

Inflationary Bias in Mid to Late Transition Czech Republic

Randall K. Filer and Jan Hanousek*

April 2003

Abstract: A series of studies confirm results presented Filer and Hanousek (2000) suggesting that mismeasurement of inflation during the transition is a serious problem, on the same relative order of magnitude (and greater in absolute magnitude) as in advanced market economies. Overall, inflation has been overstated by more than 4 percentage points a year during the 1990s in the Czech Republic. By far the largest portion of this bias is due to uncaptured quality changes. In effect, Czech consumers are living considerably better after the fall of communism, but this increase in living standards has manifested itself through better quality rather than greater quantities of goods consumed.

JEL: C82, E31, P24

Keywords: Inflation Bias, Transition Economies

* Randall K. Filer is Professor of Economics at Hunter College and The Graduate Center, CUNY and CERGE-EI, a joint workplace of Charles University and the Academy of Sciences of the Czech Republic. Jan Hanousek is Citibank Professor of Economics at CERGE-EI. Both are also Research Associates of the William Davidson Institute. This research was supported by grants P97-8119-R from the Phare ACE Programme of the European Union and II/75831 from the Volkswagen Foundation. The authors gratefully acknowledge comments from Emil Stavrev, Michael Burda and participants at the Phare ACE workshops held at CERGE-EI in February 2000 and August 2001. We especially want to thank the Prices Department of the Czech Statistical Office for their cooperation in providing access to the required data and their unfailing consideration in providing background information that significantly improved our understanding of key issues.

Introduction

In earlier work (Filer and Hanousek, 2000) we speculated about the possible extent of bias in measures of inflation during transition, suggesting that these biases might sum to as much as 3 percentage points (one third of measured inflation levels) and that much smaller levels of bias, on the order of magnitude of those that had been found in many Western economies, might substantially alter the general impression of the extent of the success or failure of the first decade of the transition from communism to free markets.¹ We are now in a position to evaluate the accuracy of the earlier estimates using actual data for the Czech Republic. While some sources of bias appear to be smaller than we originally supposed, overall it seems that the simulation results suggesting that reported inflation rates during transition may be up to twice the level of actual inflation remain reasonable. Importantly, the most significant source of bias turns out to be quality improvements that have occurred in products across the spectrum of consumer goods. These improvements will have been missed in all quantity-based measures of national output. Thus, GDP deflators as well as Consumer Price Indices have been overstated during transition. In effect, citizens of the Czech Republic are substantially better off than they were in 1989. This improvement in living standards has, however, taken the form of the consumption of far better products than they were able to purchase earlier rather than an increase in the physical quantity of products consumed. By focusing on quantities, measures of inflation, GDP and incomes have missed much of the improvement in living standards since the end of communism.

¹ For other discussions of possible biases in inflation during transition, see Brada, King and Kutan (2000), Koen and De Masi (1997), and Duchene and Gros (1994).

One would expect the transition to pose a particular challenging environment in which to measure inflation. The changes involved in moving from a planned, shortage economy to a market one will be connected with massive changes in the availability and relative prices of various products. Hence transition countries will find the classic problems of CPI measures compounded.²

Theoretically, two conceptually different approaches can be used to capture changes in prices: 1) measuring the income change required to maintain a fixed level of consumer utility between the periods studied, and 2) measuring the change in the cost of a fixed basket of goods.³ The first framework produces a *cost of living index* (CLI), while the second results in a *consumer price index* (CPI). As discussed in Triplett (2001), cost of living indices appear to be a more relevant concept for public policy purposes. Given the complexity of measurement and computational requirements, however, statistical offices generally opt to produce a price index (usually a modified Laspeyres index where items in the market basket are weighted according to consumption patterns in an initial base period).

