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The Infant Mortality Rate is Higher where the Rich are Richer

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The Infant Mortality Rate is Higher Where the Rich are Richer

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Abstract

This note confirms that controlling for the income of poorer strata, the infant mortality rate is higher in countries where the rich have higher incomes using two different sources of inequality data each of which contains enough detail on the distribution of income to control for the income of poorer strata.

* I would like to thank Martin Ravallion, Brett Bratsberg and Peter Hammond for convincing me that it was necessary to address the question addressed in this note.

I Introduction

Waldmann (1992) reports a positive partial correlation between high infant mortality and the share of income going to the richest 5% (rich share). Three explanations of this pattern were discussed -- first that a high rich share reflects or causes inegalitarian government policies which cause high infant mortality, second that a high rich share is correlated with a high price of necessities compared to luxuries, and third that a high rich share causes distortion of consumption as the poor emulate consumption patterns of the rich. It has been suggested that this result might simply reflect the fact that when the rich share is high, income is unequally distributed among the lower 95% of households(e.g. Ravallion 1992). This intraquantile inequality explanation would render the result unsurprising and uninteresting. It is important to know if it might be valid.

Needless to say, I considered this possibility and attempted to rule it out by including separately the log of the income of the poorest 20% (logI0-20) of households and the income of the households in percentiles 20 through 95 (LogI20-95). This approach was not fully convincing since percentiles 20 through 95 contain a broad range of households many of which are absolutely poor. It is possible that a high rich share is partially correlated with low income in households in e.g. percentiles 20 through 50 and therefore with high infant mortality. I find it difficult to reconcile this interpretation with the entire set of results presented in Waldmann (1992) and with reasonably assumptions about the relationship between household income and infant mortality and about the distribution of household incomes. I can't assert that it is entirely ruled out by the results presented in Waldmann (1992).

It would be fruitless to attempt to evaluate the intraquantile inequality explanation by examining the results reported in Waldmann (1992) or even by re-examining the data set used in Waldmann (1992). It is necessary to evaluate the coefficient of infant mortality on the income of the rich in regressions which include finer detail on the incomes of poorer quantiles. In particular it is necessary to make sure that high income of the rich is not (partially) correlated with high infant mortality because it is (partially) correlated with low income of some other quantile. Concerns about data quality and comparability also imply that further empirical work with a new data set is required.

In section two of this note, I present results based on two separate non-overlapping data sets which demonstrate that intraquantile inequality does not explain the association between high income of the rich and high infant mortality. In each case, a high log income of the rich is partially correlated with high log infant mortality, even though it is correlated with high log income of the quantiles not included in the regression. The results are similar to those reported in Waldmann (1992) and are similar when models with the specifications used in Waldmann (1992) are estimated with the new data sets. The results imply that biases due to inequality in percentiles 20 through 95 are fairly small -- on the order of one standard error or less. Furthermore my assumption that the two different specifications used in Waldmann (1992) set a lower and upper bound on the true coefficient is supported by the data. Specifications using more detail on the size distribution of income across households give estimates falling between those including as an additional explanatory variable only the log of the income of the poorest 20% and those also including the log of the income of households in percentiles 20 through 95.

The empirical results reported in this note support the conclusions of Waldmann (1992) and contradict the intraquantile inequality explanation. I am grateful to Martin Ravallion, Brett Bratsberg, and Peter Hammond for drawing my attention to the need to evaluate this proposed explanation.

II Data, Specification, and Results

This note uses two separate data sets on the size distribution of income across households. The first is the data set reported by Paukert (1973). This data set gives quintile shares and the share of the top 5% of households. All distributions are pre-tax. These distribution data are considered more comparable across countries than those reported by other sources (Robert Summers personal communication). Because more detail on the size distribution is given by Paukert than by *World Tables1976* (International Bank for Reconstruction and Development 1976), it is possible to address questions about intraquantile inequality which were not addressed in Waldmann (1992).

I also use more recent data on the size distribution of income across households reported by the World Bank in *Social Indicators of Development 91-92* data on diskette (International Bank for Reconstruction and Development 1992 from now on referred to as SID). These data are less detailed than those reported in Paukert -- SID reports only the two lowest quintiles and the two highest deciles. However, since the data set is new and no notes hint at inclusion of data on e.g. the distribution of income across income recipients, the data might be more comparable than those reported by Paukert. Also, since the samples of income distribution data do not overlap, results with the two data sets complement each other.

Other data used along with the Paukert income distribution data in regressions reported in table I are real per capita GDP in 1965 corrected for purchasing power parity (RGDP), the infant mortality rate in 1965 (IM), the Fertility rate in 1965, and the adult literacy rate in 1960 all taken from Barro and Wolf (1989) who used the sources listed in the data appendix.

