Poverty and Vulnerability in Urban China

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Abstract

In this paper we want to analyse the structure of Poverty and Vulnerability in a Chinese urban agglomeration. Following the World Bank we define the danger of falling into poverty as a dynamic concept: Insecurity is an important component of welfare and can be understood as vulnerability to a decline in well-being. Insofar we define Vulnerability as today's risk of falling into poverty or deeper into poverty in the future. We focus on the income dimension of poverty and vulnerability on the household level neglecting other aspects. For our analysis we employ data from the 2005 Shenzhen household survey. The 2005 Shenzhen household survey is the first household survey of this type conducted by a non-government research team. Contrary to existing household surveys this survey includes information on the migrant population. The dataset comprises 1056 households and 3256 individuals. The survey allows us to specifically look at the impact of the registration system on poverty and vulnerability. We also look at the different subclasses of migrants to analyze if different origins of migration have different effects on poverty and vulnerability. Are rural-urban migrants more vulnerable than urban-urban migrants? How does vulnerability differ from the poverty estimates? We first present a variety of descriptive facts to give a broad overview of poverty and inequality in Shenzhen. We then employ a method which allows us to generate vulnerability estimates from our cross-section dataset. The special importance of our results for Shenzhen is also due to the special role of Shenzhen for China. Because it was the first SEZ and experienced such a massive growth process it can be regarded as a role model for further development in China.

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Introduction

The World Bank recently stressed the connection between empowerment, security, opportunity and poverty in its World Development Report. Embedded in this connected view lies the concept of insecurity and risk whereas insecurity can be characterized as the risk of negative shock to wellbeing and welfare. These negative shocks can be of idiosyncratic or systemic nature and if severe enough can affect welfare drastically enough to push a household or individual into poverty. Common idiosyncratic shocks which can drastically reduce a household's welfare are death, illness and unemployment. Often seen systemic shocks are war, droughts and political unrest. All the factors which can negatively affect the welfare and income of a household also increase its risk to fall into poverty and therefore make a household more vulnerable. In our analysis we will limit ourselves to idiosyncratic shocks due to data constraints. The concept of vulnerability as reflected in the literature is a very broad one. Alwang et. al (2002) decompose a households vulnerability into three different components. The risk, options for managing risk and the outcome in terms of welfare loss. Depending on the area of study the focus on one of these components can be very different. According to Alwang et. al exposure to risk is directly connected to vulnerability since it makes households vulnerable to an undesirable outcome. Risks themselves differ in magnitude and duration. These risks can be mitigated by the households through ex ante or ex post risk management measures depending on the question if the risk has already been realized or not. Risk combined with the household's response to it finally leads to the outcome. This outcome - mostly stated in terms of welfare loss - depends on the magnitude and duration of the risk as well as on the risk management of the household. Often the outcome is linked to an acceptable minimum outcome to facilitate analysis. A poverty line is often used as the minimum acceptable outcome barrier. Policy measures to reduce the vulnerability of households can target each of these three components. The concept of welfare or well being is also very broad one. A plethora of different factors like health, education and income constitute the well being of a household and can be vulnerable to risks in a very different way. Since these concepts are so broad, we have to limit ourselves to parts of these issues. In our study we will only focus on the risk dimension of vulnerability. We will use income as an albeit crude, but well observable measure of welfare. We furthermore chose a poverty line as minimum acceptable outcome and do not look at welfare losses in general which do not result in poverty. This allows us, to include the households which are poor and stay poor even if they are not subject to shocks in our

analysis of vulnerability. Our definition of vulnerability follows Coudouel et. al (2002) who define vulnerability as the risk today of being or falling into deeper poverty in the future.

The concept of vulnerability departs from classical methods of poverty measurement in many ways. It generally endorses a more dynamic view on the poverty phenomenon. An assessment of poverty via poverty headcount ratios allows us to measure how many people within the target population are poor today. This can be interpreted as an ex-post measure of a households well being. It tells us nothing about the future prospects of probably only transitory poor households to escape poverty and also nothing about the probability of non-poor households to become poor in the future. Since many policy measures are targets to reduce poverty in the future or to prevent households from becoming poor altogether a more forward looking approach seems feasible. The concept of vulnerability facilitates this through its dynamic nature. A household's vulnerability is seen as a current realisation of a dynamic process. It is an outcome which is influenced by past systemic or idiosyncratic events and characteristics and an estimation of the possible future path of welfare development of the household. This kind of dynamic process could best be analysed using panel data. Many vulnerability assessments therefore employ panel data techniques if the necessary data is available. Using a similar definition of vulnerability Pritchett et. al (2000) measure vulnerability in Indonesia. Raghav and Imai (2009) employ the above mentioned concept of vulnerability as well as two more definitions to assess vulnerability using an Indian panel. Since many datasets covering development countries are not panels but only cross sectional data these methods cannot be used to measure vulnerability. Nevertheless, this serious data restriction should not lead to an abandonment of the vulnerability concept for this data since the benefits of this measure for poverty analysis and policy guideline outweighs the costs of necessary methodological restrictions and theoretical assumptions which have to be made to apply this method to cross sectional data.