Unfortunately, policy makers are often not fully aware of the difference between price indices and cost of living indices and tend to use readily-available CPI measures for purposes for which unavailable CLI measures would be better suited. In the transition countries, without a

²There are additional problems of inflation measurement that are unique to the transition environment and beyond the scope of this paper. Like most countries, the Czech Republic includes the cost to consumers of subsidized products in the basket used to compute price indices but does not explicitly offset increases in these prices due to reduced subsidies with the gains to other consumers from reduced need to pay for the subsidies. This creates a potential overstatement of inflation if the number and amount of subsidies is changing over time and if these subsidies are paid for out of general tax revenues such as income taxes. In fact, under communism, products were generally subsidized out of "taxes" imposed on the surplus generated by other, less favored products. Thus, in inflation measurement, increases caused by removal of subsidies on some products will, in large measure, be offset by lower price increases for the products no longer being forced to cover transfers to loss-making producers.

³ Triplett (2001) provides a good analysis of pros and cons of these two alternatives.

long-history of accurately measuring price changes, users of this data have made the implicit assumption that a consumer price index, as conventionally calculated, can be used for policy purposes as if it were a cost of living index.

We now turn to an examination of various sources of possible bias, comparing our analysis of probable levels of bias of each type with our earlier simulation-based estimates for the Czech Republic and with magnitudes found in other, more stable, economies.

1. Substitution Bias

Filer and Hanousek (2000), speculated that consumer substitutions as relative prices changed might have resulted in an “upward bias in the CPI [that] might have been around 1.24 percentage points for 1996 and 0.77 percentage points in 1997” during years when the reported inflation rates were 8.8 and 8.5 per cent respectively. Using the 738 representatives in the Czech consumer price basket, Hanousek, and Filer (2002b) have now calculated Fisher Exact Price Indices for the Czech Republic.⁴ Results are shown in Table 1, where for exposition’s sake, the previous year is taken as 100 in all cases.

⁴ The Fisher Exact Index (Fisher, 1927) is calculated as the geometric mean of a Paasche and a Laspayres Index or $[p^1 \cdot x^0 p^0 \cdot x^1 / p^0 \cdot x^0 p^0 \cdot x^1]^{1/2}$ where vectors of p and x are prices and quantities in periods 1 and 0 and $p \cdot x$ represents the inner product of a price and quantity vector. Diewert (1976) provides a number of reasons why a Fisher Exact Index Number should be “preferred in empirical applications” including simplicity and the fact that it is the only index consistent with an aggregator function that can provide a second-order approximation to an arbitrary twice-differentiable linear homogeneous utility function. In other words, under reasonable assumptions, the Fisher Exact Index is a true cost of living index, For a more detailed discussion, see Hanousek and Filer (2002b) .

Table 1. Alternative Price Indices - Czech Republic
(Previous year = 100)

	Modified Laspeyres (1989 or 1993 weights)	Paasche (current weights)	Superlative (Fisher Exact)	Absolute CPI bias	Bias as % of Increase in Fisher Index
1991	156.6*	148.5	152.5	4.1	7.81
1992	111.1*	112.1	111.58	-0.48	-4.15
1993	120.8*	119.3	120.03	0.77	3.84
1994	110	n.a**.	n.a.	n.a.	n.a.
1995	109.1	108.5	108.8	0.3	3.41
1996	108.8	107.8	108.30	0.50	6.02
1997	108.5	107.8	108.15	0.35	4.29
1998	110.7	109.5	110.1	0.6	5.94
1999	102.1	101.9	102	0.1	5

Source: the CSO and authors' computations.

*Uses 1989 weights

**Because of mid-year changes of the consumer basket and weights, we are not able to calculate a Paasche index for 1994.

Using these results, a conventional Laspeyres index seems to overstate the cost of living index by about 0.4 percentage points (5 per cent of inflation rates) per year due to substitution across referent items alone. The exception to this pattern is early in transition (such as 1992) when elimination of shortages prevailing as a legacy of central planning, combined with a shift to market prices, resulted in the Paasche Index exceeding the Laspeyres Index.

