IFN Working Paper No. 900, 2012

When More Poor Means Less Poverty: On Income Inequality and Purchasing Power

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When more poor means less poverty: On income inequality and purchasing power*

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Abstract

We show theoretically that the poor can benefit from price changes induced by higher income inequality. As the number of poor in a society increases, or when the income difference between rich and poor increases, the market for products aimed towards the poor grows and such products become more profitable. As a result, there are circumstances where an increase in poverty associates with higher purchasing power of the poor. Using cross-country data at two points in time on the price of rice and Big Mac hamburgers, we confirm the relationship between inequality and purchasing power of the poor, and show that it is robust to several control variables and also to a first-difference specification.

JEL classification: D63; I3

Keywords: Inequality; Poverty; Prices; Purchasing power

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* Financial support from the Jan Wallander and Tom Hedelius Research Foundation is gratefully acknowledged.

1. Introduction

In Africa, the retail chain Pick 'N Pay is investing in the poorer parts of the continent through low-price format stores, rather than expanding its existing high and middle-end supermarkets. According to Weatherspoon and Reardon (2003), this illustrates a trend: Supermarkets geared towards the poor.[2]

In China, rural farmers commonly used washing machines not only to wash clothes, but also to wash vegetables. Haier, China's biggest home appliance manufacturer, responded by developing a washing machine with larger pipes and providing instructions on how to clean vegetables in it. Anderson and Billou (2007) use this particular example to illustrate that products are often developed specially for the poor, rather than modeled on what has worked for middle and high-income groups. Similarly, the Philippine telecom corporation Smart Communications launched very small pricing packages on telecom that matched the many poor consumer's incomes and needs.

The examples above illustrate that, provided that the market is sufficiently big, it is part of a profit maximizing strategy for firms to sell low priced products and services to poor consumers. This paper notes that as a result, the price structure will depend on the income distribution. As a somewhat counter-intuitive result, higher income inequality will under some circumstances associate with higher purchasing power and possibly improved welfare of the poor.

As noted by Pendakur (2002), the price structure is usually ignored when measuring economic inequality. The income of rich and poor in a country is deflated using the same price vector.[3] But if prices depend on the income distribution, changes in the income distribution will not necessarily imply similar changes in the distribution of purchasing power. The distributional importance of the price structure is noted by Broda and Romalis (2009), who show that much of the increase in income inequality in the US has been offset by a relative decline in the prices of products that poorer consumers buy – the so called *Walmart-effect*. We argue that this is no coincidence: Higher income inequality will often imply higher demand for products targeted towards the poor, and the increasing supply of these goods will mitigate adverse effects of higher income inequality by its impact on the distribution of purchasing power.

[2] Incidentally, the African supermarket chain Massmart was bought by Walmart in 2010, a chain that in the US has been highly successful providing low-price products to cash-constrained Americans.

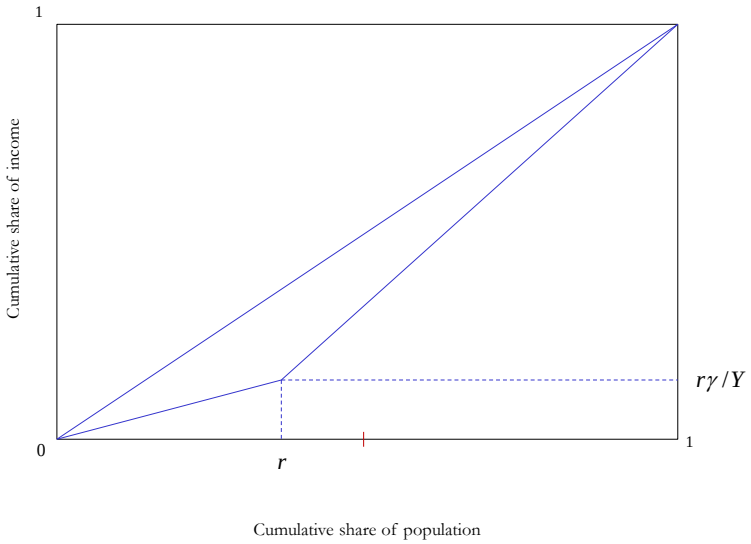
[3] Using Canadian data on regional price information and expenditure-dependent price deflators Pendakur (2002) shows that relative prices affect both the level of and year-to-year changes in family inequality.

This paper develops a simple model to analyze the effects of income inequality on the distribution of purchasing power (section 2). The claim that higher income inequality has purchasing power effects that are beneficial for the poor is then tested empirically using data from middle- and high-income countries on income inequality and the price of two inferior goods: rice and Big Mac hamburgers (section 3). Section 4 concludes with some remarks on directions for future research.

