Income Determination and Income Discrimination in Shenzhen

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Abstract

Shenzhen is not only one of the fastest growing urban agglomerations in mainland China, Shenzhen also stands for a unique, most rapid and successful transformation towards an urban market economy. How important are personal characteristics, social norms and policy related discriminatory factors for income determination even in such an extraordinary city? This paper estimates the income effect of non productivity related discriminatory factors (like personal characteristics, social norms and policies), compared to productivity related returns on human capital. The design of the Shenzhen Household Survey 2005 that was employed here enables us to include a large set of discriminating factors in a Mincer Becker type of income model. Further, we are able to take a unique look at the migrant population in this urban centre. Our results show that the human capital approach holds. We also find strong evidence of a significant influence of social norms and policies, particularly relevant in a developing and transition economy, even in such an exceptional city. The most important discriminating factor appears to be the hukou registration system. The ongoing existence of these non productivity related discriminating factors can be regarded as indicator of an ongoing process of transition towards a fully functioning market economy.

JEL classification: R23, O15, O18, I21
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1 Introduction

Located in Guangdong province Shenzhen grew from a small fishing village of approximately 20,000 inhabitants at the beginning of the 1970s to around 300.000 people when parts of Shenzhen became a SEZ in 1980. Now after nearly 30 years of rapid economic growth Shenzhen counts six million inhabitants. Shenzhen not only has been a major location for FDIs and rapid export growth, the average annual GDP growth rate between 1980 and 2005 of approximately 27% is outstanding and now often being refereed to as "Shenzhen speed" [Guo and Feng 2007].

Shenzhen surely is one of the fastest growing urban agglomerations in mainland China, or even the world. *How important are personal characteristics, social norms and policy related discriminatory factors for income determination even in such an extraordinary city?*

As market forces lead to positive returns to education, in most developed economies human capital is the dominant determinant of income. For Shenzhen, on the one hand, productivity related market forces are expected to determine a large part of income. On the other hand, non productivity related discriminating factors such as personal characteristics, or policies, social norms, attitudes and traditions can also be expected to play an ongoing role for income determination. We define discriminatory factors broadly as every factor that has an impact on income that is not generated by real productivity.[1] In this paper we are particularly interested in these non productivity related forces. These factors are sometimes labelled (wage) income discrimination factors. Their impact on income and inequality of income can be regarded as a more general indicator of the socio-economic development during transition. As stated by Tanzi (1998), in developing and transition countries the impact of these factors on income is often higher than in economies mainly driven by market forces. To test for these factors the traditional Mincer-type model has been extended in various ways.

Human capital related extensions include apart from age *informal learning* and *experiences* as well as *modern sector specific human capital* as income generating factors.
In this respect *time of residence* positively correlates with income, as analysed by Fan (2001), Liu et al. (2004) and Wan (2006) especially for the Hong Kong metropolitan area which would stress a positive influence of the assimilation process. The migrants can accumulate city specific human capital or job skills, and adapt to local labour markets, thus improving job matching and enhancing their productivity the longer they reside in the city. This may ultimately justify a rise in income. Still, one cannot expect wage convergence towards native wage levels as a result of this process, i.e. discriminatory earning differentials may shrink but persist.
In a somewhat related context, the migratory background may also influence income determination due to its influence on *mobility and job changes*. Yueh (2004) argues that labour mobility of migrants strongly exceeds the mobility of urban residents, with migrants usually earning less. In this context, lower wages for individuals who often change their occupation may reflect a general lack of human capital, or firm-specific human capital that is destroyed with a job change.

Discriminating factors are the major focus of this paper. Therefore, we must identify the most relevant non productivity related factors of discrimination as suggested in the literature.

[1] Obvious examples are gender, social status etc. . Human capital for example would not qualify because the impact on income is generated by a real productivity increase.

This kind of discrimination is related to *personal characteristics, social norms, attitudes* and *policies.* With respect to the above questions the literature identifies a set of discriminatory variables which are briefly introduced in the following section.

Gender and *martial status* are among the most studied personal characteristics. Ng (2004), Shu (2005) and Ng (2007) find that women with comparable education earn less than men as a consequence of gender discrimination rather than differences in productivity. These results are similar to findings by Knight and Song (2003) while Hughes and Maurer-Fazio (2002) state that the gender discrimination declines with women's rising education levels.
They also find that *marital status* also affects the gender wage gap as married women in China experience a more pronounced absolute wage gap compared to unmarried women. Furthermore Bishop et al. (2005) show that women generally experience smaller returns to marriage than men, especially for men with only small incomes. Here, they argue that this marriage income-gap is caused by different gender-related effects arising from marriage: Married men usually work harder and are more productive in their role as a family's provider, while married women may reduce their working efforts, perhaps to concentrate on raising a family. This argument is stressed by Li et al. (2006) who show that husbands contribute more to family earnings than wives. The argument that marriage enhances the productivity and commitment of men may also explain possible earning differentials between married and unmarried men. A different social status associated with marriage may be another explanation.