In the next section our dataset is described along with some background information on Shenzhen were the data was collected in 2005. This is followed by a brief descriptive overview of poverty and inequality in Shenzhen to set a background for our further analysis. We then introduce the method which is used to analyse vulnerability together with our interpretation of results and a comparison with traditional poverty estimates.

The Shenzhen Data

In 1980 the Chinese government implemented a drastic change in policy which initiated Chinas extraordinary economic success. This success was mainly driven by a dramatic urban expansion and head started as a controllable social experiment. A limited number of areas were granted the status of special economic zones promoting internal and external liberalization. Shenzhen is the most outstanding example for these experiments since it experienced the most outstanding growth and successful structural transformation of all. Shenzhen is one of the most dynamic urban centres that ever existed. The dynamic development of an urban centre of this dimension (if we take the period between 2001 and 2007 as an example: the population nearly doubled, GDP more than tripled and GDP per capita also nearly doubled) is only possible with large immigration flows into the centre. Growth is not only supported by immigration of additional labour, immigrating human resources seem to be a driving force for these dynamics. Migrants can be regarded as an important element of the success story in China's most rapidly expanding urban centre. Therefore, we want to find out, to what extend the rural-urban migrants are able to participate in income growth. How far have the migrants benefited from the drastic gains in welfare. Are migrants specifically vulnerable to poverty? How does their vulnerability profile differ from their poverty profile? However, these questions are rarely asked, because data availability on migrants is poor. Most surveys (in particular official statistics) do not or only poorly cover them. There is generally few official data available that makes an econometric analysis possible. Therefore, we use our dataset to give an answer to these questions. We now can assess the factors which cause inequality, poverty and vulnerability and picture the situation of rural-urban migrants in Shenzhen.

The 2005 Shenzhen household survey is the first household survey of this type conducted by a non-government research team. In addition to existing household surveys this survey includes information on the migrant population. The dataset comprises 1056 households and 3256 individuals. The survey was conducted with the help of Shenzhen University using multistage random sampling and considered residents' registration status. According to official data [Shenzhen Statistical Yearbook 2005] one third of inhabitants have a Shenzhen registration (hukou) and two third do have a non-Shenzhen registration and can therefore considered to be migrants. This population structure is reflected in the

survey frame. The sample was drawn from three of the six districts of Shenzhen due to budget constraints: The former special economic zone (Lohou), the cultural and educational area (Nanshan) and the new industrial park (Baoan). Since the official frame of the Shenzhen Statistical Yearbook was much too small, information about the city structure (districts, streets, mansions) had to be compiled from scratch using government information, official statistics and migrant surveys conducted by Shenzhen University and the labour bureau. After this information was compiled ten streets (Xiaoqu) from each district were randomly chosen. Thereafter mansions or buildings and then the households within these mansions were chosen. The interviews were conducted face to face by an interviewer. Missing income data as well as obviously incorrect data was removed to compile the effectively used dataset. The dataset is composed as follows:

Shenzhen Household Survey						
Households						
District	Total samples	Effective samples	Shenzhen hukou	Non-Shenzhen Hukou	Urban hukou	Rural hukou
Nanshan	355	340	119	204	181	142
Luohu	378	343	117	243	216	144
Baoan	321	289	31	258	121	168
Total	1，054	972	267	705	518	454
Individuals						
District	Total samples	Effective samples	Shenzhen hukou	Non-Shenzhen Hukou	Urban hukou	Rural hukou
Nanshan	1，146	1，031	368	663	577	454
Luohu	1，128	1，065	349	716	636	429
Baoan	973	850	92	758	350	500
Total	3，247	2，946	809	2，137	1，563	1，383