Since referent items are broadly defined,⁵ it is likely that a great deal of substitution took place within referent items. This is especially important given that in the Czech Republic when a particular product is replaced in a store/item sample unit within a referent category the linking

⁵ Examples include “ladies’ walking shoes,” “electric iron,” or “sleeping bag.”

is done immediately unlike in the US where there is a seasoning process whereby items are excluded from calculations for the first several months after price sampling starts for them to eliminate any transitory effects at the time of introduction.

Given the likelihood of substitution across various brands of products as relative prices change and the fact that broad level substitution across the very different types of products defined at the referent level accounts for about a 5 per cent upwards bias, it appears that the original overall estimate of between 9 and 14 per cent may be approximately accurate.

2. Outlet Substitution

It is clear that there has been a major shift in distribution channels during transition as conventional small retail shops are supplemented by larger hypermarkets and discount stores. In the earlier paper we speculated that substitution to cheaper outlets might have added about 0.65 percentage points to inflation rates in 1996 and 1997.

Currently the Czech Statistical Office collects 2827 of its 27,801 (10.2 per cent) item/store pair individual prices for food and beverages in hypermarkets. Independent market research firms report that such stores have captured approximately 20 per cent of the food and beverage market. Similarly, they now account for about 10 per cent of clothing and footwear sales as opposed to the 5 per cent of prices for clothing and shoes collected from hypermarkets by the Czech Statistical Office. Discount stores, which concentrate on food and beverage items, account for about 10 per cent of sales in this area as opposed to the 3 per cent of prices collected from this type of low-priced store by the Czech Statistical Office. Similar differences exist with respect to other categories such as electronic equipment or recreational items. Thus, there is

certainly room for outlet substitution to lead to overstated prices in the last half of the 1990s when these stores have become more common.

Table 2 shows that there are price differences between hypermarkets and discount stores and more traditional outlets, although these differences are smaller than 15 per cent assumed in the earlier paper. More critically, there are no reported price differences in areas other than food and clothing. This seems to contradict the widespread presumption among Czech shoppers that hypermarkets offer better values than conventional stores. Several possibilities may explain these findings. The Czech Statistical Office prices standard sizes in the consumer price index, so the advantage of hypermarkets may lie in offering larger sizes at lower unit costs even though these are excluded from the consumer price basket. Alternatively, for items such as cameras or electronic goods hypermarkets offer better value by providing higher quality product varieties at the same price as smaller stores, differences in quality that are not captured by price index samples.

Table 2
PRICE DIFFERENCES BETWEEN VARIOUS TYPES OF OUTLETS

	Food: Hypermarket vs. Food Shop	Food: Discount Store vs. Food Shop	Food: Hypermarket vs Supermarket	Food: Discount Store vs. Supermarket	Clothing: Hypermarket vs. Clothing Store
Price Difference	-8.9%	-9.4%	-7.4%	-7.9%	-2.9%

Tables 3a and 3b show the implicit annual overstatement of price increases in the food, beverage and clothing categories created by the under representation of hypermarkets and discount stores in the outlet sample from which prices are collected. Scaling up these observed

possible biases by the share of food, beverage and clothing in the consumer basket suggests that in total price increases were overstated by 0.10 percentage points a year, substantially less than our earlier speculation.

Table 3a
IMPLIED BIAS FROM OUTLET SUBSTITUTION TOWARDS HYPERMARKETS
1997 - 2001

	Estimated Market Share - 1997	Estimated Market Share - 2001	Official Market Share	Estimated Price Difference	Implied Annual Bias
Food & Beverages	0%	20%	10%	8%	0.2%
Clothing & Shoes	0%	10%	5%	3%	0.04%

Table 3b
IMPLIED BIAS FROM OUTLET SUBSTITUTION TOWARDS DISCOUNT STORES
1994 - 2001

	Estimated Market Share - 1994	Estimated Market Share - 2001	Official Market Share	Estimated Price Difference	Implied Annual Bias
Food & Beverages	0%	10%	3%	9%	0.1%

3. Quality Improvements and New Goods

As is well known, planned economies had a tendency to sacrifice quality for quantity since the latter is easier to measure and specify in a planning environment (see Stiglitz 1994).

