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Price Measurement and Mismeasurement in Central Asia

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Abstract

The vertiginous increases in the overall price level and dramatic swings in relative prices experienced by Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan since the onset of the transition rendered their traditional Paasche retail price indices obsolete and called for the introduction of Laspeyres consumer price indices. While the latter represent a major improvement, several measurement or interpretation issues remain, reflecting various potential index number biases, dispersion of prices and inflation across geographical areas and social groups, discontinuities in the inflation process, residual shortages, and seasonality.

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Summary

This paper examines consumer price measurement issues as they arise in Kazakhstan, the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan. Much of the discussion also applies to other transition economies, where absolute and relative price movements have been similarly dramatic during the last few years. Under these circumstances, vastly different estimates of increases in the overall price level are obtained depending on which index is actually used.

The Paasche retail price indices inherited from the central planning regime had a number of shortcomings. In particular, they suffered from inadequate geographical, outlet, and product coverage, and their shifting weights precluded chaining. These indices were therefore gradually replaced by Laspeyres consumer price indices.

Although the introduction of Laspeyres indices represents a distinct improvement, a number of practical and conceptual problems remain. The former include insufficient coverage of private outlets, use of inappropriate exchange rates, and the lack of human and computer resources needed to produce a reliable price index. The latter encompass the urban bias typically affecting the consumer price index, the exclusion of certain social groups, the treatment of expenditure inequalities across households, and the use of fixed base-period quantities as weights, which prevent the Laspeyres index from capturing substitution effects.

Even if one were satisfied that the optimal implementable index formula has been selected, the question remains of the appropriate level at which to compute it. Since prices vary substantially across regions and consumption patterns differ across social groups, it may be worth considering a set of specialized subindices in addition to the overall, national consumer price index.

Quite aside from the nature of the index formula and level of disaggregation, the signals sent by short-run movements in the consumer price index may be misleading in that they may not reflect actual inflation trends. High-frequency disturbances include discrete adjustments in administered prices, shifts in the taxation mix, and seasonal variations. The persistence of shortages may also distort the meaning of the index.

I. Room for Confusion

By mid-1994, the price of cottage cheese in Kazakhstan was reported to have risen by 29,000 times from its pre-transition December 1990 level, the price of milk by 14,600 times, the price of potatoes by 5,700 times, the price of vodka by 2,600 times, and the price of bread made of first category flour by 900 times. Similarly dramatic price developments were witnessed in the Kyrgyz Republic, Tajikistan, Turkmenistan, and Uzbekistan since the onset of the transition. The question immediately arises of the implications for living standards of such vertiginous and disparate surges in prices. More narrowly, how reliable are the aggregate price measures used to deflate household incomes and expenditures under such circumstances?¹

Since prices of individual items move at widely different speeds, the choice of the index used to compute aggregate price levels is far from neutral. Enormous differences appear between alternative measures of inflation associated with different price indices, as illustrated by Table 1 which compares inflation as quantified by a retail price index and by a consumer price index in selected 12-month periods for the five countries of central Asia. Not only do extremely large discrepancies emerge, but even the direction of the bias is not uniform, with one index rising much more than the other in some countries, and much less in others.

These price indices are used for indexation purposes, for example to periodically revise minimum wage and minimum pension levels. They also obviously play a key role in economic analysis, including to assess inflation and real wage developments or to monitor poverty levels. Thus, the choice of the index is likely to have serious implications for policy design and outcomes. Another way to highlight the magnitude of potential errors is to compare the path of real wages using alternative deflators. As shown in Chart 1 for Kazakhstan, the real wage seems to increase from 1992 to 1993 based on the retail price index, whereas it seems to fall based on the consumer price index. Even more importantly, the average 1993 level of the real wage is more than twice as large using the retail price index than using the consumer price index.²

This paper focuses on the prices faced by households, abstracting from producer prices. Section II describes the transition from the retail price indices (RPIs) in place at the time of the dissolution of the USSR to more appropriate consumer price indices (CPIs). Section III discusses the implications of price heterogeneity across regions and social groups. Section IV warns against the potentially misleading signals that even correctly designed and computed price indices may send. Section V concludes.

¹Most of the discussion in this paper would also be relevant for the other countries in transition.

²As another example, Haley and Shabsigh (1994) describe the financial programming dilemmas faced in Moldova by the authorities and the IMF team as a result of consumer price index problems.