2. A simple model and some theoretical considerations

Assume that society consists of two groups, rich and poor, with incomes $\lambda>0$ and $\gamma \in (0, \lambda),$ respectively. The poverty rate in the population is *r*. Normalizing the population to 1, total income will be $Y = r\gamma + (1-r)\lambda.$ The share of total income held by poor will be $r\gamma / Y.$ From the properties of the commonly used Gini-coefficient (see, for example, Lambert 1993), it follows that coefficient will increase as the poverty rate increases from 0 to 0.5, and then decrease as the poverty rate approaches 1. Assuming that $r < 0.5$, and using *G* to denote the Gini-coefficient for income, our model has the properties that a higher poverty rate increases the Gini-coefficient, and a higher income of the poor decreases it: $G_\gamma < 0$ and $G_r > 0$. Figure 1 illustrates the model graphically.

Figure 1. The Gini coefficient in a model with two income groups



Assume further that there are N goods with prices $p_1,\ldots,p_N$. Let $\alpha_1,\ldots,\alpha_N$ be the consumption weights of the poor, let $\beta_1,\ldots,\beta_N$ be the consumption weights of the rich (in both cases, weights sum to 1), and let p_R and p_P be the price indices associated with the consumption patterns of rich and poor, so that

$p_R = \beta_1 p_1 + \ldots + \beta_N p_N$, and

$p_P = \alpha_1 p_1 + \ldots + \alpha_N p_N$.

The purchasing power of the poor will be $\frac{\gamma}{p_P}$, and the purchasing power of the rich will be $\frac{\lambda}{p_R}$. Assuming $\alpha = \beta$ for all goods corresponds to using what Pendakur (2002) calls a naïve price vector where $p_R = p_P$, describing the special case of homothetic preferences where consumption weights are independent of income. If poor spend bigger shares of their income on relatively cheaper goods, we have $p_R > p_P$, and inequality of purchasing power will be smaller than inequality of income. This gives us a formal definition of the Walmart-effect:

Definition *The Walmart effect*: $p_R > p_P$ implies that $\frac{p_P \lambda}{p_R \gamma} < \frac{\lambda}{\gamma}$.

In the model, there are three different ways in which the distribution of income may change: By a change in the income of the poor γ, by a change in the income of the rich λ, and by a change in the poverty rate r. If prices are constant, these income changes translate directly to changes in purchasing

power. If prices depend on the income distribution, these changes will have both direct and indirect effects on purchasing power.

Consider the change in purchasing power of the poor resulting from a change in the income of the poor. The effect can be decomposed into a direct effect caused by the change in income, and an indirect effect caused by changes in the prices of goods consumed by the poor:

$$\frac{\partial \frac{\gamma}{p_P}}{\partial \gamma} = \frac{\mathrm{p_P} - \frac{\partial \mathrm{p_P}}{\partial \gamma}\gamma}{(\mathrm{p_P})^2} = \frac{1}{\mathrm{p_P}} - \frac{\gamma \frac{\partial \mathrm{p_P}}{\partial \gamma}}{(\mathrm{p_P})^2}$$

If prices are unaffected by a change in γ, $\frac{\partial \mathrm{p_P}}{\partial \gamma} = 0$ and the expression above simplifies to $\frac{1}{\mathrm{p_P}}$. Similarly, the change in purchasing power of the poor resulting from a change in the income of the rich will be

$$\frac{\partial \frac{\gamma}{p_P}}{\partial \lambda} = \frac{-\frac{\partial \mathrm{p_P}}{\partial \lambda}\gamma}{(\mathrm{p_P})^2}$$

Finally, the change in purchasing power of the poor resulting from a change in the poverty rate will be

$$\frac{\partial \frac{\gamma}{p_P}}{\partial r} = \frac{-\frac{\partial \mathrm{p_P}}{\partial \mathrm{r}}\gamma}{(\mathrm{p_P})^2}$$

Clearly, the signs of the derivatives $\frac{\partial \mathrm{p_P}}{\partial \gamma}$, $\frac{\partial \mathrm{p_P}}{\partial \lambda}$, and $\frac{\partial \mathrm{p_P}}{\partial \mathrm{r}}$ are important. In the short run, changes in γ, λ and *r* will lead to demand shifts causing short run price changes, but as the supply side adapts, prices will reflect the new income structure of the economy.