Thus, it is not surprising that the transition involved a massive upgrading in quality.⁶ In the Czech Republic, automobiles made by Škoda went from being the butt of countless jokes⁷ to a car that placed first in the JD Powers survey of consumer satisfaction among UK drivers in 1998. Yet according to the official quality adjustment of the Czech Statistical Office, the Škoda that won that consumer satisfaction survey was only a 5 per cent higher quality car than the model made by the communists at the start of transition. Similar uncaptured improvements in quality occurred in a wide range of products, most entirely missed by statistical offices in the region.

Mikulcová, Hanousek and Filer (2003) provide hedonic estimates of the measurable quality improvement due to changes in observable characteristics for automobiles, video cameras and video recorders in the Czech Republic. Between 1993 and 1995 prices for the automobile component of the Consumer Price Index (2.5 per cent of the entire basket) were reported by the Czech Statistical Office to have increased by 23.1 per cent after adjustment for quality improvements. Hedonic regressions, on the other hand, suggest that prices increased by only 4.5 per cent during this two year period. Thus, failure to correct for only observable differences in these cars led to price increases being overstated by 0.25 percentage points per year during this two year period. For video cameras the Czech Statistical Office reported a decrease in prices of 7.9 per cent between 1996 and 1998 while a quality-adjusted hedonic regression found an actual price decrease of 19.3 per cent. The corresponding official change in prices for VCRs was minus 15.6 per cent between 1996 and 2000, a period when hedonic regressions based on

⁶ Given the broad nature of products in the Czech consumer price basket, there were very few “new” products introduced over the past decade. Rather, the referent was redefined to reflect changes in brands or characteristics. We leave it for further research, therefore, to investigate the introduction of previously unavailable items into post-communist societies.

⁷ Q. What do you call a Škoda driver who says he has a speeding ticket? A. A dreamer

observable characteristics suggest that prices fell by 37.6 per cent. VCRs comprise 0.41 per cent of the Czech consumer basket. This implies that quality changes in VCRs alone caused inflation to be overstated by 0.03 percentage points per year over the second half of the 1990s.

Of course, observable characteristic changes provide at best a lower bound on the extent of post communist quality improvements. Much of the story consist of improvements in the performance of apparently identical products. Thus, for example, hedonic regressions will miss automobile quality improvements due better fitting parts assembled more tightly leading to a smoother ride and lower noise level. What we would like to know is how much better Czech consumers think the current Škoda is than the version available at the start of the transition? Hanousek and Filer (2002) report the results of asking a focus group of consumers exactly this question. Between 1990 and 2001 the price of the Škoda automobile included in the consumer price basket as measured by the Czech Statistical Office increased from 86,708 crowns to 260,000 crowns or 199.9 per cent. Slightly less than a quarter of this increase was attributed to quality changes by the CSO, such that the automobile component of the CPI was reported to have increased by 155.1 per cent. When consumers were asked what would be a fair price in today's market for the 1990 vintage Škoda, they reported that they would be willing to pay 135,000 crowns right now for the older version (assuming it were on sale as a new car) given that they could also purchase the current version for 260,000 crowns. Thus, instead of allocating 22 per cent of the total price increase to quality changes as reported by the CSO, consumers themselves allocated 72 per cent of the price change to quality improvement.⁸ On a compound basis, the CSO reported that automobile prices increased 9.8 per cent a year after quality

⁸ Calculated as $(260,000 - 135,000)/(260,000 - 86,708)$.

adjustments (11.6 per cent a year before such adjustments). When consumers' opinions regarding quality improvements are considered, the true price increase was 4.5 per cent a year, less than half the official level.