For urban China, a China specific factor seems to be of particular importance. As pointed out by Xue and Gries (2007) the *hukou*[2] *registration* status appears to be one of the most important sources of discrimination. Migration from the rather poor rural areas[3] to the large cities driven by economic incentives leads to a huge presence of people with rural registration (hukou) in the urban areas [Chen and Coulson (2002), Du et al. (2005) or Lu and Song (2006)]. While the hukou registration system was designed to control and limit migration its success was limited and it was recently relaxed. Studies by Lu and Song (2006) Fan (2001) or Wan (2006) show the existence of significant income differences between the migrant population and inhabitants with an urban registration. These differentials cannot be explained by a higher endowment of productive skills by the urban registered population alone and are in part a consequence of discrimination. The hukou system also restricts social services such as education to local inhabitants [Liu (2005)]. The possibility to receive an urban hukou appears to correlate positively with educational attainment.

Further, membership in the *Communist Party* still seems to influence income positively, as shown by studies from Knight and Song (2003) and Cao and Nee (2005). However, it should be noted that Party membership may not only be a discriminatory factor based on connections but rather also signal ambition or ability as stated by Gerber (2000) and Lam (2003).

Employment in *state-owned enterprises* promises more job security and protection leading to better pay and social benefits. Employment in the private results in significantly higher employment risks. Workers are more exposed to market forces, driving down wages for low skills and driving up wages for higher skills. For the Chinese case, Knight and Song (2003) suggest that state-owned enterprises that usually employ urban residents pay better than private sector companies where most migrants work. Thus, the wage gap between urban residents and migrants may also partially be explained by the correlation of migration and mobility and labour market segmentation. In general, this labour market segmentation will

[2] Hukou is the Chinese term for the Chinese urban registration status system.
[3] Also labelled the rural urban income gap by e.g. Sicular et al. (2007) or suggested by Lu and Song (2006).

affect all citizens in a Chinese urban area.
Generally higher wages can be expected for employees in firms with high shares of foreign ownership. Firms with foreign ownership can be expected to have better access to international technologies and organisational skills and hence exhibit higher total factor productivity. If part of the higher productivity is passed to the workforce, foreign shares should positively affect wages.

Also, *social networking* should be considered as a relevant determinant. Here, theory as e.g. assembled by Mouw (2003) suggests that higher social capital endowment, i.e. social networks of friends and acquaintances, positively affects wage determination through increased information and influence. In China, social networks (guanxi) are commonly believed to influence economic and political behaviour. For example, Bian and Ang (1997) find that guanxi networks influence the mobility of workers and their success in finding higher status jobs. As pointed out by Chen and Sun (2006), urban social networks influence an individual's access to better jobs, higher wages and the bureaucratic decision process. Thus, social capital may be closely connected to wage determination and its impact should be positive. Still, Chen and Sun (2006) find that the overall influence of urban social networks on income diminishes over time, particularly as the reform and growth process continues. Thereby, the influence of social capital on income may correlate more closely with lower paid jobs where market and productivity considerations do not matter as much. This brief review of related literature directly leads to the aims of this paper.

The intention of this paper is to estimate the extent of existing income discrimination in Shenzhen, an especially dynamic case of a transition economy in China. How important are social norms and policy related discriminatory factors during the process of transformation, even if Shenzhen is one of the most outstanding examples for a successful transition? While in many other studies only subsets of the discussed factors were available, the design of the *Shenzhen Household Survey 2005* allows us to look at a much larger set of these income determining factors. Further, the survey's sample size enables us to explicitly look at the migrant population of this successful city. In addition, we can compare the impact of discriminatory factors between rural and urban registered residents. Therefore, the aim of this study is to quantify the extent of income discrimination and in this context take a closer look at the migrant population.

To view the importance of human capital for income we start by decomposing income disparity using the Theil index in section 2. In the econometric analysis (section 3) we start with the traditional standard Mincer-type approach as a reference model. The results show that human capital is a significant income determining factor. In order to find the most relevant discriminatory determinants of income, various factors are added in the augmented model (model 2). Besides *human capital*, *personal characteristics*, *social norms* and *attitudes*, as well as specific *government policies* also appear to impact on the income pattern even in one of the most dynamic transforming cities of China. Further, an Oaxaca-Blinder decomposition analysis is applied to estimate the overall extent of discrimination between urban and rural hukou registration. Section 4 constitutes an overall economic discussion of the estimation results, and section 5 concludes.

2 Human capital as an income generating factor in Shenzhen

To what extent do market forces reward the additional productivity of education and qualification? If human capital generates additional income, differences in income can be at least partly explained by differences in human capital endowment. Therefore, as a first descriptive way to approach the defined problem we us the Theil index to decompose income

differentials and focus on the contribution of formal qualification to income disparity. If income differentials can be mostly observed *between* groups with different formal education levels, we have some early evidence of the importance of human capital as an income generating factor. If the contribution of formal qualification to income disparity (measured by the Theil index) is small and disparity is observed basically within the qualification groups, other factors than human capital can be expected to play a major role for income determination and income disparity.