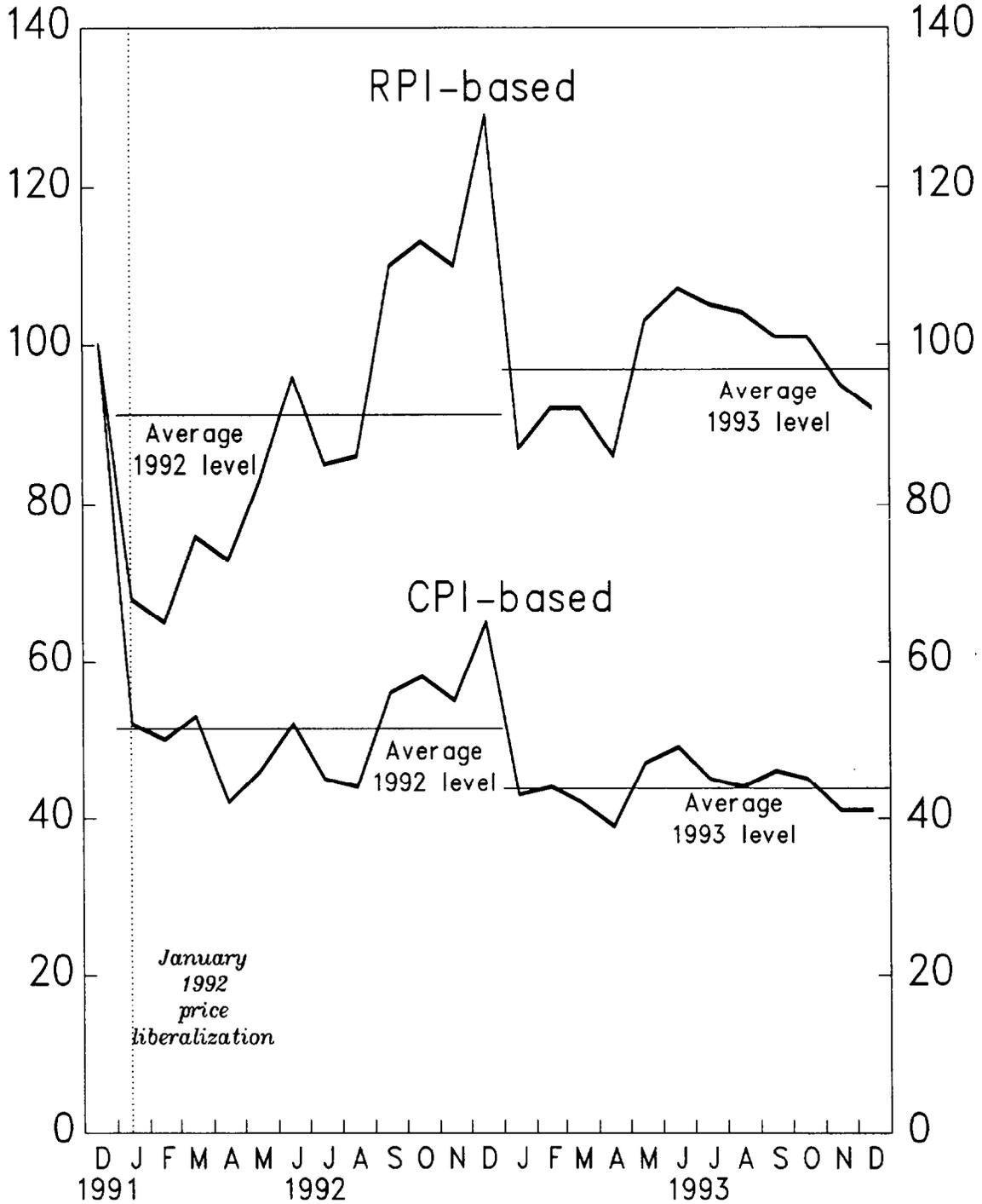
Table 1. Divergence Between RPI and CPI

	Divergence ¹	Period
Kazakhstan	2.0	December 1991 - December 1992
Kyrgyz Republic	0.6	December 1992 - December 1993
Tajikistan	0.7	December 1992 - December 1993
Turkmenistan	0.8	August 1993 - August 1994
Uzbekistan	2.1	December 1993 - December 1994

Sources: National Statistical Offices; IMF Statistics Department; and author's calculations.

¹If x is the percent increase as measured by the RPI, and y the percent increase as measured by the Laspeyres CPI, the divergence is defined as $(1+y/100)/(1+x/100)$. For example, if prices double according to the RPI but rise fourfold according to the CPI, the divergence is 2.

Chart 1
Kazakhstan: Alternative Real Wage Measures 1/
(December 1991 = 100)



Sources: Kazakh Goskomstat; and author's calculations.
1/ The wage measure does not take arrears into account.

II. From Paasche RPIs to Laspeyres CPIs

In the absence of any relative price changes, the various inflation indicators considered here would be equivalent. Because inflation is by no means homogeneous across items, sectors, locations, and households, especially in the early stages of the transition, its measurement is extremely sensitive to the characteristics of the index used. This section discusses the shortcomings of the price indices inherited from the central planning regime, summarizes the steps taken to replace the RPIs by CPIs, and highlights some of the advantages and limitations associated with the latter.

1. Obsolescence of the Paasche RPIs

The RPIs are Paasche indices based on retail delivery and sales weights. They started to be compiled at a monthly frequency in January 1991, typically with respect to the previous month and with respect to one year earlier:

$$P^{t-1,t} = \frac{\sum_{i=1}^n P_i^t q_i^t}{\sum_{i=1}^n P_i^{t-1} q_i^t} \quad (1)$$

$$P^{t-12,t} = \frac{\sum_{i=1}^n P_i^t q_i^t}{\sum_{i=1}^n P_i^{t-12} q_i^t} \quad (2)$$

where i indexes the items, p denotes elementary prices and q the associated quantities. The weights were thus revised every month (every year before 1991). The RPIs were used as a tool for planning and monitoring price developments at a very disaggregated level, and therefore had a very broad geographical coverage. In Kazakhstan for example, prices were collected in 97 districts out of 270.¹

Apart from the heavy computational burden implied by the use of current period weights, several major shortcomings plagued the RPIs. First, they covered an excessively large number of items (approximately 1,000 goods and 150 to 200 services), many of which were obsolete or unavailable.

¹The RPIs described here were introduced only in the late 1980s. Prior to 1989, a number of prices were taken from official lists rather than recorded *in situ*. See Atkinson and Micklewright (1992).

Notwithstanding the fact that this represents about three times as many items as in the U.S., British, or French CPIs, the assortment did not include some of the goods imported from outside the former Soviet Union. Moreover, the method of imputation for missing prices was often incorrect: in some cases, previous observations were simply carried over, which in a context of high, open inflation imparted a likely downward bias; in other cases, earlier rates of change were merely repeated.

Second, the number and range of outlets covered was typically limited and outdated: states and cooperative stores as well as kolkhoz markets were included but newly emerging private outlets were insufficiently taken into account or ignored altogether. Admittedly, in a pure command economy where all prices are set centrally and identically across distribution channels, outlet sampling is irrelevant, but even the Soviet economy did not conform to this model. The use of retail sales as opposed to consumer expenditure weights was misleading because private outlets were underrepresented, and because insofar as they were captured, double-counting of goods initially purchased at state stores and then resold privately was not controlled for.

Third, the specification of varieties lacked precision, meaning that model and quality changes could distort the index, all the more so as limited availability encouraged switching amongst varieties.

Fourth, the RPI for month n was only compiled in comparison with months $n-1$ and $n-12$. Given the shifting weighing structure, the cumulation of the 12 monthly changes from month $n-12$ to month n differed from the direct n over $n-12$ measure, making it impossible to construct a consistent historical price level series.

