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Inter-city Variation in Prices

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INTRODUCTION

This research has been motivated by the fact that inter-city variation in prices and hence cost of living has implications for many aspects of development and public policy. This is true for all countries and especially for developing countries like Pakistan where one would expect differences in cost of living to be more pronounced (ceterus paribus) due to a relatively underdeveloped transport network and a lack of development of a national common market.

A better understanding of the inter-city variation in prices indicates the extent to which markets within countries are integrated. A monitoring of the inter-city price index over time indicates whether the economy as a whole has become more or less integrated over time i.e. has there has been convergence or divergence within the local economy (which has also been one of the objectives of this research).

Secondly, a quantification of inter-city variation in cost of living is essential to understand differentials in *real* incomes across the country. Such an understanding will yield fairer minimum wage legislation by the government and also wage remuneration packages by employers in both the public and private sectors operating in multiple cities thus leading to better equalisation of real wages across locations. As noted by Haworth and Rasmussen (1973) the pursuit of a uniform wage policy by the U.S. Post Office in the 1970s led to greater wage dissatisfaction among workers and labor strikes in areas where cost of living was relatively higher.

Thirdly, allowing for cost of living differentials among cities will lead to better estimates of urban inequality and incidence of poverty. In this context it is particularly important to see if differences in cost of living mitigate or accentuate the difference in the magnitude of poverty between richer and poor jurisdictions.

The estimation of cost of living differentials will also lead to much greater understanding of migration patterns within countries and the functioning of regional and interregional markets across the country which are directly related to cost of living, and real wages/incomes. For example, if the same minimum wage legislation is applicable to the whole country, it will lead to migration to those cities where cost of living is relative low and hence the real value of the minimum wages is high (ceterus paribus). This illustrates the important implications that uniform minimum wage legislation and welfare packages across the country have for migration patterns when cost of living differentials are significant.

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Finally, inter-city variation in prices has important implications for understanding 'optimal' city size and future urban planning and public policy affecting the pattern of urban development within the country. It is generally believed that cost of living tends to first fall as city size increases due to emergence of agglomeration economies but as population increases diseconomies of scale and negative externalities like traffic congestion, high land rents and pollution set in that exceed the potential agglomeration economies. The issue then is discovering the 'optimal' city size at which cost of living is at a minimum.

REVIEW OF LITERATURE

Pasha and Pasha (2002) conducted a research on cost of living differentials in Pakistan by calculating a relative price index for 25 cities in Pakistan. They found significant differentials in cost of living with the maximum difference in cost of living equaling 15 percent (between Karachi, the largest metropolis and Jhang, a relatively small town located in Punjab). They set up a model to explain cost of living differentials among locations in Pakistan and found that cost of living is explained primarily by population (in cubic form) and per capita incomes. Higher per capita incomes lead to higher cost of living and as population increases cost of living first increases then decreases and then increases again. Other variables such as provincial dummies and distance from national highway emerged as insignificant.

Cebula (1980) constructed a model to estimate the determinants of cost of living differences in the United States. He found cost of living to be a positive function of population density (the number of persons per square mile) because greater congestion will increase transit and marketing costs; a negative function of population as increased population will lead to agglomeration economies which will decrease production costs and hence cost of living; a negative function of property tax/tax on capital as it will lead to bias towards labor intensive technology and hence the potential benefits of economies of scale will not be realised and also tax might be passed on from producers to consumers in the form of higher prices; a negative relationship with a dummy for legislation prohibiting trade union activity—will lead to lower costs of production and hence lower prices.

Ostrosky (1983) also tries to explain cost of living differentials in the United States by modifying Cebula's model. Instead of using a dummy for legislation prohibiting trade union activity, he uses direct data on the percentage of unionised labour force. Also, he argues that use of this dummy may actually be leading to a misspecification with this dummy capturing the impact of differences in climate because most of the warmer states (by chance) restrict union activity. Warmer states will have a lower demand for fuels and hence lower prices and a lower cost of living. He thus includes per capita annual utility bills to account for this impact in the model.

Haworth and Rasmussen (1973) also constructed a model to explain cost of living differentials for three different income baskets in the US. They hypothesise that cost of living is a positive function of population; a positive function of form/ barrier score (the higher the barrier score, the greater the topological and physical constraints that limit the expansion of city; (i) a negative function of region—a dummy for the southeastern states where cost of labor is lower; a positive function of change in population between 1967 and 1970 because of the inflationary impact of rapid population increases on prices; and a positive function of climate/temperature with extremes in either direction leading to higher fuel consumption. They find that population, form and region emerge as

significant for all budget categories. Climate is insignificant for all categories and change in population emerges as significant in the moderate budget equation probably because of scarcity of moderately priced houses.