Hanousek and Filer (2002) conducted a similar exercise for 64 products out of the 750 in the consumer basket. Because of their greater than average importance, these products accounted for a total of 16.2 per cent of the weight in the basket. Table 4 contains the results of asking consumer to report their evaluation of the relative quality of various groups of items.⁹ Across all these items (weighted by their share in the consumer price basket), the official annual inflation rate over the decade of the 1990s was 9.1 per cent a year after official quality adjustments (and 9.6 per cent a year without such adjustments). When consumers' perceptions of quality improvements are allow for, however, the annual increase in prices is reduced by almost 4 percentage points a year to 5.2 per cent.¹⁰

Reported quality improvements are smallest for food and beverages, averaging around 13 per cent. Thus, the vast majority of the price increase of somewhat over 100 per cent for these items was true inflation. Indeed, for some foodstuffs, consumer groups reported no quality improvement or even a quality decline since the end of communism. Respondents reported the greatest increase in quality for personal care products and recreational products, followed by clothing and home care products.

⁹ For the individual items themselves see Hanousek and Filer (2002), available at http://www.cerge-ei.cz/publications/working_papers/pdf/Wp184.pdf.

¹⁰ This difference probably understates the true impact of changes during the transition since it is based on prices paid when products were available and ignores the impact of waiting time or constrained choices under the planned economy.

Table 4
Summary of focus group quality adjustment estimates

Product Description	Weight 1990	Number of Items Studied	% Price Increase	Index Increase	Captured Change	% Quality Change	% Actual Price Increase
Food	68.3	18	110.94	111.08	-0.14	13.72	86.29
Beverages	4.9	2	242.86	228.09	14.77	12.24	214.29
Clothing	5.6	6	259.86	229	30.86	165.13	47.4
Shoes	1.4	2	290.65	272.28	18.37	98.69	97.51
Accommodation	0.9	2	264.20	261.18	3.02	136.6	70.22
Furniture	9.7	4	212.56	202.89	9.66	68.66	97.91
White Goods	1.6	2	227.21	216.91	10.3	-0.97	229.09
Home Appliances	7.3	6	204.86	198.27	6.59	86.38	59.68
Electric Supplies	1.1	1	310.00	329.67	-19.67	266.84	11.76
Home Care Products	3.5	3	529.88	511.11	18.77	147.72	162.51
Transportation	27.6	4	206.61	163.09	43.52	86.72	69.33
Recreational Products	15.6	7	36.65	34.16	2.49	266.78	-50.13
Amusement Services	1.9	2	202.37	202.12	0.25	95.92	54.69
Personal Care Products	9	5	71.25	70.65	0.60	289.07	-33.38
Total of Studied Items	161.9	64	149.99	139.41	10.58	84.17	65.95

4. Total Bias and Comparison With Other Countries

Table 5 summarizes the extent of CPI bias from the several sources considered above for various industrial countries. Given the high absolute rate of inflation in the Czech Republic during this period, however (at least relative to industrial countries), the absolute bias is considerably larger than in more stable economies. The striking finding, however, is that with the exception of Japan, with its very low inflation rates, the relative bias in the transition Czech Republic, expressed as a percentage of average inflation, is similar to that found in many other countries such as the U.S., Germany and Switzerland.

Table 5
Estimates of inflation bias and its sources*
 (All figures are percentage points per year)

Source	Product substitution bias	New product & quality change bias	Outlet substitution bias	Total bias	Average inflation *
Boskin et. al. (1996), USA	0.4	0.6	0.1	0.8-1.6	2.8
Crawford (1993), Canada	0.1	0.5	0.1	0.7	5.1
Cunningham (1996), UK	0.05-0.1	0.2-0.45	0.1-0.25	0.35-0.8	2.9
Hoffmann (1999), Germany	0.1	0.3	<0.1	0.5	1.1
Shiratsuka (1999), Japan	0.1	0.7	0.1	0.9	0.6
Brachinger et. al. (1999), Switzerland	0.4	0.1-0.2	0	0.5-0.6	1
Diewert (1997), typical index	0.2	>0.35	0.25	>0.8	N.A.
Filer, Hanousek (2000), Czech Republic	0.8-1.2	1.0	0.7	2.5-2.9	8.7
This study, Czech Republic	>0.8** >0.4***	3.9	0.1	>4.8** >4.4***	13.2** 9.9***

* Average of three years starting 5 years prior to the publication date of the paper to allow for publication lags except for Filer & Hanousek (2000) which used actual figures for 1996 and 1997 and this paper which uses compounded rates from 1990 to 2001.