Inequality and Poverty in Shenzhen

We begin our analysis with descriptive facts about the income dispersion and poverty in Shenzhen. To measure income inequality we calculate the Gini coefficient for the whole population as well as for the migrant and non-migrant sub populations. The Gini coefficient is given by:

$$G = 1 + n^{-1} - (2/n^2\mu)\sum_{i=1}^{n} (n + 1 - i)y_i$$

Where G is the Gini coefficient, n is the cumulated proportion of the population, μ is the average income and y is the cumulated proportion of income. For all our calculations we recognize the differences in needs which are caused by different household sizes and compositions and calculate household income per equivalent adult as proposed by Deaton (1997) using the OECD equivalence scales to adjust for household sizes. To facilitate our absolute poverty estimates we furthermore take account of the fact that Shenzhen is one of the farthest developed cities in China. We correct the PPP exchange rate of the ICP 2008 for the whole of China with a regional price deflator. We use the urban Shenzhen price expenditure basket from Brandt and Holz (2006) and update it with regional urban CPI data from the Chinese National Bureau of Statistics from 2000 until 2005 to arrive at the best correction factor for our 2005 data. With this correction our estimates become comparable to poverty estimates in real terms for other cities and regions in 2005 and allow us to measure the absolute poverty in PPP terms much more accurately.

Our estimates of income dispersion for this adjusted per capita household income yield a Gini coefficient of 0.54 for overall income inequality, 0.47 for the urban registered and 0.36 for the rural-urban migrant population. These high Gini values underline the great degree of income inequality in this city.

We chose to use the Theil index, too, to be able to decompose general inequality in a within and between group component. The decomposition of the Theil Index is as follows as proposed by Bourguignon (1979), Cowell (1980) and Shorroks (1980):

$$T = \sum s_g T_g + \sum s_g \ln \frac{\mu_g}{\mu_y}, \; with \; s_g = \frac{n_g \mu_g}{n \mu_y}$$

The total inequality as measured by the Theil index T is then composed of the first term which describes the income share weighted inequality within each of the g subgroups, and the second term which captures the inequality between the different subgroups. The variable μ_g is the mean income in subgroup g and s_g is the share of total income of subgroup g. This decomposition allows us to have a more detailed look at the driving forces of inequality in a population. It gives a deeper insight and more detailed facts about the phenomenon of disparity between and within different groups. We again chose the

migrants and non-migrants as subgroups. Applying this Theil index composition to our data yields an overall Theil of 0.62 which is made up of 0.38 for the non-migrants and 0.24 for the migrants. Decomposition in the between and within component yields 0.15 for the former and 0.36 for the latter. It is obvious from this composition that the within group inequality contributes to total inequality more than twice as much as the between component. Our Theil index calculations also mirror the higher income inequality within the subgroup of the urban registered inhabitants from the Gini estimates.

After this overview of income inequality we now turn our attention to the poverty issue. The poverty headcount counts the number of people who live in poverty as a fraction of the whole population:

$$P_0 = \frac{1}{n}\sum_{i=1}^{n}(x_i \leq z)$$

where *n* denotes the size of the population, *z* defines the poverty line, x_i the welfare measure. The correct definition of the poverty line *z* is an important issue. We decide against the cost of basic needs approach which is commonly used to assess poverty and employ purchasing power parity prices for greater comparability with different dollar levels as well as local measures such as the minimum wage for urban Shenzhen. We use broader definitions of poverty since the use of very low poverty lines – like one dollar a day – is like presuming that no urban poverty exists in China (Khan 1998). Furthermore, we want to shed light on not only grave poverty but also relative deprivation which is of equal importance for policy makers as put forward by (Li 2006). We also calculate the poverty headcount ratio for relative poverty lines and use the standard half as well as two thirds of the median income for the relative poverty line.

Povery Line	*Poverty headcount %*
Relative Poverty (1/2 Median)	23,2
Relative Poverty (2/3 Median)	34,7
Dollars a Day in PPP Terms $1	0
Dollars a Day in PPP Terms $1,25	0,09
Dollars a Day in PPP Terms $2	0,48
Dollars a Day in PPP Terms $3	2,69
Shenzhen minimum wage (9600 RMB) unadj. Inc.	15.9

If we run separate poverty estimates for the migrant and non-migrant subgroups we arrive at marked differences for poverty incidence. 27.66% of the migrants have income which is below the minimum wage whereas only 6.1% of the inhabitants with an urban

hukou earn less than the minimum wage. Similarly drastic differences can be seen for the $3 a day poverty threshold. Only 0.87% of the non-migrants fall below this poverty line but 4.92% of the migrants are poor by this definition.