The infant mortality rate in 1965 for Surinam was not available and the income distributions reported by Paukert for Germany and Morocco have been criticized (Christian Morisson personal communication). These data points are excluded from all results including summary statistics leaving a sample size of 51 countries for which income distribution, RGDP and infant mortality rates are available. Virtually identical results were obtained in regressions including data from Germany and Morocco (results not shown).

All regressions also include the year of the income distribution survey, since a significant coefficient on this variable might indicate bias due to the difference between the year of the income distribution survey and the year of the real GDP estimate and the infant mortality rate. Virtually identical results were obtained in regressions without this variable (results not shown).

Table I reports regressions with the same specifications used in Waldmann (1992) and regressions with new specifications which use more detail on the size distribution of income. The intraquantile inequality explanation of the results in Waldmann (1992) would not explain a positive coefficient in estimates with the new specifications. Results with the old specifications are included for comparison.

Columns 1 and 8 of Table I report the results of regressing the log of infant mortality in 1965 (LIM) on the share of the richest 5% of households (share 95-100%) and on the income of the same quantiles used in Waldmann (1992). In this note, logIxx-yy is the log of the product of RGDP and the share of income received by households in percentiles xx to yy. LogI0-20 is the log of the product of RGDP and the first quintile share of the household income distribution. In column 1 the log of infant mortality in 1965 LIM is regressed on a constant, share 95-100%, LogI0-20, and the year of the income distribution survey. The coefficient on share 95-100% is positive but statistically insignificant. The coefficient is slightly larger than the coefficient estimated with the same specification and a different data set and reported in Waldmann (1992). Column 8 of table I reports the result when logI20-95 is added to the regression. The coefficient on share 95-100% increases to 2.08 and becomes statistically significant with a t-statistic of 2.52. This coefficient is slightly smaller than the coefficient estimated with the same specification and a different data set and reported in Waldmann (1992).

Column 2 of table 1 reports regressions of LIM on the income of the rich logI95-100, a constant, the year of the survey and logI0-20. The coefficient on the income of the rich is negative with a t-statistic of -1.07. This is not surprising since the income of the rich is a much better predictor of the income of the middle quantiles than is the share of the rich. Column 7 of table I reports a regression including the income of the rich and logI20-95. When logI20-95 is included, the choice of share or income of the rich makes little difference. The t-statistic actually rises to 2.71. A similar result was reported in Waldmann (1992).

All of these results are consistent with the explanation that a high income of the rich is partially correlated with high infant mortality because it indicates an unequal distribution of income among households in percentiles 20 through 95. To address this proposed explanation, I add logI20-40 to the regression reported in column 2. This means that infant mortality is regressed on the income of the rich and the income of the two poorest quintiles. The results reported in column 3 of table 1 demonstrate that intraquantile inequality is not the true explanation. The coefficient on the income of the rich is positive 0.22 the t-statistic is 1.88 Which rejects the null against the appropriate one sided alternative hypothesis of a positive coefficient. Note that in this regression the incomes of 55% of households are excluded. As demonstrated in column 2 of table III, the income of the rich is partially correlated with a higher income of the third quintile (logI40-60) and as demonstrated in columns 2 and 3 of table three with the fourth quintile logI60-80. This implies that, given logI0-20 and logI20-40, higher rich income is correlated with higher income in at least the upper 40% of the income distribution. Furthermore the coefficient on logI20-40 is positive. This is not surprising, since the partial correlation of logI0-20 with logI40-60 and logI60-80 is negative. However the incomes of the first and second quintiles are much better indicators of the distribution of income in the first and second quintiles than is the income of the rich. It is almost impossible to reconcile column 3 of table I and columns 2 and 3 of table III with the hypothesis that the infant mortality rate is a decreasing function of household income without externalities. Any such explanation would require completely implausible assumptions about income distributions and the shape of such a function. This amounts to strong evidence against the intraquantile inequality explanation.

Column 4 of table I reports the effect of the addition of LogI40-60. The coefficient on the income of the rich increases to 0.32 and the t-statistic increases to 2.56 significant at the 1% level against the one sided alternative. As reported in column 3 of table III, the income of the rich is positively correlated with logI60-80, the income of the excluded quintile. This result can not be plausibly explained by intraquantile inequality. Note that this t-statistic is higher than that obtained with either of the principal specifications used in Waldmann (1992). This suggests that the problem of intraquantile inequality is not of great empirical importance.