Fifth, geographical aggregation of local price data was apparently sometimes done without weighing the regions by consumer expenditures, implying that large and wealthy regions would be underrepresented and vice versa. If price variation across areas had been nil under central planning, no bias would have ensued. However, even in the old regime, prices were far from uniform across regions.¹

2. A new generation of indices

In collaboration with technical assistance missions from the IMF and the OECD, Laspeyres CPIs were set up in the countries of central Asia in 1993-94 (Table 2). The methodology was analogous to the one used in the Russian Federation in 1992, and in line with internationally agreed standards.² However, since it had become obvious already by 1992 that the traditional RPIs were increasingly inadequate, interim revised RPIs or so-

¹Another distortion was that side-payments (bribes) were not reflected in the RPIs. However, this problem might also affect CPIs.

²See Koen and Phillips (1993). The latter are spelled out, for example, in Turvey *et alii* (1989).

Table 2. Vintages of Monthly Price Indices¹

Index	Availability	Comments
Kazakhstan		
RPI	1991 →	Still published by Statistical Committee of the CIS
Hybrid CPI	...	Quarterly, unpublished
CPI	1992 →	Published by Kazakh Goskomstat
Kyrgyz Republic		
RPI	1991- ...	Published at least through 1993
Hybrid CPI	1991-1994	
CPI	1993 →	Published since January 1995
Tajikistan		
RPI	1991- ...	Published at least through 1994
Hybrid CPI	1990 →	Quarterly in 1990-1992
CPI	...	Experimental
Turkmenistan		
RPI	1991- ...	Published at least through 1994
Hybrid CPI	...	Monthly since 1993
CPI	1993 →	Experimental
MCBI	1992 →	Minimum consumption basket index
Uzbekistan		
RPI	1991- ...	Published at least through 1994
MCBI	...	Minimum consumption basket index
CPI	1994 →	Published since January 1995

¹Status as of early 1995. Monthly frequency unless specified otherwise.

called hybrid CPIs were introduced and used in several countries, following the guidelines of the former USSR Goskomstat.¹

In some cases, the RPIs were revised by extending the range of outlets covered. The hybrid CPIs used the same elementary price data as the RPIs, but with fixed weights reflecting household budget survey expenditure rather than retail sales turnover estimates. Thus, the hybrid CPIs shared the weaknesses of the RPIs stemming from deficient outlet and item coverage. Furthermore, at least some of the hybrid CPIs and revised RPIs turned out to be computed using a Sauerbeck rather than a Laspeyres algorithm. As shown by Lequiller and Zieschang (1994), the two formulae are deceptively similar but under the circumstances produce vastly different results.

The Sauerbeck formula for the price level index is as follows:

$$S^{0,t} = \prod_{\tau=1}^t \sum_{i=1}^n \omega_i^b \frac{p_i^\tau}{p_i^{\tau-1}} \quad (3)$$

where 0 is the base period and t the current period; ω stands for the expenditure weights, and b is the associated reference period, i.e.:

$$\omega_i^b = \frac{p_i^b q_i^b}{\sum_{i=1}^n p_i^b q_i^b}$$

The Sauerbeck formula can thus be described as a chain of fixed-weighted averages of short-term price relatives.

In contrast, the Laspeyres formula is a chain of averages of short-term price relatives but with time-varying weights:

$$L^{0,t} = \frac{\sum_{i=1}^n p_i^t q_i^0}{\sum_{i=1}^n p_i^0 q_i^0} = \sum_{i=1}^n \left[\omega_i^0 \frac{p_i^{t-1}}{p_i^0} \right] \frac{p_i^t}{p_i^{t-1}} = \prod_{\tau=1}^t \sum_{i=1}^n \left[\frac{\omega_i^0 \frac{p_i^{\tau-1}}{p_i^0}}{\sum_{i=1}^n \omega_i^0 \frac{p_i^{\tau-1}}{p_i^0}} \right] \frac{p_i^\tau}{p_i^{\tau-1}} \quad (4)$$

While the two formulae coincide for period 1 (provided b=0), they differ from period 2 onwards. Compared to a genuine Laspeyres index, the

¹The terminology is inconsistent across countries and time, which added to confusion among users.

use of the Sauerbeck formula entails a potentially huge upward bias when price increases across items are non-synchronous, which, as documented by De Masi and Koen (1995) and De Broeck, De Masi, and Koen (forthcoming), was typically the case in the early stage of the transition.¹ Conversely, it may result in a downwards bias when price changes are relatively (but not entirely) uniform. In the case of the Kyrgyz Republic for example, compounding the monthly rates of change in the hybrid CPI (based on fixed 1989 weights) produces a cumulative increase of 14.7 times between December 1992 and December 1993, compared to a 8.7 fold rise using a Laspeyres CPI instead. A similarly large drift was recorded for Tajikistan over the same period.

The new Laspeyres CPIs typically cover about 300 items chosen for their representativeness and availability. Items are defined broadly at the national level, so as to accommodate variations in local availability and reduce the number of missing items. However, price collectors are required to carefully specify varieties so as to ensure their consistency over time. The weights are based on household budget survey information and the recommendation is to update them yearly, using average annual expenditure data (in order to control for seasonality). By chaining the resulting indices, a longer, multi-year historical series can be obtained.

The regular updating of the weights is important as the large changes in real incomes and relative prices occurring in the course of the transition entail first-order changes in the structure of household expenditures (Table 3).² For example, at the most aggregated level, early in the transition (mainly in 1992-93), the share of food rose sharply while that of paid services declined. Subsequently (starting around 1993-94), the latter began to increase as subsidies for energy, rents, and transportation began to be reduced.³

3. Remaining caveats

Although the introduction of Laspeyres CPIs represented a distinct improvement in price measurement, a number of practical and conceptual problems remain. Practical difficulties are many given the breakdown in the traditional statistical reporting mechanisms, the lack of human resources, expertise and computer equipment, and occasional political interferences. Over time, however, these problems can be overcome. In contrast, conceptual dilemmas are unlikely to fade away.

¹Seasonal price bouncing would also produce an upward bias.