Consistent with the anecdotal evidence cited in section 1, $\frac{\partial p_P}{\partial r} < 0$ follows from the presence of fixed production costs: A higher poverty rate implies a larger market for inferior products demanded by the poor. We refer to this as the market size effect:

Definition *The market size effect*: $\frac{\partial p_P}{\partial r} < 0$

Empirical evidence (see e.g. Deaton and Muellbauer 1980) and the anecdotal story on washing machines in section 1 suggest that consumer preferences are non-homothetic. Clearly, firms may also meet fixed costs in supplying different goods to rich and poor consumers, in which case the profitability of product differentiation depends on the income difference between rich and poor, δ = λ – γ, being sufficiently large. We refer to this as the market segregations effect:

Definition *The market segregation effect*: $\frac{\partial p_P}{\partial \delta} < 0$

As defined, p_P decreases both when the poor become poorer and when the rich become richer.

Intuitively, both purchasing power effects work through the mechanism that inferior goods will be part of a profit maximizing strategy for firms only if the demanded quantity is high enough. This will be true if the poor are sufficiently numerous, (the market size effect), or if the income distance between rich and poor is sufficiently large (the market segregation effect).

Finally, note that in our model, any change – an increase in r or λ, or a decrease in γ – that leads to an increase in Gini-inequality of income will associate with a decrease in p_P, assuming that both the market size effect and the market segregation effect is present. This means that comparisons of income inequality across countries will overstate the differences in inequality of purchasing power.

The next section examines empirically if higher Gini-inequality indeed associates with lower prices of two inferior goods: Rice and Big Mac hamburgers.

3. Empirical evidence

We use data from the UBS-publication Prices and Earnings, mainly known for providing the Big Mac index that shows how long an average wage earner has to work to afford the well-known hamburger across countries. Based on surveys in 73 cities across the world, the report provides a comparison of both prices for various goods and average incomes, and uses this information to calculate measures of purchasing power to compare the living standard in each of the cities surveyed.[4]

The data provided by UBS is very adequate for testing model predictions and analyzing the relationship between inequalities and prices. First, all countries covered are classified as either middle- or high-income countries. Consequently the model assumption on a poverty rate lower that 0.5 is likely not violated. Second, the UBS data is suitable with respect to the types of goods covered. We use information regarding the number of minutes work required at the average hourly net wage in each city to buy 1 kg rice and 1 Big Mac. These goods are chosen because they are highly standardized and likely demanded

4 Reports are available at http://www.ubs.com/1/e/wealthmanagement/wealth_management_research/prices_earnings.html

relatively more by the poor than the rich in a developed context. To maximize the number of cities included, while maintaining comparability over time, we use data from the 2009 and the 1997 UBS reports. Table A1 in the Appendix presents the countries included in the analysis.

The purchasing power effects imply that, controlling for average income, higher income inequality should associate with a lower price of these goods and thus fewer minutes of work required to buy the goods. Table 1 presents a first test estimating a pooled regression, using country data from 1997 and 2009 on net income *Gini* coefficients from Solt (2008) updated in 2011, log real *GDP per capita* from Heston et al. (2009), and controlling for *taxes* as share of GDP (Heritage Foundation 2009), log *population* size, *urbanization*, and geographical dummies (World Bank, 2010).[5] Since the impact on purchasing power is unlikely to be instant, particularly the effect of higher inequality, these variables are lagged.[6] This specification also reduces the bias following from potential reverse causality. Table A2 in the Appendix provides descriptive statistics for all of the above variables.

Table 1 Inequality and the price of rice and Big Mac - Pooled regressions

	Rice	Rice	Rice	Big Mac	Big Mac	Big Mac
Gini (net income)	0.535*	-0.450**	-0.636**	1.795***	0.181	-1.385***
	[0.303]	[0.191]	[0.265]	[0.671]	[0.404]	[0.496]
log GDP per capita		-19.92***	-19.62***		-32.64***	-33.04***
		[3.003]	[2.760]		[4.993]	[4.622]
Tax (% of GDP)			-0.196			-0.382
			[0.197]			[0.315]
log Population			-0.615			-3.338*
			[0.984]			[1.713]
Urbanization			0.0380			0.0845
			[0.0896]			[0.157]
Sub-Saharan Africa			17.90			76.45***
			[15.69]			[21.58]
Asia			1.368			9.334
			[5.101]			[9.362]
Latin America			0.799			44.15***
			[6.985]			[12.36]
Number of observations	77	77	77	77	77	77
R-squared	0.058	0.611	0.632	0.183	0.604	0.747

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

The bivariate correlation between income inequality and the price of rice is positive, suggesting that rice is more expensive more unequal countries. This is, however, driven by the well-documented fact that poorer countries are more unequal on average. In particular the relationship between average income and

[5] GDP per capita, taxes, urbanization and population is collected for the years 1993 and 2005 respectively. The net income Gini variable refers to average income inequality 1992-1995 and 2004-2007 respectively.