The **Theil index** is a member of the Generalized Entropy (GE) family of indices [Cowell, 1995; Cowell and Kuga 1981]

$$GE(c) = \frac{1}{c^2 - c}\left[\frac{1}{n}\sum\left(\left(\frac{y_i}{\mu_y}\right)^c - 1\right)\right],$$

where the parameter *c* captures the sensitivity of a specific GE index to different parts of the income distribution [Cowell, 1981, 2000].[4] Using the L'Hopitals rule, the *GE* index converts [Cowell, 1977, 2000; Cowell and Kuga 1981] into the Theil (*T*) index, with individual income share weights $s_i = \frac{y_i}{n\mu_y}$, for $c = 1$. In this case the Theil (T) index assigns approximately equal weight to all parts of the distribution.

$$GE(1) = \left[\frac{1}{n}\sum\left\{\left(\frac{y_i}{\mu_y}\right)\ln\frac{y_i}{\mu_y}\right\}\right] = \sum s_i \ \ln s_i = T$$ [5]

We are particularly interested in the property of additive decomposability, meaning that an overall inequality measure can be additively decomposed into the subgroup inequality contributions. Decomposition of the Theil index[6] leads to

$$T = \sum s_g T_g + \sum s_g \ln\frac{\mu_g}{\mu_y}, \text{ with } s_g = \frac{\eta_g \mu_g}{\eta \mu_g}$$

Total inequality is 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 take a more detailed look at the driving forces of income differentials and hence the role of human capital as an income generating factor.

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[4] For a given income distribution, a negative value of *c* gives more weight and sensitivity to gaps in the lower (income) tail of the distribution. For large and positive values of *c*, proportionally more weight is given to the upper (income) end of the distribution. It is thus adequate to pick a rather low or negative value for *c* if one is more interested in inequalities amongst the "poor", and a positive and high value for c if the interest is more focused on the "wealthy". The variable *n* represents the population size, y_i the individual's income and μ_y the mean income of the population subject to measurement.

[5] A major advantage of the general entropy class of inequality measures and specifically the Theil indices is that they are the only inequality indices to satisfy the axioms [Bourguignon, 1979; Cowell 1980; Shorrocks 1980] of additive decomposability, symmetry (anonymity), population homogeneity (population replication), are income homogeneous of degree zero (scale invariance), continuous and differentiable in all individual incomes, additively decomposable and satisfy the Pigou-Dalton principle of transfer (strong principle of transfers).

[6] See e.g. Bourguignon 1979; Cowell 1980 or Shorrocks 1980.

Formal qualification and **income differentials** are closely linked under market conditions. If formal qualifications can generate income, differences in formal qualifications will cause income differentials. Do we observe income differentials mostly between groups of various education attainment levels or within each of these groups? Is education the dominant determinant of income or are other discriminating factors and policies even more important. To answer this question we use the Shenzhen household survey 2005. The survey was conducted using random sampling taking into account the registration status of the residents. According to official data [Shenzhen Statistical Yearbook 2005] one third of inhabitants had a rural registration (hukou) and two thirds had an urban registration. This structure was reflected in the sample. The sample was drawn from three of the six districts of Shenzhen: Luohu, Nanshan and Baoan. A total of 1056 households and 3256 individuals were surveyed. For our analysis we restricted the sample to the working age population (between 16 and 65) and excluded any income which was reported to be below zero or above 1250000, which should be considered as too high to be correctly reported and is thereby removed as an outlier. For a full description of the survey see Xue and Gries (2007). We apply this data set by grouping according to various formal qualification and education achievements. We choose formal qualifications for grouping since in developed countries human capital is generally regarded to be the most important discriminatory factor [Tanzi 1998].

FIGURE 1 INSERT HERE

Figure 1: Theil Index by education groups

The results of our decomposition exercise are described in Figure 1 and straight forward. For Shenzhen we obtain a *between group* Theil-contribution Theil of 0.198 and a within group Theil of 0.486. Total value of the Theil index is 0.684. I.e., broadly speaking 30 percent of total income disparity comes from income differences between education groups. All the other differences (approximately 70 percent) in income are due to differences within each education group. From this result it becomes evident that a large part of income differentials cannot be explained by different endowments with human capital alone. Other discriminatory factors seem to have an important influence on income differentials.

3 Empirical Model and Estimations

After a first descriptive glance at the problem we turn to the econometric analysis. To be able to quantify the impact and importance of *human capital* and the various *discriminatory factors* we employ a regression analysis. We start with the simplest form of the regression approach and gradually augment our model to illustrate the importance of the various factors.

Model 1: As the first step in the regression analysis we employ the standard Mincer-Becker Equation[7] to estimate the returns to education and evaluate the impact of other discriminatory factors on personal income. We use the age of the individuals and its squared value[8] as

[7] This method was first described by Mincer (1958, 1962, 1974), Becker (1962) and Becker and Chiswick (1966) and Chiswick (2006).

[8] The additional use of its squared value in traditional Mincer type estimations of the earnings function captures the mentioned decreasing returns over lifetime.

proxies for the potential experience. It should be noted that the impact of these variables can be expected to be lower than in the original Mincer Equation as described by Harmon et al. (2005). Although econometric problems as discussed by Griliches (1977), Murphy and Welch (1990) or Card (2001) may occur when estimating returns to education, Lemieux (2006) argues that the Mincer equation generally remains valid and robust for the estimation of educational effects on earnings. As Card (1999) points out, the estimation of the causal effect of education on earnings using the traditional method faces only a small upward (ability) bias compared to identical twin studies. Psacharopoulos and Patrinos (2002) concede that these findings are on average very similar to the ones presented in their worldwide compilation and state that the estimation method makes little difference to the returns to education. To correct for the heteroskedasticity in the dataset due to an increase in the variance in earnings with an increase in the age of the individuals, we employ White-corrected standard errors.