²Owing to the weaknesses of the household budget surveys in central Asia, analyzed by Falkingham and Micklewright (forthcoming), the data in Table 3 should be taken with a grain of salt. For example, the weight for alcoholic beverages is likely downward biased (and is often adjusted upwards for the compilation of the CPI).

³This is a fairly general pattern in transition economies, see De Masi and Koen (in preparation).

Table 3. Household Expenditure Weights

(In percent)

		Food	Non-Food Goods	Services	Alcoholic Drinks
Kazakhstan	1990	38.6	44.5	11.9	5.0
	1991	42.6	44.4	8.7	4.3
	1992	49.7	38.0	6.9	5.4
	1993	52.0	35.7	7.3	5.0
	1994 ¹	54.5	30.1	12.2	3.2
Kyrgyz Republic	1990	37.8	47.3	11.0	3.9
	1991	42.9	44.2	8.7	4.2
	1992	52.8	35.9	7.9	3.4
	1993	58.0	29.6	9.6	2.8
	1994 ¹	51.8	34.8	10.7	2.7
Tajikistan	1990	44.4	44.1	9.7	1.8
	1991	49.1	42.1	7.1	1.7
	1992	58.5	30.9	8.6	2.0
	1993	70.3	22.5	5.0	2.2
	1994	...	...	...	...
Turkmenistan	1990	43.5	43.3	9.8	3.4
	1991	47.2	43.6	6.6	2.6
	1992	43.4	49.1	4.3	3.2
	1993	52.1	39.2	4.8	3.9
	1994	...	...	...	...
Uzbekistan	1990	48.6	37.5	11.0	2.9
	1991	49.3	39.6	7.9	3.2
	1992	54.0	36.7	6.1	3.2
	1993	61.3	30.3	5.5	2.9
	1994	...	...	...	...

Source: Statistical Committee of the CIS.

¹Preliminary estimate.

One practical limitation the new Laspeyres CPIs shared with the old RPIs, especially at the beginning, was that outlet coverage in some countries may have been less diversified than desirable, with bazaars and private shops underrepresented, possibly as a result of pressures not to record the higher prices for items that were missing in state stores but available in the other outlets. Presumably, this problem is receding since with liberalization prices tend to converge across outlet types.

A second complication is that in some countries price collectors have been known to use the (appreciated) official exchange rate to price some appliances--such as television sets, cassette players, refrigerators, and electric irons--that were mostly sold for U.S. dollars. Since foreign exchange at the official rate was generally not available for this kind of purchases, the (much more depreciated) parallel market exchange rate should be used. This source of distortion disappears, however, when multiple exchange rates are unified.

A third dilemma involves the presence of an urban bias in the CPIs, which are essentially urban indexes. For example, in the Kyrgyz Republic, the national CPI is based on the prices quoted in only 8 cities; in Kazakhstan, the CPI is based on prices recorded in 20 cities (accounting for half of the total urban population). It is thus unlikely that the CPI will capture price developments for rural and largely under-monetized areas. It should of course be acknowledged that in most countries, as pointed out by Turvey *et alii* (1989), the geographical coverage of the CPI is restricted to urban centers because of practical problems with data collection in rural areas and conceptual problems for the coverage of subsistence production. To justify this limitation, it is typically argued that consumption in urban areas represents the bulk of consumer expenditures, that some of the purchases by rural households take place in city stores, and that price movements (although not necessarily price levels) in rural areas are often similar to those in neighboring urban areas. It is difficult to assess the validity of these arguments in the specific case of the central Asian countries. However, the relative importance of the rural population and of non-monetized economic activity in central Asia implies that these types of rationalizations are *a priori* less convincing for central Asia than for Russia.¹

A fourth limitation of the CPIs is that they are *de facto* restricted to some socio-economic groups. In Kazakhstan for example, the CPI weights were until 1994 based on the expenditures of workers' and employees' households, excluding pensioners' and farm workers' households.² However, this is not necessarily a problem: if for instance the CPI is used to calculate the consumption wage of workers, restriction of the coverage to wage-earners is

¹The share of the rural population in the countries of Central Asia ranges from 42 percent in Kazakhstan to 69 percent in Tajikistan, compared with 26 percent in Russia.

²In 1995, the coverage was expanded to include these two groups.

appropriate. Some of the other deficiencies of the household budget surveys, such as the overrepresentation of industrial workers or the lack of adjustments for within-year inflation in the computation of expenditure weights, may nevertheless distort the CPI. The next section discusses this topic further.

A fifth issue pertains to the fact that, as noted by Prais (1959), the CPI weights reflect the composition of the estimated aggregate expenditures of the reference population, thus implicitly placing more weight on wealthier groups and on "luxuries" (defined as items with an income elasticity exceeding unity), and less on the poor and on "necessities". In that sense, the CPI would probably underrepresent food and overrepresent consumer durables. In principle, the implied "plutocratic bias" can be corrected by averaging expenditure proportions over the whole population instead of summing expenditure amounts. Such a "democratic" index would measure price developments as faced by the average household rather than as related to total consumption expenditure. While a traditional plutocratic index is appropriate as a general measure of inflation or for national accounting purposes, a democratic index may be preferable for indexation.¹

In practice, the coverage of the household budget surveys typically excludes the top and bottom percentiles of the income distribution, meaning that the CPI will in effect be a compromise between a pure democratic and a pure plutocratic index. Moreover, another democratic element sometimes creeps into the CPI--by default rather than by design--when population rather than expenditure data are used to weight regional price relatives in the process of geographical aggregation, as has been the case in Tajikistan, for example. While it is therefore not clear *a priori* how large the plutocratic bias associated with the actual CPIs would be, the rise in income inequality associated with the transition suggests that the bias would, *ceteris paribus*, increase over time.

A sixth limitation of the CPIs stems from the fact that a Laspeyres index is an upper bound for a constant-utility measure because it ignores substitution effects.² The use of fixed base-period quantities as weights does not enable the Laspeyres index to capture changes in consumption arising from changes in relative prices. When the latter shift, consumers substitute the relatively cheaper commodity for the relatively more expensive one in order to minimize the expenditure needed to maintain the initial level of utility; in contrast, with fixed quantities, consumers would have to spend more to maintain the initial level of utility.