** 1990 to 1999

*** 1993 to 1999

In comparison to the earlier simulation results presented in Filer and Hanousek (2000) contained in the next to last row of Table 5, the more complete results summarized in the final row show differences due to substitution that seem to be about as large as the earlier work suggested once substitution across products within referent groups is allowed for, while finding that outlet substitution appears to be less significant than previously assumed. The most important difference, however, is the large role played by unmeasured quality improvements that

occurred as the substandard goods of the planned economy were replaced by world-class products. Czech consumers believe that over 40 per cent of the apparent annual price increase in the items studied over the decade represents an improvement in the quality for the goods they can purchase. In short, according to consumers themselves they are living substantially better at the end of the 1990s than they were when the transition started. This increase in well being has largely been missed by official statistics that report relatively unchanged real incomes because it has occurred primarily in terms of consumption of higher quality goods and services rather than greater unit consumption. Overall, the combined influence of these several sources of difference suggests that official CPI increases may have overstated true cost of living increases during the first decade of the transition by at least a third, and by well over 40 per cent once the initial years of price decontrol are excluded from the analysis.¹¹

5. Policy Implications

The fact that official statistics overstate true inflation rates during the transition has a number of significant policy implications, particularly if policy makers erroneously assume that they are dealing with a cost of living index and based decisions on inaccurate perceptions of changes in consumers' welfare. This is especially true if CPI measures are used to judge applicant countries' success in conforming to the Maastricht criteria for inflation rates required to join the European Monetary Union. There are other implications for the accession process. Negotiations are focusing on issues such as freedom of labor mobility and amounts of structural

¹¹ These findings are consistent with other evidence suggesting that CPI measures increases in the cost of living. Filer and Hanousek (2002) report the results of surveys of Romanian households in early 2001. Although the official inflation rate for the year 2000 was 40%, the implicit inflation rate that maximized the number of respondents whose reported real income change was consistent with their self-reported change in economic well being was less than 20 percent.

assistance. If inflation rates are overstated (and, consequently, real incomes are understated), then current EU members may be excessively fearful of labor mobility, delaying one of the most significant benefits of the single market.

Domestically, upwardly biased measures of inflation that result in an overstatement of income declines and understatement of real incomes and living standards could create greater pressure for spending on social assistance programs at a time when all transition economies face the need to reduce government spending and growth-inhibiting tax rates. In addition, Central Banks focusing on overstated inflation rates are likely to be overly restrictive, thereby reducing growth rates and inhibiting a rapid restructuring of the post-communist economies. Finally, if citizens believe official reports of declining real incomes overall despite their own perception of increasing standards of living due to quality improvements, there is likely to be a political reaction, reducing public support for necessary market reforms and increasing political instability.

6. Conclusion

Simulations in Filer and Hanousek (2000) suggested that official measures of consumer price inflation in the Czech Republic were likely to overstate increases in the cost of living by over 25 per cent (and perhaps by as much as 50 per cent) in 1996 and 1997. These estimates, however, were based on a series of assumptions that had not been verified. Now, results from a variety of studies over a longer period find that the degree of bias suggested in the earlier work may have even understated the true difference between these two measures.

The bottom line is that real growth rates in the transition Czech Republic (and by analogy other transition economies) have been much greater than commonly believed. Adjusted by changes in the CPI, the Czech economy reported shrank by a compound 0.7% per cent a year between 1990 and 1999. Our lower-bound estimate of the bias in inflation of 36 per cent implies, however, that properly measured the economy grew on average by 3.6 per cent a year during this period. Given that the vast majority of this bias is due to uncaptured quality improvements, a similar conclusion would apply to real growth rates using other inflation measures such as the GDP deflator. Correct inflation adjustment would have a major impact on beliefs about the success of the move to market economy and the speed of convergence to EU economic levels.