We use the model described in Table 1 as a reference point for the quality of the augmented Mincer model introduced thereafter:

Model 1:

Estimation Equation

$$\ln y_i = \alpha + \beta_1 Age + \beta_2 Age^2 + \beta_3 \ln workingtime + \beta_4 low + \beta_5 \sec + \beta_6 high + \epsilon_i$$

Variables

Pure Labor Input

ln*workingtime*: logarithm of number of hours worked in the year

Human Capital, Education

formal education achievments

low: completed primary education

sec: completed secondary education (Junior High, High School, Technical College)

high: completed tertiary education (Junior College, University, Postgraduate)

potential experience/informal education

Age: Age in years (potential experience)

Agesq: Age squared (parabola shaped lifetime income profile)

Table 1: Standard Mincer-type model as reference model

On the left side of our estimation equation is the logarithm of the yearly income. On the right side we start with the constant followed by the standard Mincerian variables, namely the age of the individual and its squared value, yearly working hours and dummy variables for completed school levels. The dummy variables *low*, *sec* and *high* represent the corresponding completed education levels and are equivalent to an average number of 6.0, 10.5 and 16.6 school years. The results for this reference model are reported in Table 3.

Model 2: The second model is an extended version of Model 1. To be able to quantify the effect of other discriminatory factors like personal characteristics, or social norms and attitudes we add further variables X_i, *[i=1…n]* to the basic Mincer-type regression. The choice of these variables is based on the set of discriminatory factors identified above. The full model is now described in table 2.

Model 2:

Estimation Equation

$$\ln y_i = \alpha + \beta_1 Age + \beta_2 Age^2 + \beta_3 \ln workingtime + \beta_4 low + \beta_5 \sec + \beta_6 high + \sum_{j=1}^{n} \beta_j X_j + \epsilon_i$$

Variables

Pure Labor Input

ln*workingtime* : logarithm of number of hours worked in the year

Human Capital, Education

formal education achievments

low : dummy for completed primary education

sec : dummy for completed Junior High or High School or Technical College

high : dummy for completed Junior College or University or Postgraduate studies

potential experience/informal education

Age: Age in years (potential experience)

Agesq: Age squared (parabolic shape of lifetime income)

infedu: dummy for reported informal education, i.e. on the job training

stay: duration of residence in Shenzhen in years

job_changes: total number of job changes

Discriminating Factors

personal characteristics

male: dummy for gender

married: dummy for marital status

social norms attitudes and policies

rural: dummy for rural regestration (hukou)

sez: dummy for living within the Special Economic Zone

commi: dummy for communist party membership

friendjob: dummy for job provision by a friend/relative

stateshare: dummy for employed by company that is if fully or partly state owned

foreignshare: dummy for employed by foreign company or Chinese foreign joint venture

Table 2: Definition of the augmented Mincer-type model, model 2.

Model 3: After it became evident that rural hukou has by far the most important and highly significant impact of all discriminatory factors on the regression results, and after testing for the equivalence of the coefficients for both groups (of hukou) it became evident that the data contain different sets of information for the different groups and should not be pooled. Therefore, we ran a separate regression for both population subgroups for the complete set of variables taken from model 2. *Model 3a* defines the regression for people with an *urban hukou* and *model 3b* is the model for *rural registered* people.

Regression results: Running the regression for all four models we received the results reported in Table 3. To compare the explanatory quality of our augmented Mincer model (Model 2 und Model 3a and 3b) with a basic version without any explanatory variables accounting for social norms and attitudes and policy measures (Model 1) we also calculated the Akaike information criterion for both models.

	model1			model2			model3a			model3b		
	b	P-Value	SE	b	P-Value	SE	b	P-Value	SE	b	P-Value	SE
Age	0.124	(0.000)	(0.016)	0.059	(0.000)	(0.017)	0.109	(0.000)	(0.031)	0.051	(0.001)	(0.016)
agesq	-0.001	(0.000)	(0.000)	-0.001	(0.000)	(0.000)	-0.001	(0.001)	(0.000)	-0.001	(0.000)	(0.000)
low	0.022	(0.844)	(0.110)	-0.024	(0.784)	(0.087)	-0.104	(0.802)	(0.413)	0.037	(0.617)	(0.074)
sec	0.668	(0.000)	(0.101)	0.261	(0.001)	(0.081)	0.042	(0.892)	(0.311)	0.242	(0.000)	(0.069)
high	1.914	(0.000)	(0.105)	1.054	(0.000)	(0.098)	0.775	(0.014)	(0.315)	1.182	(0.000)	(0.130)
lnworkingtime	0.105	(0.103)	(0.064)	0.194	(0.001)	(0.058)	0.176	(0.098)	(0.106)	0.251	(0.000)	(0.065)
male				0.408	(0.000)	(0.036)	0.380	(0.000)	(0.056)	0.438	(0.000)	(0.042)
infedu				0.145	(0.008)	(0.054)	0.112	(0.069)	(0.061)	0.354	(0.001)	(0.111)
commi				0.166	(0.018)	(0.070)	0.159	(0.039)	(0.077)	0.076	(0.635)	(0.160)
sez				0.178	(0.000)	(0.039)	0.318	(0.000)	(0.068)	0.051	(0.263)	(0.045)
job_changes				-0.031	(0.003)	(0.010)	-0.045	(0.012)	(0.018)	-0.015	(0.187)	(0.011)
married				0.356	(0.000)	(0.065)	0.393	(0.000)	(0.092)	0.298	(0.000)	(0.074)
friendjob				-0.158	(0.000)	(0.044)	-0.270	(0.001)	(0.084)	-0.068	(0.160)	(0.048)
stateshare				0.116	(0.300)	(0.112)	0.130	(0.253)	(0.114)	0.033	(0.923)	(0.337)
foreignshare				0.277	(0.000)	(0.059)	0.267	(0.001)	(0.079)	0.220	(0.004)	(0.077)
stay				0.023	(0.000)	(0.003)	0.020	(0.000)	(0.003)	0.016	(0.007)	(0.006)
rural				-0.624	(0.000)	(0.052)						
_cons	5.970	(0.000)	(0.598)	6.642	(0.000)	(0.543)	5.877	(0.000)	(1.037)	6.012	(0.000)	(0.590)
rmse	0.861			0.752			0.832			0.623		
N	1891.000			1879.000			976.000			903.000		
r2_a	0.400			0.541			0.357			0.324		
aic	4808.527			4279.946			2427.057			1723.409		