6 GDP per capita, taxes, urbanization and population is collected for the years 1993 and 2005 respectively. The net income Gini variable refers to average income inequality 1992-1995 and 2004-2007 respectively.

income inequality is negative across middle- and high income countries (see e.g. Ferreira and Ravallion 2008). Once controlling for GDP per capita, the sign for income inequality is reversed. Furthermore, as shown in column 3 of table 1, the negative relationship between inequality and the price of rice strengthens when introducing additional control variables. The same pattern holds for the price of Big Mac hamburgers (column 4 to 6): The positive coefficient on Gini inequality disappears when controlling for GDP per capita, and the sign becomes negative and significant once introducing regional controls for Sub-Saharan Africa and Latin America, both of which have very high income inequality levels.

The above empirical findings clearly corroborate the predictions of our model. Moreover, the size of the effect is economically significant: On average, a 10 point increase in the Gini coefficient (corresponding to shifting from the level of inequality in Latvia to Kenya) decreases the time required to buy a kilo of rice by 7 minutes (compared to the 2007 global average of 22 minutes). Similarly a corresponding inequality increase would on average decrease the time required for a Big Mac by 16 minutes (compared to the 2007 global average of 37 minutes).

3.1 Robustness tests

Cross-country variation is known to be vulnerable to bias from omitted variables. Although table 1 shows that the result is strengthened by the inclusion of additional control variables, the result may still be spurious due to some unobserved characteristic. In order to clean the estimates from potential bias from time invariant unobserved heterogeneity and minimize the risk for endogeneity, we also run first-differences regression explaining changes in purchasing power between 1997 and 2009 by changes in inequality from 1992-1995 to 2004-2007. Table 2 shows the results.

Table 2 Inequality and the price of rice and Big Mac - First-differences

	Rice	Rice	Big Mac	Big Mac
Gini, change 1993-2005	-0.192	-1.970	-1.673**	-3.140*
	[0.405]	[1.130]	[0.652]	[1.555]
Initial log GDP per capita	-14.48***	-1.621	9.056	8.457
	[4.647]	[9.667]	[5.443]	[10.92]
Time required in 1997	-1.014***	-0.718**	-0.233	-0.531
	[0.146]	[0.285]	[0.140]	[0.377]
Population, change 1993-2005	-4.410	-138.2*	48.51	-108.8
	[24.71]	[64.36]	[29.48]	[84.39]
Urbanization, change 1993-2005	-0.736*	0.299	1.595	2.339**
	[0.432]	[0.695]	[0.979]	[0.983]
Tax (% of GDP), change 1993-2005		-1.545		-2.627**
		[1.335]		[1.053]
Sub-Saharan Africa	-4.355	36.47*	12.78	97.89
	[6.325]	[18.00]	[9.526]	[57.88]
Asia	3.021	27.93*	9.080*	43.62**
	[3.533]	[13.47]	[5.215]	[19.57]
Latin America	-1.850	14.33	27.00*	76.93*
	[7.283]	[12.85]	[13.65]	[37.17]
Observations	44	23	44	23
R-squared	0.806	0.874	0.599	0.750

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

In general, countries where inequality has increased over the time period are also countries where the price of a Big Mac hamburger has decreased, in line with the discussion in section 2. Once again the finding is robust to a large number of control variables. The sign for income inequality is negative also for rice, though not significant. The lack of significance is hardly surprising given the number of observations that are lost when running the first difference regression.

As a final robustness test, we note that both the market size effect and the segregation effect suggest that income inequality tend to lower the price of goods demanded mainly by the poor – but should not affect the price of normal goods. USB publications also provide information on the number of minutes work required at the average hourly net wage to buy 1 kg of bread, which arguably is a normal good. Table 3 presents the estimation results from testing the effect of income inequality on the price of bread.