Henderson (1999) estimated the relationship between housing prices and commuting times with respect to metro area populations for a cross-section of 80-90 cities worldwide and finds that housing prices and commuting times are more than 100 percent higher in a metro area of 5 million people compared to one with a population of 100,000. Similarly, Rousseau (1995) found that costs of living are about 90 percent higher in Paris at 9 million people than in a typical French city. These differentials for cost of living have also been found in other studies for the USA and Brazil [Henderson (1998)] and some other countries in Latin America [Thomas (1980)].[1]

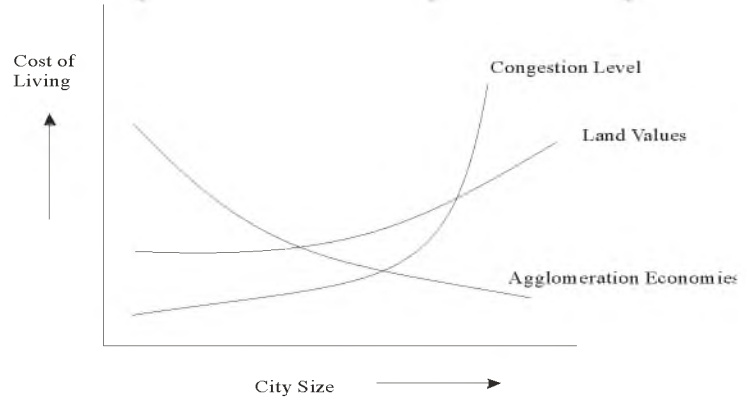
Also Langsten, Ramussen, and Simmons (1985) argue that another explanation for the relationship between city size and the relative cost of living can be embedded in 'rent' theory. The higher cost of living in large cities is the result of higher house/ land rents and hence higher land values rather than congestion (although higher land values may indirectly be the result of higher congestion in some cases).

Thus summarising, previous studies on cost of living differentials illustrate that urban cost of living can be influenced primarily by one or more of the following:

Population size—agglomeration economies (+)
Population density—congestion (–)
Per capita income (+)
Land values (+)
Property taxes—high production and living costs (+)
Geographical and provincial/state variations.

Also, as noted by Pasha and Pasha (1999) there is likely to be a very ambiguous relationship between city size and cost of living, with land values and congestion costs increasing as city size increases, exerting an upward influence on cost of living whereas agglomeration economies tend to keep costs of living relatively low. Pasha and Pasha (2002) use the following Figure 1 to illustrate these influences on cost of living as city size increases.

Fig. 1. Factors Contributing to Cost of Living



[1]The source of all the citations in this paragraph is Henderson, Shalizi, and Venables (2001).

METHODOLOGY AND DATA

The following methodology and data were used to derive the results:

P_{ij} = retail price of commodity/ service j in location i
Q_j = share in household consumption nationally of commodity / service j
P^*j = average national price of commodity / service j
N_i = population of location i
I_{ij} = index value/relative price of commodity j in city i
I_{ci} = composite cost of living index for city i.

The first step was to calculate the average national price for all the commodities (for all 32 cities in the sample) using the following formula:

$$P^*j = \frac{\sum_i N_i P_{ij}}{\sum_i N_i}$$

Then relative prices/index values for every commodity in every city were computed using the following formula:

$$I_{ij} = \frac{P_{ij}}{P^*j}$$

We then used the relative prices of commodities in every city to construct a weighted relative composite cost of living index (I_{ci}) for every city:

$$I_{ci} = \sum_j I_{ji} \cdot Q_j$$

We used the latest (March-April 2008) prices of 133 commodities from the *Monthly Bulletin of Statistics* of the Federal Bureau of Statistics for 32 cities/towns of Pakistan. Out of these cities sixteen are from Punjab, six are from Sindh, five from NWFP and four from Balochistan. The data on share in household consumption of commodity j has been taken from the latest *Household Integrated Economic Survey 2005-06.* Population figures for the cities have been taken from the *Population Census of 1998.*

Evaluation of Results

Overall Trend

The results presented in Table 1 indicate that there are significant differences in cost of living across Pakistan with the maximum difference in cost of living equaling 25 percent between Mirpur Khas (with a population of 250,000) which has an index value of 90.12 and Turbat (with a population of 90,000) having the maximum index value of 112.15. It is interesting to note that the cost of living is not at a maximum in the bigger metropolis like Karachi or Lahore but rather in one of the smallest towns in our sample.