Table 3: Regression results

The differences between the basic model (model 1) and the full model (model 2) are significant and the goodness of fit of the full model is better than of the simple model. This implies a clear and significant impact of the discriminatory factors on personal earnings. We also tested the blockwise significance of all the variables in the vector *X*. They proved to be significant at the 1% level. The R^2 of 54% shows a relatively high explanatory power for the full model. The R^2 of around 33% for the separate regressions (model 3a and 3b) is still comparatively good. It is clear that the coefficients for the urban and rural subgroups differ widely. Especially their returns to education appear to be significantly different. As this section reports just the results, a more extensive economic discussion of all these effects is given in the subsequent section (section 5).

Using the results of table 3 we calculate the *income impact factors* for the different formal qualifications and years of schooling (see table 4)[9]. The *income impact factor per completed formal qualification* is the total income effect of completing a particular formal qualification. Finishing higher education instead of no education generates a jump in income. I.e., an urban university graduate has (other things equal) on average an income that is 2.17 times as high as the income of person with no education. The income impact factor per year of schooling captures the return of one more year of schooling within the respective formal qualification program. E.g. the reward for an additional year of schooling within high education leads on average to an increase in income by the factor 1.13 for an urban resident. Thus the first value indicates a comparable return per year during each type of education, while the second value gives the total reward for the completed qualification (compared to no education). In table 4 we report the differing returns for urban and rural registered people according to the results

[9] The method is using continuous time like Mazumdar (1981). For details see the appendix.

from models 3a and 3b[10]:

	low			secondary			high		
		income impact factor per			income impact factor per			income impact factor per	
	share in each group [1)]	return per year of schooling	return per completed qualification	share in each group	year of schooling	completed qualification	share in each group	year of schooling	completed qualification
rural	25.6%	(1.006) [2)]	(1.03) [2)]	69.8%	1.05	1.27	4.6%	1.16	3.26
urban	3.6%	(0.98) [2)]	(0.90) [2)]	39.8%	(1.009) [2)]	(1.04) [2)]	56.6%	1.13	2.17

[1)] For shares in this group people with low and no education have been pooled so that the shares sum up to 100%

[2)] Values in parentheses are only reported for completeness. The values are statistically insignificant. Hence, for further calculation these values are taken as zero.

Table 4: Educational attainment by hukou, and income impact factors of education attainment

To obtain an overview of the distribution of education in the rural and urban registered population subgroups we also report the percentage of the working age population with a completed specific formal qualification in each subgroup. For this population share only, those with no or little education have been added to the *low* category so that the values of all shares sum up to 100.

Oaxaca-Blinder Decomposition: In addition to the regressions we employ the Oaxaca-Blinder [Oaxaca (1973) and Blinder (1973)] decomposition method to examine whether differences in the endowments of the two groups or a difference in the returns for these endowments are mainly responsible for the differences in average income. In this context the label "endowment" stands for the characteristics and attributes of the group, while the label "return" stands for the different rewards for these characteristics and attributes. Therefore, the observable income differences among the two groups may be due to differences in group endowments (differences in characteristics and attributes, e.g. higher share of university graduates etc.), or due to differences in returns (rewards for the characteristics and attributes, e.g. for university graduation). The income differences which can not be explained by differing endowments are differences in returns. These (in terms of differing endowments) unexplainable differences are an estimate of discrimination. This discrimination is often labelled "return effect". The differences due to differing attributes are mostly called "endowment effect".

We apply the decomposition method to the full regression model (model 2) and use the subscript *r* for people with rural registration and *u for* people with urban registration. While $\overline{Y}_u \overline{Y}_r$ is the mean of the income in each group, $\overline{X}_u \overline{X}_r$ represents the vector of the means of the explanatory variables which we refer to as attributes. $\hat{\beta}_u, \hat{\beta}_r$ denote the estimated coefficients for the respective variable of model 2.

Hence, the general equation [Oaxaca and Ransom 1994] for the decomposition is

$$\overline{Y}_u - \overline{Y}_r = \left(\overline{X}_u - \overline{X}_r\right)\beta^* + \overline{X}_u\left(\hat{\beta}_u - \beta^*\right) + \overline{X}_r\left(\beta^* - \hat{\beta}_r\right)$$

$$with: \beta^* = \Omega\hat{\beta}_u + (I - \Omega)\hat{\beta}_r.$$

[10] We do not report the values for primary and secondary education for urban hukou since the coefficients proved to be clearly insignificant.