Column 5 of table I reports the small decrease in the coefficient on logI95-100 caused by the inclusion of additional explanatory variables -- the literacy rate in 1960 and the fertility rate in 1965. This is striking since the additional variables are strongly significant with the expected signs. Note also that one country -- Chad -- is dropped from the regression since the literacy rate in 1960 was not available. Column 6 of table one reports the similarly small effect of the addition of continent dummies for third world America (Latin America), Africa, South Asia and East Asia. The comparison group is first world countries including Europe, the USA, Canada, Japan and Australia. The t-statistic on the income of the rich LogI95-100 is 1.82, significant against the one sided alternative. Note that the R^2 of this regression is 94% leaving very little room for omitted variables which might bias the coefficient on logI95-100.

The results reported in table I provide strong evidence against the intraquantile inequality explanation. Combined with the results reported in table III, they pose the puzzle -- why is the income of the rich associated with higher infant mortality given equal or higher incomes of the non-rich.

Table II reports results obtained with a different data set. The income distribution data are from *Social Indicators of Development 91-92* data on diskette (International Bank for Reconstruction and Development 1992 referred to as SID). Neither the diskette nor the printed version of *Social Indicators of Development 1990* (International Bank for Reconstruction and Development 1991) gives any hint of mixture of incomparable data e.g. the distribution of income across income recipients. None of the income distributions used in regressions reported in table II were used in regressions reported in Waldmann (1992) or in table I. Countries were selected if income distribution data was available for a year from 1975 to 1985. This gave a sample of 41 countries. The dependent variable for all regressions reported in table II is the log of the infant mortality rate measured in the same year as the income distribution reported in SID (*Social Indicators of Development 91-92* data on diskette International Bank for Reconstruction and Development 1992). Incomes of quantiles were defined as the product of the income share of the quantile and real per capita GDP (RGDPCH) for the same year as reported in *Penn World Table Mark V* data on Diskette (Heston and Summers 1991). The year of the infant mortality rate, the survey and the real GDP estimate was included as an additional explanatory variable (yearsid). Note that, since GDP and infant mortality are measured in the same year as the income distribution, the variable year has a very different meaning in table II and table I. This also explains why the constant terms in the regressions reported in table II are very large, since year ranges from 1,975 to 1,985.

Again I report results both with specifications as close as possible to those used in Waldmann (1992) and results with new specifications. Since the SID data set does not contain information on the distribution of income among households in percentiles 40 through 80, it is more difficult to evaluate the intraquantile inequality explanation with this data set. Since the richest quantile share reported in SID is the share of households in percentiles 90 through 100, the results in table III are not comparable to the results in table I or the results reported in Waldmann (1992). Nonetheless, this data set is useful, since it is recently collected and since the income distribution data are based on different surveys than the data used in Waldmann (1992) or in the regressions reported in table I. This means that an accidental correlation between measurement error in quantile share and the disturbance to or measurement error of the infant mortality rate can't affect all three sets of results. Of course, since differences across countries in income distribution and in infant mortality are persistent, a correlation due to omitted country characteristics, could affect all three sets of results.

Columns 1 and 2 of table II report the fact that both the share of percentiles 90-100 (Sharet90-100) and the log of the income of percentiles 90 through 100 (LnI90-100) is negatively correlated with log infant mortality when the only other explanatory variables are LnI0-20 and the year of the data. In contrast columns 5 and 6 report the strongly positive coefficient of the share of percentiles 90-100 and LnI90-100 respectively when LnI20-90 is added to the regression. The coefficient on LnI90-100 is 0.72 with a t-statistic of 2.57. As above these results can be explained by the intraquantile inequality explanation.

Column 3 of table II reports the results of regressing the log of infant mortality on a constant, LnI0-20, LnI20-40, the year of the data and LnI90-100. The coefficient on LnI90-100 is 0.32, somewhat more than a standard error less than the coefficient reported in column 5. The t-statistic is 1.81 which rejects the null against the appropriate one sided alternative of a positive coefficient. Given both the difference in the data sets and the difference between LnI90-100 and lnI95-100 the similarity of this result and the result with an analogous specification reported in column 3 of table I, is remarkable. Again it is almost impossible to reconcile this result with the intraquantile inequality explanation.

Column 4 of table II reports the effect of adding LnI40-80 to the regression. The coefficient on LnI90-100 increases to 0.48. The additional explanatory variable reduces the identifying variance, so the t-statistic increases only to 1.82. Since inequality within percentiles 40-80 is likely to be important, intraquantile inequality might explain this result.