In central Asia like in other countries in the early years of the transition, relative prices moved a lot, implying a sizable potential substitution bias. As indicated earlier, it was therefore recommended to

¹Note, however, that a Paasche price index may be preferable to a Laspeyres for the deflation of nominal macroeconomic aggregates.

²This proposition was originally established by the Russian scholar Konüs (1924).

revise the CPI weights annually. The resulting chain index (involving the periodic revision of the weights) would *ceteris paribus* be expected to rise more slowly than a fixed-base index. However, even with annual updating of the weights, there would still remain scope for an intra-annual substitution bias. Moreover, as shown by Szulc (1983), chaining Laspeyres indices may under certain circumstances also lead to paradoxical results.

Another way to take into account substitution effects is to use geometric rather than arithmetic averaging. In that case, instead of the quantity, it is the share of expenditure on each item that is held constant, consistent with the assumption that consumers reduce quantities purchased proportionately with any increase in price. Using the above notation, the price index level at time t would be expressed as:

$$G^{0,t} \equiv \prod_{\tau=1}^t \prod_{i=1}^n \left(\frac{p_i^t}{p_i^{\tau-1}} \right)^{\omega_i^b} = \prod_{i=1}^n \left(\frac{p_i^t}{p_i^0} \right)^{\omega_i^b} \quad (5)$$

Geometric averaging has the added advantage of treating price increases and decreases symmetrically, avoiding the overstatement of inflation that may result from the use of a Laspeyres index when prices oscillate.¹ However, as pointed out by Lequiller (1995) and evident from Table 3, the assumption of constant expenditure shares is inadequate in the context of the transition. The behavioral hypothesis of unitary price elasticities might be relevant within narrowly defined groups of goods or services whose components are indeed close substitutes, but not for broader categories.

Two other sources of potential bias deserve mention. Those would not arise if price collection were carried out in ideal fashion but they do affect CPIs even in market economies benefitting from a long experience with sophisticated methods of price registration such as the United States. The first one is related to outlet substitution. If outlets are held fixed over time in the price surveys but consumers substitute towards outlets that offer the lowest prices, there will be an upward bias to measured inflation.² In central Asia, price decontrol measures and structural changes in retailing are likely to entail considerable shifting across outlets.

¹For more details on geometric averaging, see Moulton (1993).

²This source of bias has been studied recently for the United States by Reinsdorf (1993). However, as noted by Diewert (1995), part of the bias identified by Reinsdorf is in fact an elementary functional form bias due to the use by the U.S. Bureau of Labor Statistics of an arithmetic rather than a geometric average at the lowest level of aggregation.

The second potential bias relates to new goods (or services), and is also a recurrent issue in market economies.¹ Many new items are becoming available to consumers in central Asia in the early stages of the transition. If they represent improved versions of old products but are not recognized as such by the price collectors, or if they are not properly linked into the index, an upward bias may ensue. On the other hand, it is possible that the deterioration of some old items is not captured in the index either, implying an offsetting bias. For example, unchanged nominal rents in a context where insufficient maintenance reduces the quality of the housing stock are likely to enter the CPI as an item with zero inflation even though in effect the unit price for the corresponding service has actually increased.

III. One or Several CPIs?

Even if one were satisfied that the optimal implementable index formula has been selected, the question remains of the appropriate level at which to compute it. In particular, since prices vary across regions and consumption patterns differ across social groups, it may be worth considering a set of sub-CPIs in addition to the overall, national CPI.

1. Regional dispersion of prices and inflation

If prices and inflation rates are not uniform from one location to the next, the extent of regional differentiation in nominal money incomes cannot be equated with dispersion in living standards. For policy purposes, substantial geographical price and inflation divergence may justify different levels of, and adjustments to, social benefits across regions.

Price level dispersion within the countries of central Asia is indeed significant. For example, in Kazakhstan in late 1994 the cost of a basket of 33 basic foodstuffs was 1.8 times as high in the most expensive city as in the cheapest one.² At the same time, dispersion was much more pronounced for services such as rents and utilities, with max/min ratios reaching 157 times for rents and 133 times for central heating.

To some extent, high price level dispersion reflects the relatively high transportation costs implied by a harsh climate, large distances, and a poor communication infrastructure. It also results from differing levels of local subsidization, especially for food and services. The extent of price controls and subsidies in a given city or oblast would itself depend on the local authorities' zeal to liberalize and on available budgetary resources.³

¹For a more general discussion in light of experience in the United States, see Fixler (1993).

²The average of the 33 max/min ratios for individual items would be larger.

³The same holds for Russia, see De Masi and Koen (1995).

The same factors account for the considerable dispersion in inflation rates across regions (as illustrated in Table 4 for Kazakhstan). As price liberalization proceeds, driven by policy objectives as much as by necessity, the inflation process progressively becomes geographically more homogeneous. However, market integration tends to advance faster for non-food goods than for foodstuffs and services since arbitrage is easier for tradeables. In the case of services, the synchronization of price adjustments across regions will take longer to materialize, as the sharp increase in price level divergence observed during the early years of the transition resulted less from a harmonization of cost-recovery ratios for different qualities of service than from dissimilar local pricing and subsidization policies.¹

Regional disparities in price levels are one of the reasons for dispersion in nominal wage and social benefits levels across geographical areas. They are clearly not the only one, however: in Kazakhstan for instance, the purchasing power of gross wages in terms of a basket of 33 basic foodstuffs in the poorest two oblasts was half of that in the richest two in December 1994. Heterogeneous inflation rates could justify the use of regional CPIs instead of the nationwide CPI for indexation purposes, or at least for the monitoring of living standards. Since inflation rates are likely to converge in the long run, the usefulness of regional CPIs can be expected to decline over time. Nevertheless, recent and prospective regional variations seem large enough to justify distinguishing inflation rates geographically.²

2. Differences between social groups

Constructing different CPIs for different socio-economic groups is by no means a novel idea. As recounted by Diewert (1993), Joseph Lowe--who is sometimes considered as the father of the consumer price index--argued in the early 19th century that separate indices ought to be constructed for different groups (middle class households, farmers, miners, unmarried laborers, married laborers with children, etc). In the central Asian transition countries, expenditure patterns differ substantially across

¹An extension of the quantitative analysis from Kazakhstan to other central Asian countries should take into account that due to shortcomings in regional expenditure and retail delivery data, the national weights are sometimes used in the calculation of the oblast indices.