As the methodology requires a choice of the reference group for the non-discriminatory normal wage structure by assigning a value for the weighting matrix Ω, there have been various discussions about the best definition of this weighting matrix. For a full discussion see e.g. Oaxaca and Ransom 1994. We decided to follow Oaxaca and report the values for both reference groups to limit any reference group bias, assuming that the true value lies between both boundaries. For $\Omega = 0$ (taking the group *u* as reference category) we obtain: $\bar{Y}_u - \bar{Y}_r = \left(\bar{X}_u - \bar{X}_r\right)\hat{\beta}_r + \bar{X}_u\left(\hat{\beta}_u - \hat{\beta}_r\right)$. This term can be transformed into an expression suitable for economic interpretation,

$$\bar{Y}_u - \bar{Y}_r = \left(\bar{X}_u - \bar{X}_r\right)\frac{\left(\hat{\beta}_u + \hat{\beta}_r\right)}{2} + \frac{\left(\bar{X}_r + \bar{X}_u\right)}{2}\left(\hat{\beta}_u - \hat{\beta}_r\right).$$

In this equation the difference in mean income $\bar{Y}_u - \bar{Y}_r$ between rural *r* and urban *u* is explained by the difference in endowments (first term) and the difference in returns for those endowments (second term). Table 5 shows the result of the Oaxaca-Blinder decomposition.

Omega	Edowment Effect (Endowment with factors)	Return Effect (Coefficients/Discrimination)
(rural as reference group): I	53.4%	46.5%
(urban as reference group): 0	47%	52.9%

Table 5: Oaxaca-Blinder decomposition results

For $\Omega = 0$ (urban as reference group) the return component accounts for 52.9% of the income differential. This means that on the average and all other things being equal, the higher income of people with an urban registration is to 52.9% due to higher returns to the different characteristics and attributes and to 47% due to higher endowments themselves. This would imply a degree of income discrimination of 52.9% of the total average income difference between both groups.

To avoid any reference group bias we conducted the same decomposition with the rural hukou subgroup as reference group. The respective values are 53.4% endowments and 56.5% returns if we change the reference group to those with rural registration ($\Omega = I$).

4 Education vs. Personal Characteristics, Social Norms and Attitudes

Education: As expected from human capital theory, formal as well as informal education both significantly affect personal income. This result can be clearly drawn from the regressions in table 3. A major part of income can be explained by formal qualifications. While secondary and higher education have a significant and large influence on average earnings, low education seems to be insignificant. More generally, the positive impact of education increases with the education level as observed e.g. by Xue and Gries (2007), or Zhang et al. (2005) for urban China. The returns to formal education from the basic model (model 1) come close to the estimates of Zhang et al. (2005) even if they divide the educational levels into more groups and their latest observed year is 2001. However, if we add the gender dummy to model 1 [like in Zhang et al. (2005)] our coefficient for higher education appears significantly lower. In our sample only the return to higher education is affected because the relative share of males with this level of education rises significantly after secondary education. So the gender dummy reduces the overall return significantly at

this level of formal achievement.
Informal education (indicated by *age* and *infedu)* also contributes positively and significantly. This can be explained by relating informal education to real individual productivity as observed by Xiao (2002). “Frequent job changes” (*job_changes*) was discussed as indicator for low and easy substitutable human capital. Therefore, the negative and significant sign of table 3 supports this idea. Furthermore, the “time of residence in Shenzhen” (*stay*) has a positive impact on earnings. Even if the coefficient is small this result would support the thesis of assimilation and accumulation of location or modern sector specific human capital. However, compared to the impact of formal qualifications, informal education affects income much less.

Discriminatory Factors: Generally speaking, inserting the carefully chosen discriminatory factors leading to the full specification in model 2 added a lot of explanatory power to the income analysis. The estimation results of the extended model (table 3) indicate that besides human capital, many other discriminatory factors remain relevant for income determination in Shenzhen. All non productivity related personal characteristics and social norms and policies indicating variables except the *stateshare* dummy prove to be significant and show the expected sign.

Two of the most frequent personal characteristics considered are gender and marital status. Gender discrimination (*male*) appears to be present and highly important, since the male dummy underlines that being male exerts great influence on income. It is unclear if the positive impact of marriage (*married*) is mostly due to traditional views or higher motivation and need as discussed above.

Receiving help by relatives or friends when searching for a job (*friendjob*) is negative. This is particularly interesting because social networking seems to be an important part of the allocation mechanism in many transition economies in Eastern Europe. Within the context of strong family boundaries and easy implicit or explicit compensation payments within a family, it would have been reasonable to expect that relatives or friends would be preferably appointed when filling highly paid vacancies. However our results suggest the opposite. In this sample people with the highest income found their job through the newspaper. This result may indicate a rather efficient job market matching process in which unofficial job provision practices seem of low importance at least for higher income jobs. However, our result could indicate that job provision by friends is needed for workers with particularly low skills or personal handicaps entering the labour market. Hence, once these people are employed, they realize a reduction in income.

Membership in the Communist Party (*commi*) still seems to be of some importance in determining income. However, from the data we can also see that the share of people in the Communist Party in each education group drastically increases the higher the education group. Nearly half of those with postgraduate status are members of the party whilst only compromising 10% of the whole sample.