Columns 4 and 5 of table III report that LnI90-100 has a positive partial correlation with the incomes of quantiles excluded from the regressions reported in table II. For the intraquantile inequality explanation to be valid a negative correlation with some quantile share is needed. While only some quantile shares were available, the assertion that the correlation of LnI90-100 with the income of households in a large number of percentiles is negative, is completely implausible. Again results using more detail of the income distribution fall between results obtained with the specifications used in Waldmann (1992).

In addition to the results reported in tables II, I estimated models with the same specifications using a partly overlapping data set on income distribution in 46 countries collected from 1965 to 1979 (source SID). The results were very similar although the estimates analogous to those reported in column 3 did not reject the null hypothesis (results not shown). I also estimated models with the same specifications using a partially overlapping data set on income distribution in 35 countries collected from 1980 to 1988. In these regressions, the coefficient on LnI90-100 was smaller and the t-statistics less significant (results not shown). This difference might indicate a change in the association between the income of the rich and infant mortality, or perhaps it should be pooled with results with older data resulting in a lower point estimate. However the change is entirely due to the extremely unequal distribution reported for Sri Lanka in 1986. Sri Lanka is a well known anomaly with a surprisingly low infant mortality rate given its low per capita real GDP, this is sometimes ascribed to strongly egalitarian policies. Finally, a much more equal income distribution was reported for 1970 and 1973 (this latter distribution was used in the regressions reported in table II). When Sri Lanka in 1986 is excluded from the regression, the coefficients are virtually identical to those estimated with data from 1975 through 1985. The coefficients on logI90-100 from regressions with the specifications reported in columns 3, 4 and 5 of table II differ by less than one tenth of a standard error from those reported in table II (results not shown).

Also I estimated similar models with data from Flegg (1982) matched with income distribution data from Jain (1973). Again with this data set I found that high income for the rich was partially correlated with high infant mortality in regressions including the income of poorer quantiles even when it was also partially correlated with high income of excluded quantiles. However, Jain's footnotes reveal that these data (also used by Flegg) report different distributions for different countries -- distribution of income across households, income recipients, the economically active population &c. When an indicator variable for "distribution across households" was included in the regression it had a significant t-statistic, indicating the incomparability of the distribution statistics measuring different distributions (data not shown). These results may indicate nothing, but if they are of any value they strengthen the case against the intraquantile inequality explanation.

III Conclusions

This note has demonstrated that the association between high income of the rich and high infant mortality is almost certainly not caused by a negative correlation between income of the rich and income of poorer quantiles. This conclusion is now much more strongly supported by the data than the same conclusion reported in Waldmann (1992).

If this note has indeed demonstrated that the perfectly reasonably intraquantile inequality explanation for the positive association between income inequality and infant mortality is not the whole story, it is necessary to look for less obvious explanations. As in Waldmann (1992) I note three possibilities -- high income for the rich could be correlated with high prices for necessities compared to luxuries, high income of the rich might cause or be caused by government policies harmful to the poor which also increase infant mortality and finally high income of the rich might affect the choices of poor families leading them to imitate the consumption patterns of the rich at the expense of their infants.

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Data appendix

Variable Name | Definition and Source

-

FERT65 : Total fertility rate in 1965 (children per woman)
Source : World Bank World Tables, various editions.

GDP65 : GDP per capita in real terms (RGDP) in 1965
Source : Heston and Summers (1988) ; <Includes Corrections for Brazil and Indonesia>

LIT60 : Adult literacy rate in 1960.
Source : World Bank World Tables, various editions.

IM : Infant Mortality Rate in 1965 (ages 0-1)
Source : World Bank World Tables, various editions.

RGDPCHt : GDP per capita in real terms (RGDPCH) in year x
Source : Heston and Summers (1991).

Share x-y : Share of income received by the households in percentiles x through y
Source : Paukert (1973).

Year : Year of survey reported in Paukert
Source : Paukert (1973).

LogIx-y : Natural logarithm of GDP65 times Share x-y

$Share_t$x-y : Share of income received in year t by the households in percentiles x through y
Source : *Social Indicators of Development 1991-2*

LnIx-y : Natural logarithm of product of $Share_t$x-y and $RGDPCH_t$

Yearsid : Year of survey reported in SID
Source : *Social Indicators of Development 1991-2*