It is evident that grave poverty is very low in Shenzhen. Measured by the new World Bank standard 2008 very few people live below 1,25$ a day in Shenzhen city. A look at the broader poverty lines of 2$ and 3$ a day shows quite some poverty incidence, also relative poverty and below minimum wage poverty incidence is significant. What is obvious is that the migrant subgroup differs significantly from the urban registered ones. While income dispersion within is lower poverty incidence is much higher. Migrant's incomes differ not as much but they do not differ around a much lower mean level with a higher exposure to poverty.

After these descriptive facts about income inequality and poverty in Shenzhen we want to calculate ex-ante estimates of poverty and conduct our estimation of vulnerability. We want to know in how much the poverty and vulnerability estimates differ from each other and to what extent the two population subgroups differ from each other.

Estimation of vulnerability

The concept of vulnerability as expected poverty or poverty risk has to take into account not only the mean income but also the variance in income. This variance in income can be interpreted as the idiosyncratic and aggregate risk that a household has to face. Even a household with a high mean income can very well be vulnerable to poverty if the variance in income is high enough. The estimate of such income variance would optimally be conducted using panel data extracting the ex post variance of income from the time series. Aggregate shocks as well as idiosyncratic ones could be taken into account. Since our data is only cross-sectional we use a method suggested by Chaudhuri (2002) to generate vulnerability estimates. The idea behind this approach is to estimate the explained variance of income over the cross section and use this together with the explained mean income to generate a vulnerability estimate.

Assuming that the following stochastic process generates household consumption:

$$\ln i_h = X_h ß + e_h$$

With ι_h being the equivalence scale adjusted per capita income of household h. The vector X_h summarizes the household's characteristics and β is the vector of coefficients. In this specification e_h is the error term with $E(e_h) = 0$ which represents the idiosyncratic shocks a household might suffer and which explain the income differences between otherwise observationally equivalent households. It is assumed that these shocks are iid over time but not across households. Furthermore a stable coefficient vector ß is assumed which implies a stable structure of the economy ruling out any aggregate or systemic shocks. Chaudhuri (2002) points out that these limiting assumptions are necessary since we try to compute our vulnerability estimates from a single cross section. The variance of the error term – and therefore also the logarithm of the income - is assumed to depend on the same observable household characteristics as the income itself:

$$\sigma^2_{e,h} = X_h\theta.$$

The coefficient vectors β *and* θ are estimated using a three step feasible generalized least squares procedure originated by Amemiya. The estimated coefficient vectors are then used to compute expected consumption as well as the expected variance of consumption for each household:

$$\hat{E}[\ln \iota_h | X_h] = X_h\hat{\beta}$$

and

$$\hat{V}[\ln \iota_h | X_h] = \sigma^2_{e,h} = X_h\theta.$$

Under the assumption that the logarithm of the income follows the log normal distributions these estimates can be used to derive a vulnerability estimate in the sense of future expected poverty for each household. If the poverty line *z* is chosen as minimum acceptable outcome and threshold level for poverty then with the use of the cumulative standard normal distribution the probability that a household *h* might fall under the poverty line *z* is given by:

$$\hat{v}_h = \widehat{PR}(\ln \iota_h < \ln z \,|X_h) = \Phi\left(\frac{\ln z - X_h\hat{\beta}}{\sqrt{X_h\theta}}\right)$$

For a complete derivation and more exhaustive discussion of the method see Chaudhuri (2002) or Chaudhuri (2000). As pointed out by Chaudhuri (2002) this method has one major advantage over most other techniques to estimate vulnerability from regression results. Directly modelling income variance depending on household characteristics allows to consider variations between households. This implies that the

mean income and its variance are not monotonically related across households allowing them to differ independently. Since it is quite plausible that a poor household might well have a low mean income but high income volatility this feature of the methodology appears to represent reality quite well.