Table 1

Cost Of Living Index by City (National Average = 100)*

City	National Average = 100			
	Food and Beverages	Wheat	Non-food	Overall
Islamabad	110.59	99.00	105.01	106.63
Punjab				
Lahore	99.59	99.70	100.24	99.52
Faisalabad	100.21	99.85	106.66	105.64
Rawalpindi	104.26	97.95	100.27	101.51
Multan	97.20	91.03	113.15	108.56
Gujranwala	101.86	100.46	101.98	103.80
Sargodha	92.68	92.25	97.17	96.89
Sialkot	98.39	93.15	94.91	97.28
Bhawalpur	94.61	87.06	111.09	105.79
Jhang	93.20	90.11	92.92	94.46
Okara	92.96	89.50	90.89	93.02
D.G Khan	92.60	87.99	91.92	92.85
Jhelum	99.03	96.68	103.54	103.59
Bahawal Nagar	90.56	84.02	109.68	104.26
Vehari	95.08	89.33	104.79	102.70
Mianwali	92.47	94.98	109.33	104.90
Attock	99.71	93.10	98.09	98.04
Sindh				
Karachi	103.72	103.02	95.63	99.32
Hyderabad	96.97	97.41	93.17	95.00
Sukker	97.48	94.98	95.99	97.09
Larkana	94.41	93.76	91.08	92.28
Mirpur Khas	90.80	90.11	88.32	90.12
Nawab Shah	96.41	90.11	93.27	94.95
NWFP				
Peshawar	102.52	111.17	100.15	101.08
Mardan	99.90	105.69	94.30	97.38
D.I. Khan	88.75	103.50	103.97	98.32
Abbotabad	96.78	99.85	109.78	105.43
Bannu	95.41	109.59	100.76	99.80
Balochistan				
Quetta	107.41	114.46	112.54	111.27
Khuzdar	103.19	91.33	94.51	98.25
Turbat	124.20	97.41	104.37	112.15
Lorali	104.85	107.16	96.33	100.08

*Presented province- wise in descending order of population.

For the food and beverages category, the maximum difference in cost of living equals 40 percent with the minimum index value recorded for Dera Ismail Khan and the maximum for Turbat. The low index value of food items in D. I. Khan is primarily due to very low prices for milk and milk products, spices, fruits, vegetables, chicken and meat and relatively low prices for almost all major food items (except for wheat which is slightly above national average) probably due to sufficient localised production of these items.

The maximum cost of living index value for Turbat can potentially be attributed to a lot of varying factors such as the small size of the city (preventing it from benefiting from economies of scale), area/provincial bias, and the remoteness of the city. With respect to Mirpur Khas its low cost of living can be attributed to its locational advantage/provincial actor, being part of Sindh, enabling it to have better access to imports and also to the relatively fertile land making up a major portion of the city allowing for high production of agricultural items and rearing of livestock. The fact that prices for wheat, lentils, gur, fruits, vegetables, meat and chicken etcetera for the city are among the lowest for the sample tends to support the latter explanation. Also, one of the factors that could be the reason for its lower cost of living relative to Turbat could be its larger size. However, given prior literature on optimal city size with respect to cost of living one would hardly expect a population size of 250,000 to fully realise the potential benefits of agglomeration economies as a 'medium sized' city in Pakistan will have a population far greater than 250,000. Thus, one may conclude that the low cost of living in Mirpur Khas can be attributed to a great extent to its provincial and geographical advantage.

Construction of the overall index also reveals extreme variation in the costs of education across the city with the education index having a standard deviation of as much as 50. This has very important implications for regional development and 'inclusive growth' as human capital formation through education is widely recognised to be one of the major drivers for development.

Provincial Influence on Cost of Living Variations

As noted earlier Turbat's high cost of living could be due to the provincial factor. Table 2 below gives the (weighted) average provincial index values for overall cost of living, food and beverage index and the wheat index.

Table 2

Province-wise Comparison

Province/Capital	Food and Beverages Index	Wheat Index	Overall Index
Punjab	99.23	97.15	101.68
Sindh	102.30	101.57	98.43
NWFP	100.82	109.30	100.37
Balochistan	108.35	109.85	109.39
Islamabad	110.59	99.00	106.63

One can see from the above table that prices are more than nine percent above the national average in Balochistan followed by Islamabad whereas prices in Punjab and NWFP are just marginally above the national average and those for Sindh are below the national average. The overall low prices in Sindh could be due to better access to imports due to the close proximity to port whereas as high prices in Balochistan could be indicative of the lack of integration of Balochistan with the rest of the economy.