Table I Infant Mortality and Income of Various Quantiles

	1	2	3	4	5	6	7	8
# obs.	51	51	51	51	50	50	51	51
R^2	0.66	0.65	0.78	0.80	0.90	0.94	0.76	0.75
Constant	-2.16 (1.05)	-1.13 (1.01)	-1.06 (0.81)	-1.52 (0.82)	-2.91 (0.64)	-2.40 (0.63)	-0.20 (0.87)	-1.03 (0.94)
Share 95-100	1.58 (0.95)							2.08 (0.82)
LogI 95-100		-0.13 (0.12)	0.22 (0.12)	0.32 (0.12)	0.24 (0.09)	0.17 (0.09)	0.42 (0.16)	
LogI0-20	-0.64 (0.10)	-0.65 (0.12)	0.40 (0.22)	0.32 (0.22)	0.16 (0.16)	0.24 (0.14)	-0.02 (0.17)	-0.003 (0.17)
logI20-40			-1.22 (0.23)	-0.35 (0.50)	0.15 (0.37)	-0.16 (0.32)		
LogI40-60				-0.82 (0.42)	-0.70 (0.31)	-0.35 (0.27)		
LogI20-95							-1.01 (0.22)	-0.61 (0.14)
Year/100	0.66 (1.51)	0.50 (1.54)	0.49 (1.23)	0.81 (1.26)	0.31 (0.91)	0.48 (0.78)	1.20 (1.29)	1.11 (1.30)
Literacy Rate 1960					-0.69 (0.24)	-1.23 (0.33)		
Fertility Rate 1965					0.18 (0.04)	0.02 (0.05)		
Latin America						0.73 (0.15)		
Africa						0.49 (0.20)		
South Asia						0.54 (0.19)		
East Asia						0.52 (0.19)		

Standard errors in parentheses. Dependent Variable is the log of the infant mortality rate in 1965. Year is the year of the income survey. Germany and Morocco are excluded. Excluded indicator variable is First World.
For data sources and definitions see data appendix.

Table II

Infant Mortality and Quantile Incomes

	1	2	3	4	5	6
# obs.	41	41	41	41	41	41
R^2	0.83	0.85	0.91	0.91	0.90	0.90
Constant	-25.38 (45.51)	-10.19 (43.00)	-29.12 (34.75)	-26.78 (35.02)	-15.99 (36.08)	-18.33 (36.52)
Share 90-100%	-0.11 (1.37)					3.19 (1.31)
Ln Income 90-100%		-0.30 (0.15)	0.32 (0.18)	0.48 (0.27)	0.72 (0.28)	
Ln Income 0-20 %	-0.86 (0.09)	-0.63 (0.13)	0.88 (0.34)	0.78 (0.37)	0.25 (0.24)	0.30 (0.26)
Ln Income 20-40 %			-1.94 (0.42)	-1.42 (0.76)		
Ln Income 40-80 %				-0.55 (0.68)		
ln Income 20-90 %					-1.71 (0.42)	-1.04 (0.22)
Yearsid/100	-1.89 (2.30)	1.18 (2.18)	2.04 (1.76)	1.94 (1.77)	1.50 (1.83)	1.55 (1.85)

Standard errors in Parentheses.
Dependent variable is the log of infant mortality in the same year as the income distribution (range 1975 to 1985). Yearsid is year of infant mortality, income distribution and per capita GDP. Other independent variables are the share of the richest 10 % of households from Social Indicators of developement or the log of product of share of quantile from Social indicators of developement with real per capita GDP from
Penn World Table Mark V.
The sample of income distribution data does not overlap with the sample used in table I.

Table III
Income of Poorest Excluded Quantile and income of rich

	1	2	3	4	5
Dependent Variable	LogI20-40	LogI40-60	LogI60-80	LogI20-40	LogI40-80
# obs.	51	51	51	41	41
R^2	0.94	0.98	0.99	0.99	0.995
Constant	0.06	-0.55	0.33	-9.77	4.23
	(0.51)	(0.27)	(0.24)	(13.56)	(5.60)
LogI95-100	0.29	0.12	0.16		
	(0.06)	(0.04)	(0.04)		
LogI90-100				0.32	0.29
				(0.05)	(0.04)
LogI0-20	0.86	-0.10	-0.07	0.78	-0.19
	(0.06)	(0.07)	(0.65)	(0.04)	(0.08)
LogI20-40		1.05	-0.31		0.93
		(0.08)	(0.15)		(0.10)
LogI40-60			1.20		
			(0.13)		
Year/100	-0.37	0.92	-0.28		
	(0.77)	(0.42)	(0.37)		
Yearsid/100				0.45	-0.18
				(0.69)	(0.44)

Standard errors in parentheses.
In columns 1,2 and 3 LogIx-y are log of product of Quantile shares from Paukert (1973) and per capita real GDP (RGDP) in 1965 from Heston and Summers 1988. Year is the year of income distribution survey. In columns 4 and 5 LogIx-y are log of product of Quantile shares from Social Indicators of Development and real per capita GDP (RGDPCH) in the same year from Penn World Table Mark V. Yearsid is the year of the income survey and of RGDPCH.

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