²In many advanced market economies, regional CPIs are deemed useful enough to be computed and published alongside the nationwide index.

Table 4. Regional Dispersion of Inflation Rates in Kazakhstan

(Ratio of average annual RPI to previous year)

	Food			Non-food goods			Services		
	1991	1992	1993	1991	1992	1993	1991	1992	1993
Inflation									
Akmolinskaya	1.94	10.0	13.2	2.04	6.8	14.4	1.63	8.0	17.3
Aktuibinskaya	1.89	9.7	12.2	1.87	9.7	13.1	1.71	8.4	19.2
Almatinskaysa	2.11	9.7	13.3	1.74	10.0	18.0	2.00	9.7	20.6
Atyrayskaya	1.95	9.3	12.3	1.77	9.6	11.3	1.64	8.0	16.3
East-Kazakhstan	1.88	11.3	12.6	1.93	10.4	11.2	1.48	10.9	17.1
Zhambilskaya	1.81	9.9	10.9	2.04	9.2	12.6	1.78	6.6	16.5
Zhezkazghanskaya	1.94	9.8	15.6	1.99	6.6	15.2	1.30	9.1	19.0
West-Kazakhstan	1.69	13.3	11.8	2.01	7.5	10.1	1.37	9.3	22.6
Karagandinskaya	1.81	13.9	11.5	2.00	10.6	13.8	1.63	9.3	17.1
Kzyl-Ordinskaya	1.79	7.2	13.0	2.16	7.7	10.6	1.43	8.5	25.7
Kokchetavskaya	1.96	10.6	12.5	1.95	9.2	11.5	1.77	10.8	16.1
Kustanayskaya	2.04	9.4	13.0	2.04	8.6	14.6	1.57	8.6	16.9
Manghitauskaya	1.90	9.7	14.7	1.72	7.2	14.2	1.49	10.4	18.7
Pavlodarskaya	2.02	8.1	13.1	1.60	13.9	15.8	1.47	12.2	19.6
North-Kazakhtan	1.99	10.9	13.3	2.06	10.3	9.8	1.60	10.5	16.2
Semipalatinskaya	1.86	10.5	12.5	1.85	8.4	16.1	1.59	9.5	22.5
Taldykorganskaya	2.10	9.3	12.9	2.00	10.0	12.5	1.53	9.9	22.1
Turgayskaya	2.19	10.1	14.8	2.09	10.2	10.8	1.71	11.2	20.5
South-Kazakhstan	1.76	8.1	13.2	1.82	8.2	13.0	1.79	11.5	20.5
Almaty-city	2.40	11.6	13.6	1.78	9.0	17.2	1.57	9.3	22.0
National average	1.95	11.2	12.8	1.95	7.7	13.3	1.59	9.5	19.4
Dispersion indicators									
Max/Min	1.42	1.93	1.43	1.35	2.11	1.84	1.54	1.85	1.60
Coefficient of variation	8.3%	15.3%	8.3%	7.5%	17.8%	17.5%	10.0%	14.0%	13.6%

Sources: Kazakh Goskomstat; and author's calculations.

social groups. Moreover, prices may also vary significantly from one group to the next.¹

One way to take into account systematic variations in expenditure patterns across groups has been the calculation of separate price indices. In Tajikistan for example, several CPIs were reportedly compiled for a while, distinguishing between blue-collar and white-collar workers on the one hand, and between various income groups on the other.

Another approach, followed in Turkmenistan and Uzbekistan, has been to monitor, alongside the overall RPI, the price of a minimum consumption basket. In Turkmenistan, a Laspeyres minimum consumption budget index (MCBI), encompassing some 350 goods and services, is produced by the Turkmenistan Economic Institute based on fixed, normative quantities.² It is taken into account for adjustments in the minimum wage. As illustrated in Chart 2, the MCBI has increased much less than the RPI. Adjustments in administered prices apparently spared some of the more weighty components of the MCBI, since they were accompanied by a widening of the spread between the two indices; two years into the comparison, the RPI had risen four times as much as the MCBI.³

Similarly, the price of an official minimum subsistence basket is monitored in Uzbekistan by the Ministry of Labor.⁴ The prices used are weighted averages of prices in stores and in the market (the latter being about 20 percent higher than the former in early 1994). The basket includes food, non-food goods, services, and taxes. Like in Turkmenistan, it reflects a fairly generous minimum consumption concept, not a physiological minimum. In contrast, the abovementioned basket of 33 staples monitored in Kazakhstan comes closer to the concept of a physiological lower bound, but is overly restrictive in that it excludes non-food items.

A third approach would have been to exclude selected items from the overall price index. In Tajikistan for instance, the Ministry of Labor was reportedly strongly opposed to the inclusion in the CPI of certain durable goods, alcoholic beverages, and luxury items, viewing the CPI more as an indexation tool than as a macroeconomic indicator.⁵

¹Elasticities of substitution (and the implied bias) may also vary across income groups, as suggested by Kokoski (1988) based on US data.

²This basket includes components such as "entertainment", suggesting that it does not correspond to a true subsistence concept but rather reflects the notion of a socially acceptable standard of living (like the Russian concept from which it was derived).

³The comparison period was selected based on data availability.

⁴See World Bank (1994). The Kazakh Ministry of Labor also started to experiment with such a measure in late 1994.

⁵In Russia, a CPI excluding luxury items was published alongside (but not instead of) the overall CPI in 1993 and early 1994, see Koen (1994). The restricted CPI tended to rise slightly more rapidly than the overall CPI.