People who reside in the districts that became a special economic zone in 1980 have a significantly higher income than people who do not. This effect is clearly indicated by the positive and significant coefficient of the *sez* dummy variable. This result implies that the conditions that came along with SEZs in Shenzhen provided a significant positive environment for income growth of the residents. Partly related to SEZs is the ownership of the firm where a person is employed. While employment by government owned firms (*stateshare*), as reported before, does not significantly add extra income, employment by

firms with foreign shares matters. Being an employee in a company that is partially or fully owned by a foreign investor (*foreignshare*) significantly increases personal income.

From the estimation results in table 3 it is evident that the most important discriminating factor in Shenzhen is the hukou system. Having a rural hukou status considerably decreases income opportunities. Models 3a and 3b reveal the differences, and the decomposition analysis also supports the idea of substantial discrimination of workers with a rural registration. Form the Oaxaca-Blinder decomposition we obtain that only 47%-53.4% of income differences are due to differing endowments while the remaining unexplained amount of income difference is an estimate of discrimination.

The results of the separate regressions in models 3a and 3b confirm that a rural hukou not only has an absolute negative effect on income but also changes the relative impact of the income determining factors. Many of the factors determining the income of urban registered people do not affect that of people with rural hukou. Most notably, being member of the Communist Party[11], living in the SEZ or job provision by a friend does not have any impact on rural registered people. In general they earn much higher *relative* returns to secondary and higher education as well as informal education than inhabitants with an urban hukou. For urban registered residents even secondary education is insignificant in the separate regression. This result may be partly due to the distribution of education within the subgroups. Far fewer people with a rural hukou have attained higher education. Also, secondary education qualifies as a distinctive positive attribute while for most urban registered people it can be assumed to be normal.

Low education doest not appear to generate extra income in both groups. The large share of people with low education and presumably a lack of differentiated jobs at this level of formal qualification does not lead to sufficiently distinguished wages between low and no education. Primary education alone does not offer any positive return to education (even for people with a rural hukou where nearly 8% of the sample have not completed primary education) so the incentive to stay in the school system and complete more than just primary education seems evident. However, education beyond primary levels seems to be especially important for people with rural hukou. While far fewer people with a rural hukou attended higher education the return to higher education is extremely high upon migration to the city. Therefore, promoting higher education for rural registered people and linking them to the modern sector would be an effective measure to reduce income inequalities.

Summary and Conclusion

Shenzhen is one of the most outstanding examples for successful transition in China. It can be regarded as highly developed and integrated into the world market. For a better understanding of urbanization and transformation processes (in China) we introduce this case study for Shenzhen to analyze the income determining and discriminating factors. For in urbanizing transition economie, on the one hand productivity related market forces are expected to determine a large part of income. On the other hand, non productivity related discriminating factors such as personal characteristics, policies, social norms and traditions can still be important for income determination. The impact of these discriminating factors on income is sometimes regarded as a more general indicator for socio-economic development during urbanization and transition.

[11] It should be noted that the rural hukou Party members make up only one third of urban hukou communist Party members.

In this paper we are particularly interested in these non productivity related forces, that are sometimes labelled income discrimination factors. The intention of this paper is to estimate the extent of the existing income discrimination in this outstanding example of urbanization and transformation, Shenzhen. In particular, social norms and policy related discriminatory factors during the Chinese process of transformation are analysed. While in many other studies only subsets of the most important discriminating factors were available, the design of the *Shenzhen Household Survey 2005* allows us to look at a much larger set of these income determining factors. Further, the survey allows us to take an explicit look at the migrant population of this successful city, and compare the impact of the different discriminatory factors with the urban registered residents.

The results of the Theil Index decomposition already suggests, that most of the income differentials cannot be explained by different endowments with human capital alone. Other discriminatory factors seem to have an important influence on income differentials. Our regression analysis emphasizes that besides human capital, non productivity related personal characteristics, social norms and attitudes, as well as specific government policies seem important for the income pattern in Shenzhen. Gender and marital status as well as policy measures, such as the formation of special economic zones or employment in a company, that is fully or partial foreign owned, all have an important impact on personal income.

Furthermore, from the estimation results it is evident that the most important discriminating factor in Shenzhen is the hukou system. Having a rural hukou status considerably decreases income opportunities. A rural hukou not only has an absolute negative effect on income, but also changes the relative impact of the other income determining factors. Many of the factors determining the income of urban registered people do not affect the income of people with rural hukou. The Oaxaca-Blinder decomposition analysis further supports the idea of substantial discrimination of people with a rural registration.

It seems apparent that social discrimination and policy measures and especially the effect of the hukou system are still very important for determining individual income. These results can be assumed to indicate that, even if we study the case of an outstanding successful urban centre, Shenzhen has not fully completed the transition process towards an economy that is dominated by productivity and pure market forces.

Appendix

Calculating the effects of education

1) The following method was used to calculate the effects of education on income: The *general* marginal percentage *effect of a formal qualification* $i = 1,2,3...$ compared to the base group 0 can be directly taken from the estimation coefficients β_i, e.g.

$$\ln Y_i = \ln Y_0 = \beta_i$$

In continuous modelling this leads to an *income impact factor of qualification* i :

$$\frac{Y_i}{Y_0} = e^{\beta_i}$$

2) The marginal percentage effect of achieving the *next higher formal qualification* $Y_1 \to Y_2$ is also taken from the estimation coefficients β_i e.g.

$$\ln Y_3 - \ln Y_2 = \ln Y_3 - \ln Y_0 - \ln Y_2 + \ln Y_0$$
$$\ln Y_3 - \ln Y_0 - \ln Y_2 - \ln Y_0 = \beta_3 - \beta_2$$
$$\ln Y_3 - \ln Y_2 = \beta_3 - \beta_2$$