For the food and beverages category, prices are significantly higher than the national average in Islamabad and Balochistan whereas prices in NWFP and Sindh are marginally above national average and those in Punjab are marginally below the national average for this category.

The province-wise average for wheat is the most interesting with prices in NWFP and Balochistan being almost 9 percent above the national average, marginally above national average for Sindh and below national average for Islamabad and Punjab (1 percent and 2.85 percent respectively) implying that there might be some controls on the inter-provincial movement of wheat from the main wheat growing provinces of Punjab and Sindh although higher prices in NWFP and Balochistan can also be the result of higher transportation costs.

Relationship between City Size and Cost of Living Variations

There appears to be a polynomial relationship between cost of living and city size as Figure 2 below illustrates. Cost of living first tends to rise as city size increases to about 90,000 after which it starts to fall reaching a minimum for a city with a population of about 350,000 and then starts to rise reaching a maximum for a city the size of 1.7 million after which cost of living starts to fall again. As noted earlier, however, we cannot conclude from this analysis that optimal city size is given by a population of 350,000 as the index values are influenced by the political affiliation of the cities.

Fig. 2. Relationship between Overall Index and Population

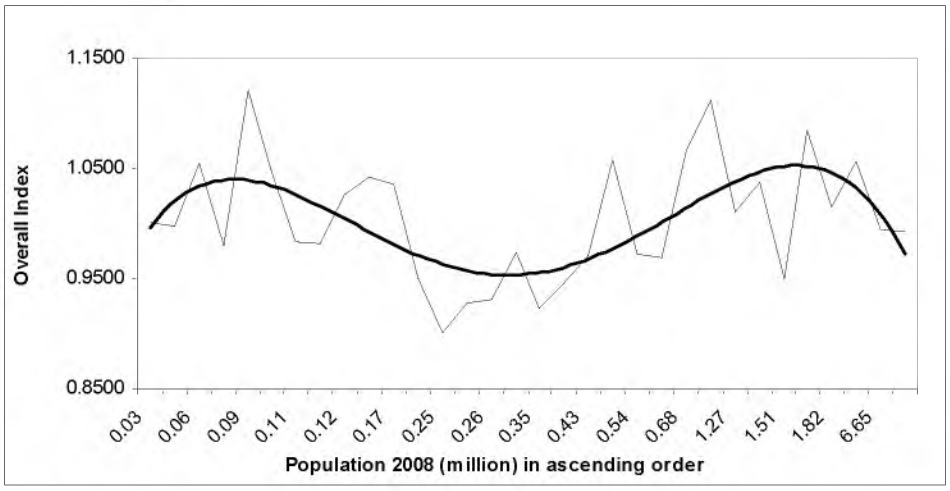


*Figure based on table presented as Appendix 1.

The polynomial relationship can be explained by our previous discussion on the relationship between city size and cost of living (p. 7). Initially, as population increases land costs increase resulting in a rise in the cost of living. However, as population increases further, agglomeration economies set in that further outweigh the increase in the cost of land and we see costs falling significantly till we reach a population of 0.3 million after which they begin to rise again as costs of congestion because of higher population density outweigh the cost reducing effect of agglomeration economies. The final dip that we see in our graph can perhaps be attributed to the fact that once a city reaches the population size of 5-6 million, the agglomeration economies are so great that they tend to outweigh congestion costs.

It must be noted, however, that the above curve is not independent of the provincial affiliation/ geographical location of the cities and the final dip that we see in the curve may well be due to the relatively low cost of living in Karachi attributable to its proximity to the port (as we will discuss later). However, the polynomial relationship between population and relative cost of living works very well even when we isolate the 'provincial affiliation' influence by regressing relative cost of living against population in polynomial form and provincial dummies.

Determinants of Cost of Living Variations

Given our analysis of the constructed index, we constructed a model to explain determinants of cost of living variations using the following explanatory variables:

Population (P): Given our previous analysis of the relationship between population and city size, we include this variable as a third-degree polynomial.

Provincial Dummy Variables: Provincial dummy variables have been set up for Sindh (D1), NWFP (D2) and Balochistan (D3). Punjab is the benchmark variable.

