked [d]	...in the employment rate [e]	[f] = [a]-[d]-[e]	[g] = [b]-[d]-[e]	[h] = [c]-[d]-[e]
Australia	83.2	na	78.4	-0.5	2.0	81.7	na	76.9
Austria	101.7	87.4	88.3	5.2	2.5	94.0	79.7	80.6
Belgium	113.7	108.1	108.3	5.7	7.5	100.4	94.9	95.1
Canada	82.9	87.9	85.2	1.4	-0.4	81.8	86.9	84.1
Denmark	98.5	89.4	93.5	8.1	-3.3	93.6	84.5	88.7
Finland	91.7	83.3	81.9	2.4	0.0	89.4	80.9	79.5
France	119.8	106.0	113.2	8.2	5.2	106.5	92.7	99.9
Germany	101.7	92.4	92.5	8.7	3.7	89.4	80.1	80.2
Greece	64.7	65.2	64.6	-2.3	11.7	55.3	55.8	55.2
Ireland	106.1	101.5	105.0	2.8	5.5	97.8	93.3	96.7
Italy	95.8	81.5	93.7	4.4	12.1	79.3	65.0	77.3
Japan	75.3	70.0	70.5	0.0	4.8	70.5	65.2	65.7
Netherlands	108.9	101.4	101.5	12.1	0.1	96.8	89.2	89.3
New Zealand	64.8	na	62.9	-0.3	0.3	64.8	na	62.8
Norway	131.6	125.0	125.5	11.9	-3.9	123.6	117.0	117.4
Portugal	53.9	53.5	53.3	2.1	2.7	49.1	48.7	48.6
Spain	76.9	76.7	74.2	-0.3	10.6	66.6	66.3	63.9
Sweden	88.6	85.5	85.6	4.8	-3.7	87.4	84.3	84.4
Switzerland	91.3	na	83.5	6.7	-2.8	87.3	na	79.5
United Kingdom	90.5	84.8	79.3	2.2	-0.1	88.4	82.7	77.2
United States	100.0	100.0	100.0	0.0	0.0	100.0	100.0	100.0

Sources: [a], [b], [c]: see Table 1; [d]: calculated by applying an elasticity of -0.35 to the per cent gap with the United States in the number of hours worked; [e]: calculated by applying a coefficient of -0.50 to the percentage point gap with the United States in the employment rate. The origin of these two coefficients is explained in the text.

Concluding Remarks

While the usual caution must of course be exercised in considering the above analysis, the insight it provides nonetheless constitutes a valuable springboard for reflection. It suggests that the gap between European countries' and the United States' per capita GDP can certainly not be interpreted as being solely the expression of a social choice combining superior productive performance and a stronger preference for leisure time. Moreover, it is worth examining the real nature of the social choice in question, which may be partly fostered by various tax measures (Cette and Strauss-Kahn, 2003). Thus, with regard to employment rate and working hour differentials between a large number of European countries and the United States, Prescott's analysis (2003) holds institutions largely responsible while Blanchard (2004) attributes even greater responsibility, especially as regards working hour differentials, to the expression of preferences, in other words, social choices.

Appendix

International Comparisons of Productivity and GDP Statistics are Inevitably Subject to Comparability Problems

Estimates of macroeconomic variables such as employment, hours worked and GDP have limitations for cross-country comparisons since the definitions and measurement conventions underlying these estimates vary from one country to the next and may change over time. This means that international comparisons and long-run analyses may be subject to a wide margin of error. Recent discussions on international comparisons of per capita GDP in France testify to their fragility and prompt us to consider only sizeable differences as robust. Ahmad et al. (2003) discuss several comparability issues in detail. What follows are some illustrations of problems involved in measuring GDP and employment.

Two usual examples of GDP measurement elements that are likely to introduce bias into international comparisons can be cited.

First, the conversion of GDP into a common monetary unit for the purposes of international comparisons may be based on several different conventions. Thus, differences in conversion conventions can change the per capita GDP rankings of countries where the figures are close (Magnien, Tavernier and Thesmar, 2002). This means that rankings of countries based on the level of a per capita GDP indicator should only consider large differences as significant and that rankings should not be established for countries where the indicator levels are close.