We chose the following right hand side variables to capture the household characteristics:

Variable	Description
Household composition	
av_age	Average age of the household members
Dpr	Dependency ratio
family_size	Amount of people living in the household
Productive assets	
av_schooling	Amount non working members
Infedu	Individual has had informal education (i.e. on the job training etc.)
Male	Household head is a male
Stay	The amount of years staying in Shenzhen
Social and China specific factors	
Rural	Individual has a rural hukou (registration)
Sez	Individual is living in the special economic zone within Shenzhen
Sector of occupation	
Foreignshare	Individual is employed in a company which is partly or fully foreign owned
Soe	Individual is employed by a state owned enterprise

To account for the household composition we include the average age of the household members as well as the dependency ratio and family size. The average schooling of the household members, an indicator variable for all kinds of informal education, gender and the time of residence in Shenzhen compromise the productive assets of the household. To capture some China specific effects we include the registration status of the household head indicating if it is a rural-urban migrant household or not as well as the SEZ indicator which identifies if the household resides in one of the districts of Shenzhen which became a special economic zone in 1980. The sector of occupation for the household head is controlled for by an indicator variable for full or partial foreign ownership of the company he works in as well as one for state ownership of the respective company.

The regressions necessary to estimate the conditional mean and variance show the following results:

	Variance estimation		Mean estimation	
Name	**coef**	**se**	**coef**	**se**
av_age	-0.000	0.003	-0.004	0.003
family_size	-0.002	0.016	0.110	0.026
dpr	0.093	0.037	-0.086	0.031
av_schooling	0.012	0.006	0.079	0.008
infedu	-0.069	0.051	0.221	0.066
stay	0.004	0.003	0.014	0.003
male	0.011	0.135	0.346	0.108
rural	-0.020	0.067	-0.682	0.056
sez	-0.027	0.042	0.272	0.050
soe	-0.010	0.068	-0.062	0.073
foreignshare	-0.024	0.061	0.377	0.087
self_employed	-0.008	0.047	-0.105	0.056
R2	-		0.468	
Number of observations	1.026		1.026	

We now proceed to generate the vulnerability estimates by drawing from the cumulative standard distribution using the estimated conditional mean and variances for each household. The poverty line is drawn at the minimum wage level. We arrive at a mean vulnerability level of 0.28 and a standard deviation of 0.26. If we choose a vulnerability level of .50 – meaning that it has a 50% chance of being poor in the future - as a threshold to define a household as vulnerable then 24% of the population can be described as vulnerable to poverty compared to 15.9% who fall below this poverty line today. We then divided the sample into the migrant and non-migrant subpopulations and calculated the vulnerability level for both subgroups separately. The urban registered subpopulation has a mean vulnerability level of 0.14 and a standard deviation of 0.10. Using the .5 vulnerability threshold again only 5.3% of the non-migrants can classified as vulnerable. The analysis of the rural-urban migrant data tells a different story. Here the mean is equal to .46 with a standard deviation of .11 and according to the above definition 39% of the household are vulnerable.

To gauge the relation between poverty and vulnerability in our sample we calculate the vulnerability to poverty ratio defined by Prichtett (2000). We arrive at vulnerability to poverty ratio of 0.87 for the urban registered population and at 1.41 for the rural-urban migrants and one of 1.5 for the whole population. A higher ratio value implies a more equal distribution of vulnerability. We summed up the result in a table:

Measure	All	Non-migrant	Migrant
Average Vulnerability	0.28	0.14	0.46
Percentage of vulnerable households	24%	5.30%	39%
Vulnerability poverty ratio	1.5	0.87	1.41

It is obvious from these results that if we take the idiosyncratic risk into account and generate ex-ante vulnerability estimates that many people in Shenzhen are vulnerable to poverty. The differences between the migrant and non-migrant population are drastic. Migrants are much more vulnerable to poverty and have a much higher average vulnerability than urban registered households. It is also evident that the vulnerability is much more evenly distributed amongst them than in the case of the non-migrants. This is in accord with the generally lower mean income and lower income dispersion in this group. Reducing their exposure to poverty risk appears to be one of the most urgent topics.

Conclusion

Poverty in developing and transition economies is still an urgent issue. Since traditional poverty measures capture only the ex-post poverty status they do not provide an optimal information criterion for poverty alleviation policies. Vulnerability measures on the other hand provide us with this kind of forward looking view. We use a method to estimate vulnerability which allows us to construct vulnerability from a cross-section dataset. We analyse the 2005 Shenzhen household survey using this method. Since the survey explicitly samples the migrant population it allows us to look at the differences in the structure of vulnerability between both groups in this rapidly developing urban agglomeration. We find that migrant households experience a much higher exposure to poverty vulnerability. More than one third of them are vulnerable to poverty. This vulnerability is also distributed more evenly than in the urban registered subgroup. Compared to the classical poverty headcount estimates this could imply that the ex post poverty rate might rise in the future. Reducing especially the migrants exposure to poverty risk appears to be acute.

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