We would have ideally liked to have included per capita income to control for quality differences between similar goods consumed in various cities on the basis of the assumption that the quality of goods is better in cities with a higher per capita income and hence they are also more highly priced. Unfortunately, data for this category was not available.

We also tried testing for the relationship between cost of living and distance of the city from the national highway, and distance of the city from the nearest international border but they came out to be extremely insignificant and were consequently dropped from the final model.

The regressions results for the above specified explanatory variables against overall index, food and beverage index and wheat index are given in Table 3.

The explanatory variable of population (in millions) in polynomial form works well for all categories except for food and beverages where X^3 does not come out to be significant. Similarly in the overall category the dummy for Sindh has a negative coefficient (as expected from our analysis of data) and is significant at the 1 percent level implying that cost of living in Sindh is less relative to Punjab. Similarly D3 or the Balochistan dummy has a negative coefficient and is significant at the 5 percent level implying overall cost of living is higher in Balochistan than in Punjab. The provincial dummy for NWFP, however, is insignificant for this category.

Table 3

Empirical Results

Variable	Food and Beverages	Wheat	Overall
Constant	94.29	89.02	99.02
	(50.29)***	(54.00)***	(60.19)***
P	7.34	9.32	5.86
	(2.062)**	(2.97)***	(1.87)*
P2	–1.94	–2.12	–1.81
	(–1.62)*	(–2.01)**	(–1.72)*
P3	0.14	0.14	0.14
	(1.46)	(1.64)*	(1.63)*
D1	–1.66	0.87	–7.11
	(–0.61)	(0.37)	(–2.95)***
D2	0.69	14.74	0.09
	(0.25)	(6.02)***	(0.036)
D3	14.39	11.99	5.46
	(4.68)***	(4.44)***	(2.02)**
R^2	0.52	0.68	0.42
Degrees of Freedom	25	25	25
F	4.59***	8.81***	3.04**

* Significant at 10 percent.
** Significant at 5 percent.
*** Significant at 1 percent.

Similarly, for the food and beverage category only the provincial dummy for Balochistan is significant (at the 1 percent level) implying that prices for food items are significantly above those in Punjab. For the wheat index category, the NWFP and

Balochistan dummies are both highly significant implying that the wheat prices are significantly high in these provinces relative to Punjab whereas the Sindh dummy is insignificant implying that price of wheat in Sindh is not significantly different from that in Punjab.

The R^2 for the overall index and the food and beverage index is relatively low whereas that for the wheat index is quite high. The low R^2 in the former may be due to the non-inclusion of per capita income to account for variations in quality.

Also if we optimise the overall regression equation with respect to population we find that the cost of living reaches a minimum for a city with a population of 2.13 million (approx) implying that the cities targeted for future urban development should be ones with populations close to 2 million.

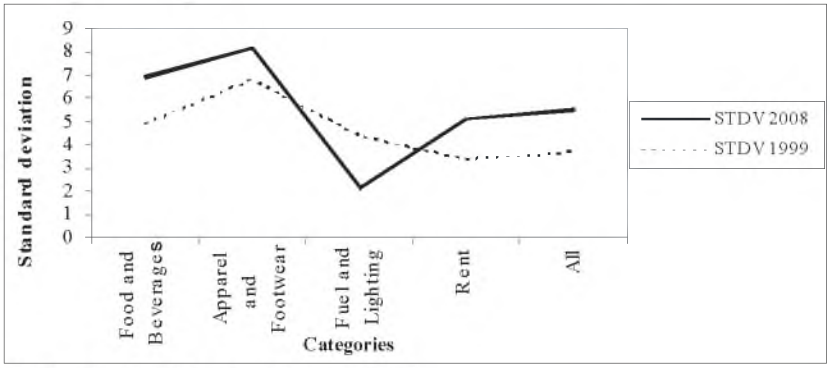
Change in Relative Cost of Living Index Over Time

Convergence or Divergence?

A major conclusion of this research has been that there has been *divergence* in the economy or that the economy as a whole has become *less* integrated since 1999 when

Pasha and Pasha (2002) computed a similar cost of living index for major cities in Pakistan[2] as standard deviation for the overall index, food and beverage index, apparel and footwear, and rent has *increased.* Only for the fuel and lighting subcategory has standard deviation decreased possibly due to standardisation of fuel (petrol and diesel) prices across the country that constitute a major component of this category. This divergent trend is indicated in Figure 3 below.

Fig. 3. Categories and their Standard Deviation in 1999 and 2008



* Figure 2 is based on the table presented as Appendix 3.