Further, some national accounts conventions may vary from one country to the next, which can lead to bias in productivity or per capita GDP comparisons. The biggest differences among developed countries are between European and U.S. conventions. U.S. conventions tend to result in higher GDP and GDP growth than European conventions. Three illustrations of such differences can be cited. All three deal with the issue of the allocation of consumption to final consumption and intermediate consumption (Cette and Stauss-Kahn, 2003 and Lecat, 2004).

- First, the FISIM (financial intermediation services indirectly measured) item is treated as intermediate consumption exclusively in Europe, whereas some of it is counted as household consumption in America and thus included in America's value added and GDP. This difference in conventions appears to increase U.S. GDP by some 2 per cent to 3 per cent with regard to European conventions.
- Second, spending on military equipment is treated as government intermediate consumption in Europe, whereas the United States counts some of this spending as investment, which increases GDP accordingly.
- Third, the classification of business expenditure on software as intermediate consumption in Europe and investment in the United States increases U.S. GDP compared to that in European countries (Lequiller, 2000). The latter difference in conventions appears to increase the United States' GDP by about 0.75 per cent compared to France. In more general terms, international comparisons of information and communications technology (ICT) are sometimes complicated by differences in accounting conventions (Cette, Mairesse and Kocoglu, 2000 and 2002).

The combined effect of these three differences in accounting conventions appears to 'inflate' American GDP by some 2 per cent to 5 per cent compared to European standards.[9]

The measurement of employment and hours worked can also be complicated by the lack of standardized conventions and changes in conventions. We can cite three examples of such difficulties.

- First, aggregate employment includes self-employed and unpaid workers and the proportion of such workers varies over time and from one country to the next. Measuring hours worked for this population is very problematic. This is particularly true of the unpaid family workers included in this population. Unpaid family workers accounted for 4.4 per cent of aggregate employment in France in 1980, versus 0.7 per cent in the United States and 10.9 per cent in Japan. The figures for 2002 were 1.7 per cent, 0.1 per cent and 4.8 per cent respectively (OECD, 2003a).
- Second, in some countries, the techniques and definitions used in the measurement of working hours have changed over time. For example, in France, when the statutory work week was reduced to 35 hours, the definition of hours worked was changed, which may have affected the measurement of hours worked made on the basis of business surveys.
- Third, and also in France, the introduction of tax deductions for households' expenditure on domestic help also led to the legitimization of many previously undeclared jobs (Audirac, Tanay and Zylberman, 1998). National accounts staff try to account for undeclared work in the GDP estimates, but not in the measurement of employment. Thus, the legitimization of some previously undeclared jobs could lead to a reduction in apparent labour productivity, all else being equal. Some of the decrease in labour productivity seen in Spain in the mid 1990s was probably due to a bias of this type.

We should also point out that productivity comparisons between industries are even more complicated. Two examples can be cited to support this.

- First, agency temps are counted as business service workers, even though about half of them work in the manufacturing industry in France. This distorts productivity estimates when output is measured in terms of gross output. It also distorts productivity estimates when output is measured in terms of value added, because the structure of temporary jobs by skills requirements is very different from the overall structure of jobs in the industries relying heavily on agency temps. This problem is especially acute in France because the use of agency temps is much more common than it is in other industrialized countries (Gonzalez, 2002).
- Second, in certain industries, distinguishing between volume changes and price changes in the measurement of output growth can be very difficult if these characteristics are subject to rapid change. This is particularly the case in the information and communications technology industries, where the case of mobile telephony services cited by Magnien (2003) provides a stark illustration.

The review of these measurement problems – and we could cite many others – tells us that we need to be very careful when making international comparisons and that we should only consider large differences as robust.

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9 It is worth pointing out, in addition, that at the total economy level, measures of productivity are not significantly affected by the methods used to carry out the volume-price breakdown of GDP, and, consequently, by the possible application of hedonic methods in the estimation of price indexes for certain products (Ahmad et al., 2003, and Schreyer and Pilat, 2001).

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