Table 3 Income inequality and the price of bread – Pooled regressions

	Bread	Bread	Bread
Gini (net income)	0.881***	0.0321	-0.308
	[0.314]	[0.305]	[0.365]
log GDP per capita		-17.17***	-12.03***
		[4.723]	[3.461]
Tax (% of GDP)			-0.458*
			[0.232]
log Population			-0.567
			[1.580]
Urbanization			0.0158
			[0.117]
Sub-Saharan Africa			7.578
			[11.36]
Asia			22.31***
			[7.132]
Latin America			16.79*
			[8.964]
Number of observations	77	77	77
R-squared	0.121	0.438	0.578

Robust standard errors in brackets

*** p<0.01, ** p<0.05, * p<0.1

Clearly, income inequality has no significant explanatory power when it comes to the time price of bread, which is mainly explained by the level of GDP and to some extent by the size of the public sector, possibly a result from agricultural subsidies.

4. Concluding remarks

We show that rising income inequality is associated with price changes that benefit the poor, which partly mitigates the effects of income inequality on inequality of purchasing power. Our simple model relies only informally on a fixed cost argument, but there are other mechanisms working in the same direction. For example, Acemoglu and Linn (2004) show theoretically that a greater market size for a particular product implies greater profitability from sales and thus spurs faster innovation. They verify the mechanism empirically, using evidence from the US pharmaceutical industry.

Our findings have some potentially important implications. It has long been known that income and earnings are imperfect indicators of well-being, and as a result many scholars have shifted focus to the distribution of individual or household consumption (Cutler and Katz (1991), Slesnick (2001), Deaton and C. (1994), Krueger and Perri (2006)). Strictly speaking, these authors do not study consumption, but rather consumption expenditure. For example, Krueger and Perri (2006) show that despite the surge in income inequality in the US, inequality of consumption expenditure has increased only moderately.

Our study suggests that the well-being of the poor may be even better than suggested by their results, as the purchasing power of a given level of consumption expenditure increases due to price changes.

It remains to be explored if purchasing power effects are large enough to have substantial consequences for the welfare of the poor. In this context, our results are relevant for the large literature on the health effects of income inequality, where results are currently very mixed – as shown by overviews by Subramanian and Kawachi (2004) and Kondo, et al. (2009). For example, psychological health measures may be more sensitive to the income distribution while more physiological measures are likely to also depend on the distribution of purchasing power.

Finally, it should be noted that the above analysis has disseminated the relationship between inequality and purchasing power focusing on inferior and normal goods. As discussed by Veblen (1994 [1899]) it is however likely that purchasing power effects do not generally benefit the poor ($\partial Pp/\partial\lambda > 0$) when it comes to status goods and conspicuous consumption. For example, when there is limited supply of attractively located housing demanded by both rich and poor, higher income of the rich will increase the price of these goods and thus decrease the purchasing power of the poor.

In any case, our study highlights a very general point. When examining economic well-being, it is important to analyze not only the incomes or even expenditure of households, but also the prices of the products they buy.

Acknowledgements We are thankful for comments and suggestions from participants in the 2010 American Public Choice Meeting (Monterey, CA), in the 2011 ECINEQ meeting in Italy, and in the Department of Economics seminar series of Umeå University, Lund University and the Ratio institute. We are also sincerely thankful for comments from Niclas Berggren, and the help and work done by research assistant Ingrid Magnusson. This work is partially funded by the Swedish International Development Cooperation Agency Sida/SAREC.

Appendix A: Country list

Argentina	Finland	Lithuania *	Slovenia *
Australia	France	Luxembourg	South Africa
Austria	Germany	Malaysia	Spain
Belgium	Greece	Mexico	Sweden
Brazil	Hong Kong	Netherlands	Switzerland
Bulgaria *	Hungary	New Zeeland *	Taiwan *
Canada	India	Norway	Thailand
Chile *	Indonesia	Peru *	Turkey
China	Ireland	Philippines	Ukraine *
Colombia	Israel	Poland	United Kingdom
Cyprus	Italy	Portugal	United States
Czech Republic	Japan	Romania *	Venezuela
Denmark	Kenya	Russian Federation	
Egypt *	Korea, Republic of	Singapore	
Estonia *	Latvia *	Slovak Republic *	

* Countries not included in difference regressions

Appendix B: Descriptive statistics

Variable	Observations	Mean	Std. Dev.	Min	Max
Rice	77	25.53	19.05	8	104
Big Mac	77	42.68	35.80	9	193
Bread	77	26.77	21.67	9	143
Gini (net income)	77	34.36	8.54	20.79	67.44
log GDP	77	9.58	0.83	7.35	11.24
Tax (% of GDP)	77	18.34	6.49	4.08	43.73
log Population	77	16.99	1.59	13.06	20.99
Urbanization	77	67.83	18.38	18.76	100
Sub-Saharan Africa	77	0.039	0.20	0	1
Asia	77	0.17	0.378	0	1
Latin America	77	0.10	0.31	0	1

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