Change in Cost of Living Rankings

To compare the change in the relative index values of cities relative to their 1999 values, the Spearman's Rank Correlation test [3] was used. A highly significant correlation coefficient value of -0.7 was derived implying that relative to 1999, cities with a relatively high cost of living index have now become cheaper. This is especially true for cities in Sindh such as Karachi, Hyderabad, Nawabshah, Larkana and Mirpur Khas—their ranking in terms of cost of living have fallen significantly relative to 1999. This change could be attributed to perhaps a greater share of imported items in consumption especially food which is reflected in lower prices for Sindh cities due to better access to imports.

We tested this hypothesis by running a regression of a change in average annual inflation rates[4] against the distance from port for 21 cities (those that correspond to the sample used by Pasha and Pasha) and got the results presented in Table 4.

Table 4

Annual Average Inflation Rate*	
Constant	5.06
	(20.29)***
Distance from Karachi Port	0.0013
	(2.79)***
R^2	0.29
F-Statistics	7.81***

* Based on data given in Appendix 5.

[2]Summary of their results is presented in Appendix 2.
[3]Refer to Appendix 4 for derivation.
[4]Refer to Appendix 5 for derivation.

The regression results indicate that the coefficient of distance from port is positive and significant at the 1 percent level, implying that average annual inflation rate for cities is less the less the distance from the port.

Data Limitations

It is worthwhile to note here that for the gas prices component within the 'fuel and lighting' category, prices were unavailable for eight cities in our sample (including all cities in Balochistan excluding Quetta) presumably because there is no gas supply to these cities implying significant differences in *standard of living* not captured by the cost of living index (gas cylinder prices were used as a proxy).

It is important to note at this point that there might be a bias in the rent index values as the data available in the Monthly Bulletin of Statistics was not the actual rental values but the rent index values—i.e., how much the rent values had changed over and above the base year values of 2000. Although rent index values can be used as a proxy for actual rents, rent index values can be biased as they suggest that two cities with identical index values have the same rents whereas this only implies that the *increase* in rents in the two cities has been similar and that there might have been significant variations in base year values of rents in these cities.

Policy Implications

Firstly, there appears to have been a decrease in national economic integration in the last nine years evident in the significant increase in the standard deviation of cost of living compared to 1999 values and very high index values for Balochistan especially relative to the other provinces. This has huge political and economic policy implications as it implies that federal policy towards the provinces is inequitable and hence a need for revising policy with respect to development expenditure allocation among provinces. The stance on wheat policy in Punjab also needs to be revised in this context (why then should not Balochistan impose a ban on inter-provincial movement of gas!).

Secondly, the fact that the cost of living in Turbat is 12 percent above the national overall average and 24 percent above the national average for the food and beverage category, the welfare payments made by the government through the Benazir Income Support Programme, for example, should be adjusted to account for cost of living differences otherwise they will lead to a very unfair distribution of funds. This is especially true since Turbat is a very underdeveloped and remote area with a high incidence of poverty such that the difference in cost of living compared to the national average is closer to 25 percent rather than 12 percent as a major share of the income of the poor is spent on food (much greater than the average expenditure of 35 percent of total income).

Thirdly, there appear to be huge disparities in cost of education across the country and hence the need to standardise cost of education to achieve inclusive and uniform growth across the country.

Fourthly, there appears to be a need for developing a more efficient transport network to minimise transport distances from the port to the rest of the country and hence minimise cost of living in other parts of the country given that imports constitute a significant portion of overall consumption.

Lastly, the fact that the most efficient city size in Pakistan's context appears to be a medium sized city with a population of about 2 million, urban development focus

should shift from the development of (inefficient) large sized metropolis such as Karachi and Lahore and should concentrate on the development on relatively smaller cities like Gujranwala, Rawalpindi, Multan, Hyderabad and the like.

CONCLUSION

The computation and analysis of relative index values for cities across Pakistan indicates that there are huge differences in cost of living across cities (with deviation in prices reaching a maximum for education) and also across provinces and these differences in cost of living have increased over time. Thus, knowledge of these cost of living variations is essential when formulating public policy with respect to allocation of development expenditure among provinces, income support and consumer subsidy programmes, inter-provincial and cross-country movement of goods and urban development.