When relative prices change, differences in expenditure shares will clearly result in disparate inflation rates across social groups, especially in the short run. Thus, a discrete several-fold increase in the price of bread for instance would constitute a much bigger inflationary shock for the poor than for the wealthy. In the longer run, similar asymmetries can arise as cost recovery ratios are gradually adjusted for services such as rents. Furthermore, different social groups may face different prices and price increases for given items, owing in particular to subsidies that are restricted to certain categories, be it *de jure* (public housing rent reductions for low-income families, discounts on milk for families with children) or *de facto* (subsidies on housing maintenance, communal services and transport are not provided in the rural areas and thus embody an urban bias). This would call for separate price registration on top of the use of different weights.

Empirical analysis conducted in the United States suggests, however, that even within apparently fairly homogenous groups, considerable short-run dispersion in inflation rates across households will remain.¹ In central Asia, one would expect, for example, that amongst pensioners, those who retain a job and benefit from the associated subsidized social services may face very different inflation rates compared to those who do not work anymore. And among the latter, the poor and the wealthy would presumably also face dissimilar increases in the cost of living. Furthermore, as argued by Kokoski (1988), household composition may be a more important determinant of expenditure patterns than age group or income ranking. It may thus well be that the degree of disaggregation of the CPI required to eliminate large within-group variation is far too extreme to be implementable in central Asia.

IV. Trends Versus Noise

Quite aside from the nature of the index formula and level of disaggregation, the signals sent by short-run movements in the CPI may be misleading in that they may not reflect actual inflation trends. High-frequency disturbances include discrete adjustments in administered prices and seasonal variations. The persistence of shortages may also distort the meaning of the CPI.²

1. Discontinuities and residual shortages

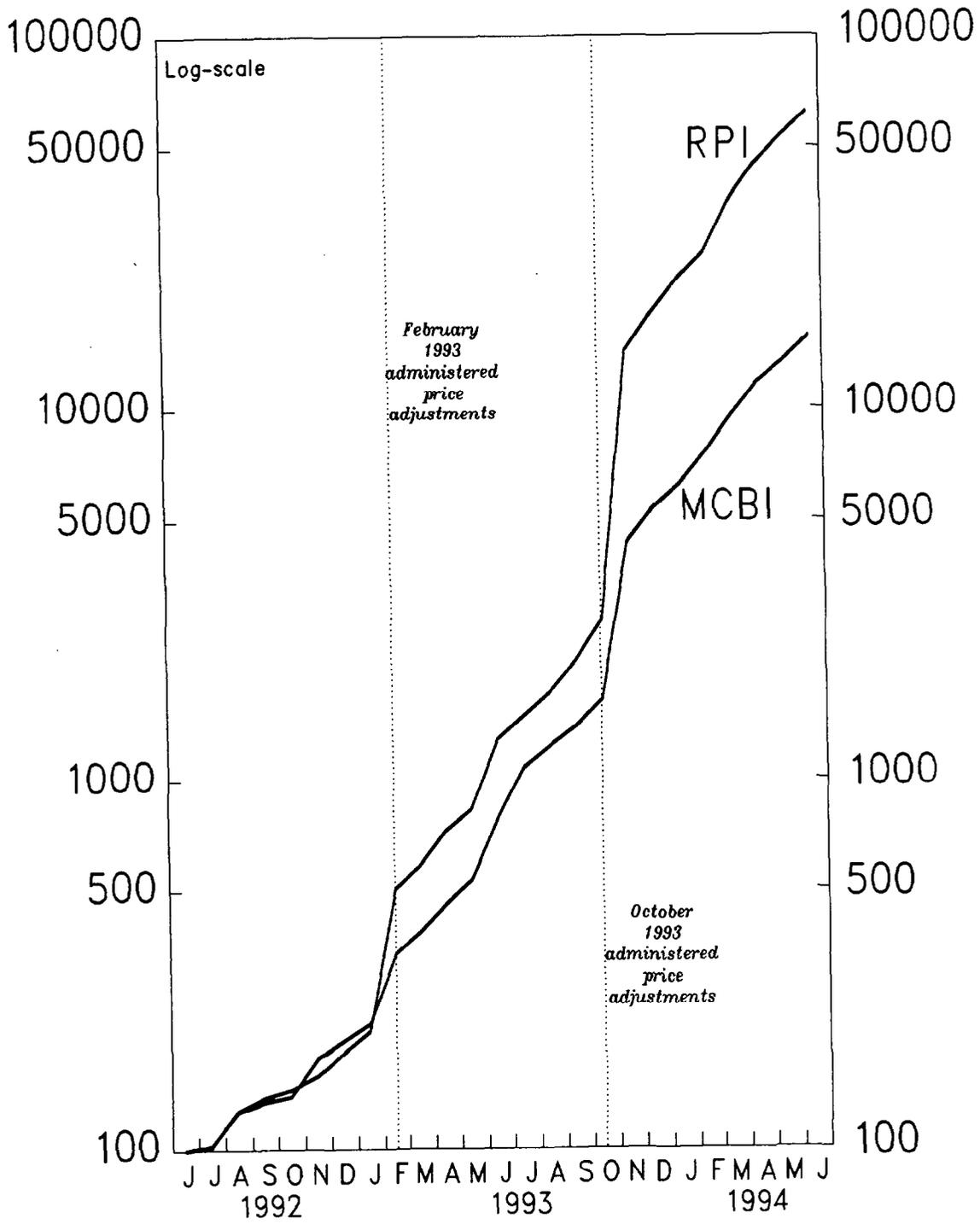
In central Asia even more than in Russia, price liberalization was not undertaken in a once-and-for-all "big bang". Rather, it turned out to be a stepwise process of decontrol.³ In addition, those prices that remain

¹See Michael (1979) and Hagemann (1982).

²Another type of noise, which is abstracted from below, involves the possible falsification of the raw inflation data by the authorities.

³See the IMF *Economic Reviews* for details.

Chart 2
Turkmenistan: RPI and MCBI
(June 1992 = 100)



Sources: Turkmen Goskomstat; Turkmenistan Economic Institute; and author's calculations.



administered, such as rents and charges for utilities, are typically adjusted infrequently and by very large amounts. As a result, the monthly inflation path typically displays spikes. Since the latter stem from discontinuities in the evolution of some of the components of the CPI, they should not be interpreted as turning points.