References

- Boskin, Michael J., E. Dulberger, R. Gordon, Z. Griliches, and D. Jorgenson. 1996, "Toward a More Accurate Measure of the Cost of Living." *Final Report to the Senate Finance Committee*, (December 4, 1996)
- Brachinger, Hans Wolfgang, Bernd Schips, and Winfried Stier (1999) "Expertise zur Relevanz des "Boskin-Reports" für den schweizerischen Landesindex der Konsumentenpreise." *Neuchatel: Bundesamt für Statistik*.
- Brada, Josef C, Arthur E. King and Ali M. Kutan, 2000, "Inflation Bias and Productivity Shocks in Transition Economies: The Case of the Czech Republic," *Economic Systems*, 24 (2): 119-138.
- Crawford, Allan. 1998, "Measurement Biases in the Canadian CPI: An Update." *Bank of Canada Review*, Spring, pp. 38-56.
- Cunningham, Alastair W. F., 1996, "Measurement Bias in Price Indices: An Application to the UK's RPI." *Bank of England Working Paper Series 47*.
- Diewert, W. Erwin, 1976, "Exact and Superlative Index Numbers." *Journal of Econometrics*. 4 (2): 115-45.
- Diewert, W. Erwin, 1997, "Comment." In: Timothy Bresnahan, Robert J. Gordon (eds.) *The Economics of New Goods. Studies in Income and Wealth 58*, pp. 423-433. Chicago: University of Chicago Press.
- Duchene, G. and Gros, D. 1994. *Cases of Output Decline in Reforming Economies*, Center for European Policy Studies, Brussels.
- Filer Randall K., and Jan Hanousek, 2000. "Output Changes and Inflationary Bias in Transition," *Economic Systems*, 24 (3): 285_294.
- Filer, Randall K. and Jan Hanousek, 2002 "Survey-based Estimates of Biases in Consumer Price Indices During Transition: Evidence from Romania ," *Journal of Comparative Economics*, Forthcoming
- Fisher, Irving, 1927, *The Making of Index Numbers: A Study of Their Varieties, Tests, and Reliability*. Boston: Houghton Mifflin, Reprinted 1967 New York: Augustus M. Kelly.
- Hanousek, Jan and Randall K. Filer, 2002, "Consumers' Opinion of Inflation Bias Due to Quality Improvements in Transition in the Czech Republic," Prague: CERGE-EI Working Paper 184.

- Hanousek, Jan, and Randall K. Filer, 2002b, "Evaluating Imperfections and Biases in Price Indices During Transition," Prague: CERGE-EI Working Paper 189.
- Hoffmann, Johannes, 1999, "Problems of Inflation Measurement in Germany: An Update," Eurostat Conference, Cardiff, UK, September 1999, [www.cf.ac.uk/carbs/confereces/past/mick.pdf]
- Koen, Vincent and Paula De Masi (1997) "Prices in Transition: Ten Stylized Facts" Washington: IMF Working Paper No. 97/158
- McClelland, Robert, 1996, "Evaluating Formula Bias in Various Indexes Using Simulations," BLS Working Paper 289. Washington, DC: U.S. Bureau of Labor Statistics.
- Mikulcová, Elena, Jan Hanousek and Randall K Filer 2003 "Hedonic Adjustments for Quality Changes in the Czech Republic," Prague: CERGE-EI Discussion Paper 2001-zzz.
- Shiratsuka, Shigenori (1999) Measurement Errors and Quality-adjustment Methodology: Lessons from the Japanese CPI. *Federal Reserve Bank of Chicago*, Economic Perspectives, pp. 2-13.
- Stiglitz, Joseph E. 1994. *Whither Socialism?*, Cambridge, MIT Press
- Triplett, Jack E., 2001 "Should the Cost-of-living Index Provide the Conceptual Framework for a Consumer Price Index?" *Economic Journal*, 111, 311-334.