Appendices

Appendix 1

City Size and Relative Index Values

City	Population 2008* (Millions)	Overall Index Value
Loralai	0.03	1.00
Bannu	0.05	1.00
Abbotabad	0.06	1.05
Attock	0.07	0.98
Turbat	0.09	1.12
Mianwali	0.10	1.05
D.I.Khan	0.11	0.98
Khuzdar	0.12	0.98
Vehari	0.12	1.03
Bahawal Nagar	0.14	1.04
Jhelum	0.17	1.04
Nawab Shah	0.24	0.95
Mirpur Khas	0.25	0.90
D.G Khan	0.25	0.93
Okara	0.26	0.93
Mardan	0.32	0.97
Larkana	0.35	0.92
Jhang	0.38	0.94
Sukker	0.43	0.97
Bhawalpur	0.53	1.06
Sialkot	0.54	0.97
Sargodha	0.59	0.97
Islamabad	0.68	1.07
Quetta	0.73	1.11
Peshawar	1.27	1.01
Gujranwala	1.46	1.04
Hyderabad	1.51	0.95
Multan	1.55	1.09
Rawalpindi	1.82	1.02
Faisalabad	2.60	1.06
Lahore	6.65	1.00
Karachi	12.07	0.99

*Population in 2008 was estimated by the following formula;

Population in 2008 = Population in 1998 $(1 + \text{average growth rate of urban population})^{10}$

Growth rate of urban population:

$$\frac{\text{(urban population in time period t) – (urban population in time t-1)}}{\text{(Urban population in time period t-1)}}$$

Average growth rate of urban population was estimated over the period 2000-2005.

Appendix 2

Relative Cost of Living Index in 1999

City*	Province**	Population (000)	National Average = 1000					
			Food and Beverages	Apparel and Footwear	Fuel and Lighting	Rent	Others	All
Karachi	S		108.23	103.64	99.39	98.00	99.20	104.84
Lahore	P		94.46	89.96	102.61	101.00	101.76	93.36
Faisalabad	P		96.78	103.70	101.69	105.00	103.40	99.31
Rawalpindi	P		100.19	98.54	104.23	99.00	99.39	100.26
Hyderabad	S		100.98	102.03	96.74	99.00	110.55	102.93
Multan	P		96.16	111.86	100.92	106.00	100.41	99.30
Gujranwala	P		90.80	93.65	104.27	98.00	96.73	93.48
Peshawar	N		98.20	105.35	99.93	99.00	97.16	98.76
Sialkot	P		96.49	103.20	102.97	100.00	106.76	100.46
Sargodha	P		91.05	97.54	89.59	105.00	95.59	93.37
Quetta	B		104.15	100.24	97.31	94.00	95.26	100.84
Islamabad	P		102.84	101.35	104.40	98.00	100.37	102.28
Jhang	P		87.86	92.69	92.13	104.00	97.23	91.24
Sukkur	S		95.55	105.20	94.99	99.00	98.33	96.96
Bahawalpur	P		91.21	89.31	95.97	106.00	94.02	92.71
Gujrat	P		97.24	91.02	95.50	98.00	99.65	97.05
Sahiwal	P		87.80	103.43	93.01	105.00	97.30	92.35
Mardan	N		93.19	91.34	99.04	99.00	96.38	94.36
Mirpurkhas	S		92.77	93.61	92.14	99.00	95.32	93.68
Larkana	S		92.37	96.05	93.88	99.00	98.36	94.33
Rahim Yar Khan	P		91.32	105.85	95.21	106.00	96.49	94.58
Nawabshah	S		96.01	92.12	92.40	99.00	103.10	96.66
Abbottabad	N		97.82	109.77	94.50	99.00	96.95	98.60
Muzaffargarh	P		92.14	95.48	94.24	106.00	98.36	94.42
Bannu	N		93.97	85.46	93.24	99.00	91.44	92.56
Standard Deviation			4.88	6.77	4.33	3.36		3.66
Range (Max-Min)			20.37	25.21	14.81	12.00		13.60

*Presented in decending order of population.

** S= Sindh, P = Punjab, N = NWFP, B = Balochistan.

Appendix 3

Cost of Living Index by City (National Average = 100)