A related type of distortion arises from the increasing commercialization of heretofore public goods and services such as child care, health care, medicines, housing, and school meals. When the relative price of these items jumps up, actual household expenditure weights shift. However, this will at best be captured in the CPI weights at the beginning of the following year, since the CPI basket cannot be revised more often than annually. The implied short-run distortion carries over into future price levels beyond the year under consideration through the chaining of the series.

Another related potential distortion emerges when the tax mix is altered, for instance when a value-added or excise tax is introduced and some direct personal income taxes are lowered simultaneously. The increase in indirect taxation will then be reflected in the CPI but not the corresponding change in direct taxation. If the CPI is used to deflate pre-tax household monetary incomes in order to derive a measure of the purchasing power of consumers, the latter will be biased downward. The problem of asymmetric treatment of taxes is of course not confined to transition economies and raises the issue of the merits of an income-based as opposed to an expenditure-based cost-of-living index, as discussed by Gillingham and Greenlees (1987). An obvious solution to this problem is to use disposable rather than gross incomes, but in practice such information may not be available.

Widespread shortages and rationing persisted in state stores long after independence in several countries of central Asia, casting some ambiguity on the meaning of the price index. For example, in Uzbekistan around mid-1993, bread seemed to be the only food item readily available at state prices, and market prices for beef and milk were about twice as high as the price in state shops. By March 1994, meat prices had almost converged across outlet types but significant differentials subsisted for such items as tea, flour, vegetable oil, sugar--for which controls and rationing remained in force.¹ Under such circumstances, the costs of searching, queuing, and forced substitution are ignored. These costs, however, can be significant and are

¹See World Bank (1994). To some extent, however, the spread might reflect quality differences.

likely to vary across income groups since better-off families often do not even try to obtain the cheaper goods at the state and cooperative stores.¹

2. Seasonality

Some components of the CPI display very strong seasonal variations. Most conspicuous are the large declines in the relative price of some foodstuffs during the summer months, particularly fruits and vegetables, and the increase in the relative price of dairy products in the winter months. Also noticeable are the fluctuations in the relative price of seasonal clothing items (witness the drop in the relative price of fur hats in the spring). To the extent that they correspond to a "catch-up" with prices that are adjusted on a more continuous basis, the aforementioned administrative price increases bunched at the beginning of each quarter or year are also of a seasonal nature (but insofar as they reflect permanent shifts in relative prices, they do not).

While the seasonal variations affecting some elements of the CPI are striking, it is very difficult to estimate the seasonal profile of the CPI as a whole. For one thing, homogeneous monthly time series are extremely short, precluding the use of any standard estimation methodology. In addition, it would be hard to disentangle permanent relative price changes from temporary ones in a context marked by extreme relative price volatility and periodic disruptions in the price regime in the form of partial decontrol measures. Furthermore, genuine seasonal patterns are themselves evolving, because consumer behavior is changing over time (partly in response to an expanded choice set) or because the frequency of administrative price adjustments increases as indexation mechanisms spread.

V. Epilogue

The measurement issues covered above pertain to prices. Welfare indicators, however, would involve a whole set of additional problems. Output data are notoriously weak because the inherited statistical apparatus misses newly emerging activities and increasingly fails even to capture production in the state sector.²

¹Price controls and rationing were implemented in the United States during the Second World War. Their impact on the CPI was studied at the time by various committees, which failed to come up with an adjusted index number concept. From 1944 to 1946, the monthly CPI reports indicated that "the index does not show the full wartime effect on the cost of living of such factors as lowered quality, disappearance of low-priced goods, and forced changes in housing and eating away from home." By late 1946, these factors had become less important and this statement was dropped.

²Most of the arguments presented in Gavrilencov and Koen (1994) on this topic for Russia would also apply to the countries of central Asia.

Income data are also extremely unreliable, not least because of widespread arrears on wages and other payments to households. In a context of double-digit monthly price increases, such delays translate into a sizable inflation tax on income flows, but are routinely ignored in the computation of real income indicators. At the same time, benefits in kind, which may have acted as a buffer in the face of large declines in measured real monetary incomes, are often abstracted from. Moreover, it is frequently overlooked that households have been increasingly running up arrears themselves on utility bills as cost recovery ratios were raised for this category of paid services. These shortcomings can be attributed to the fact that precise information on wage and other arrears is scarce, and that the valuation of benefits in kind is complicated by ongoing relative price shifts. Nevertheless, they imply that the standard unadjusted household income measures may be highly misleading.

An alternative set of measures frequently used in official publications involves physical per capita "consumption" of specific food and non-food goods. While such indicators--which actually relate to purchases more than to consumption--allow to circumvent some of the problems plaguing income measures, they ignore services and saving and therefore should be used more as instruments to quantify poverty than as synthetic welfare indicators.

Furthermore, the issue of the relevance of the selected base period is frequently overlooked. For example, inferences on the evolution of welfare are likely to differ dramatically depending on when history is assumed to start. Those who would want to paint the darkest possible picture of the transition would rather chose the month immediately preceding comprehensive price liberalization as the base period. Those pursuing the opposite objective would pick the month of price liberalization instead. In the case of Kazakhstan, real wages would be described by the former as having tumbled by half in the course of 1992 and by the latter as ending the year at the same level as in January 1992 (or, correcting for December bonuses, as declining by 18 percent between the beginning of 1992 and the beginning of 1993). As discussed by Koen and Phillips (1993) for Russia, neither of those approaches makes sense because both months are highly untypical.

As far as price measurement *per se* is concerned, the main lesson to be drawn from this review is that the selection of the index should depend on the purpose to which it will be put. Forgetting about this obvious precaution may only entail second-order mistakes when inflation is a fairly homogeneous process across items, space, and social groups. When relative prices undergo massive and repeated shifts, as has been the case in central Asia, overlooking the problems discussed in this paper can result in first-order analytical or policy errors. In this regard, the introduction of a new, more accurate measure of consumer prices in the form of a Laspeyres CPI built in accordance with international standards represents major progress but does not answer all the questions that ought to be addressed. In particular, a historical analysis of the transition is hampered by the absence of a full retropolation of the new index back to a pre-transition base.

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