City*	Province	National Average = 100				
		Food and Beverages	Apparel and Footwear	Fuel and Lighting	Rent	Overall
Karachi	S	103.72	104.79	96.34	97.06	99.32
Lahore	P	99.59	99.18	102.41	95.60	99.52
Faisalabad	P	100.21	92.39	102.50	99.93	105.64
Rawalpindi	P	104.26	95.20	102.38	111.85	101.51
Multan	P	97.20	108.13	101.88	106.58	108.56
Hyderabad	S	96.97	100.86	97.56	100.89	95.00
Gujranwala	P	101.86	92.60	100.61	105.59	103.80
Peshawar	N	102.52	101.67	101.92	101.09	101.08
Quetta	B	107.41	108.37	105.50	107.60	111.27
Islamabad	Capital	110.59	99.75	103.03	113.92	106.63
Sargodha	P	92.68	95.37	103.70	99.93	96.89
Sialkot	P	98.39	89.65	104.11	94.89	97.28
Bhawalpur	P	94.61	99.20	103.74	106.58	105.79
Sukker	S	97.48	84.52	101.39	98.42	97.09
Jhang	P	93.20	86.33	102.48	99.93	94.46
Larkana	S	94.41	98.58	100.33	98.42	92.28
Mardan	N	99.90	97.31	100.09	101.09	97.38
Okara	P	92.96	93.42	97.89	95.60	93.02
D.G Khan	P	92.60	88.44	98.63	106.58	92.85
Mirpur Khas	S	90.80	83.14	100.73	100.89	90.12
Nawab Shah	S	96.41	105.17	101.48	100.89	94.95
Jhelum	P	99.03	104.24	101.41	111.85	103.59
Bahawal Nagar	P	90.56	98.92	102.49	106.58	104.26
Vehari	P	95.08	113.82	100.46	106.58	102.70
Khuzdar	B	103.19	83.08	102.94	107.60	98.25
D.I. Khan	N	88.75	85.57	98.20	101.09	98.32
Mianwali	P	92.47	89.78	101.84	99.93	104.90
Turbat	B	124.20	79.87	102.72	107.60	112.15
Attock	P	99.71	95.25	100.15	111.85	98.04
Abbotabad	N	96.78	91.25	99.24	101.09	105.43
Bannu	B	95.41	92.30	99.66	101.09	99.80
Lorali	B	104.85	95.90	103.83	107.60	100.08
STDV		6.93	8.18	2.11	5.17	5.52
STDV 2002*		4.88	6.77	4.33	3.36	3.66

*Based on results derived by Pasha and Pasha (2002).

Appendix 4

Ranking of Cities in Descending Order on the Basis of Overall Cost of Living Index

City	Ranking 1998	Ranking 2008
Karachi	1	12
Hyderabad	2	17
Islamabad	3	3
Quetta	4	1
Sialkot	5	14
Rawalpindi	6	8
Faisalabad	7	5
Multan	8	2
Peshawar	9	9
Abbotabad	10	6
Sukker	11	15
Nawab Shah	12	18
Mardan	13	13
Larkana	14	20
Mirpur Khas	15	21
Gujranwala	16	7
Sargodha	17	16
Lahore	18	11
Bhawalpur	19	4
Bannu	20	10
Jhang	21	19

Spearman's rank correlation $(p) = \dfrac{1 - 6\sum d_i^2}{n(n^2 - 1)}$

'*d*' equals the difference between column 1 and column 2

(p) for the sample is -0.70 which is significant at 1 percent.

Appendix 5

Average Annual Inflation Rates of Cities and Distance from Port

City	Cumulative Inflation* (1998-2008)	Growth Rate of Cumulative Inflation**	Distance from Karachi Port (Miles)
Karachi	1.601	4.82	0
Lahore	1.801	6.06	646
Faisalabad	1.798	5.87	589
Gujranwala	1.877	6.49	669
Rawalpindi	1.711	5.37	708
Multan	1.848	6.33	461
Hyderabad	1.560	4.54	94
Jhang	1.750	5.75	552
Sialkot	1.636	5.05	701
Sargodha	1.754	5.75	609
Bhawalpur	1.928	6.78	428
Peshawar	1.730	5.63	692
Larkana	1.653	5.15	204
Mardan	1.744	5.72	716
Nawab Shah	1.660	5.19	131
Sukker	1.692	5.40	229
Mirpur Khas	1.626	4.98	134
Abbotabad	1.807	6.10	744
Islamabad	1.762	5.83	714
Quetta	1.866	6.43	374
Bannu	1.822	6.18	615

* Cumulative inflation = $\frac{\text{Overall index value2008} * 1.68}{\text{Overall index value1998}}$

where

$$1.68 = 1 + \frac{(\text{CPI 2008- CPI 1998-99})}{(\text{CPI 1998})}$$

* CPI (consumer price index) values have been taken from the Government Economic Survey 2007-8)
1.68 percent shows that inflation increased by 68 percent over the last 10 years.
** Growth rate of cumulative inflation = [(Anti log (log cumulative inflation value /10)) – 1]* 100.

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