In continuous time we obtain the *income impact factor for* achieving the *next qualification level j* after departing from qualification *i* as

$$\frac{Y_3}{Y_2} = e^{\beta_3 - \beta_2}$$

3) The return effect of another year of schooling within a certain formal education program *i* leads to the *income impact per year of schooling* $Y_i(t) \to Y_i(t+1)$ and can be calculated by using the estimation coefficients $\beta_i \beta_j$ and relate the total effect to the average years of schooling for the particular formal program *i* . If t_i is total duration of schooling for qualification *i* than in continuous modelling we obtain for e.g. *i=3,2:*

$t_3 - t_2$: additional years of schooling for qualification 3

$\frac{\beta_3 - \beta_2}{t_3 - t_2}$: percent impact of the average year

and finally the *income impact factor of an additional year of schooling* in program *i=3*

$$\ln y_3 = \frac{\beta_3 - \beta_2}{t_3 - t_2}$$
$$y_3 = e^{\frac{\beta^3 - \beta^2}{t^3 - t^2}}.$$

References

Becker, G.S. (1962), Investment in Human Capital: A Theoretical Analysis, Journal of Political Economy, 70, 9-49.

Becker, G.S., Chiswick, B.R. (1966), The Economics of Education. Education and the Distribution of Income, American Economic Review, 56(2), 358-369.

Bishop, J.A., Luo, F., Wang, F. (2005), Economic transition, gender bias, and the distribution of earnings in China, Economics of Transition, 13(2), 239-259.

Bian, Y., Ang, S. (1997), Guanxi Networks and Job Mobility in China and Singapore, Social Forces, 75(3), 981-1005.

Blinder, A. (1973), Wage discrimination: Reduced form and structural estimates, Journal of Human Resources, 8(4), 436-455.

Bourguignon, F. (1979), Decomposable Income and Inequality Measures, Econometrica, 47(4), 901-920.

Cao, Y., Nee, V. (2005), Remaking Inequality: Institutional Change and Income Stratification in Urban China, Journal of the Asia Pacific Economy, 10(4), 463-485.

Card, D. (1999), The Causal Effect of Education on Earnings, Center of Labor Economics, University of California, Berkeley, Working Paper No. 2.

Card, D. (2001), Estimating the Returns to Schooling: Progress on Some Persistent Econometric Problems, Econometrica, 69(5), 1127-1160.

Chen, A., Coulson, N.E. (2002), Determinants of Urban Migration: Evidence from Chinese Cities, Urban Studies, 39(12), 2189-2197.

Chen, X., Sun, J. (2006), Sociological Perspectives on Urban China: From Familiar Territories to Complex Terrains, China Information, 20(3), 519-551.

Chiswick, B.R. (2006), Jacob Mincer, Experience and the Distribution of Earnings, in: Grossbard-Shechtman, S. (Ed.), Jacob Mincer: A Pioneer of Labor Economics, Springer Publishing, 109-126.

Cowell, F.A. (1980), On the Structure of Additive Inequality Measures, Review of Economic Studies, 47, 521-531.

Cowell, F.A. (1981), Generalized Entropy and the Measurement of Distributional Change, European Economic Review, 13, 147-159.

Cowell, F.A. (1995), Measuring Inequality, 2nd ed, Prentice Hall.

Cowell, F.A. (2000), Measurement of Inequality, in: Handbook of Income Distribution, Vol. 1, Elsevier Science.

Cowell, F.A., Kuga, K. (1981), Additivity and the Entropy Concept: An Axiomatic Approach to Inequality Measurement, Journal of Economic Theory, 25, 131-143.

Du, Y., Park, A., Wang, S. (2005), Migration and rural poverty in China, Journal of Comparative Economics, 33, 688-709.

Fan, C. (2001), Migration and labor-market returns in urban China: results from a recent survey in Guangzhou, Environment and Planning, 33, 479-508.

Gerber, T. P. (2000), Membership Benefits or Selection Effects? Why Former Communist Party Members Do Better in Post-Soviet Russia, Social Science Research, 29(1), 25–50.

Guo, W., Feng, Y. (2007), Special Economic Zones and Competitiveness, PRM Policy Note, Asian Development Bank.

Griliches, Z. (1977), Estimating the Returns to Schooling: Some Econometric Problems, Econometrica, 45(1), 1-22.

Harmon, C., Oosterbeek, H., Walker, I. (2003), The Returns to Education: Microeconomics, Journal of Economic Surveys, 17(2), 115-155.

Hughes, J., Maurer-Fazio, M. (2002), Effects of Marriage, Education and Occupation on the Female/Male Wage Gap in China, Pacific Economic Review, 7(1), 137-156.

Jian, T., Sachs, J.D., Warner, A.M. (1996), Trends in Regional Inequality in China, China Economic Review, 7(1), 1-21.
Knight, J., Song, L. (2003), Increasing Urban Wage Inequality in China. Extent, elements and evaluation, Economics of Transition, 11(4), 597-619.
Lam, K. C. (2003), Earnings Advantage of Party Members in Urban China, Working Paper, Business Research Centre, Hong Kong Baptist University, Hong Kong.
Lemieux, T. (2006), The 'Mincer Equation' thirty years after 'Schooling, Experience and Earnings', in: Grossbard-Shechtman, S. (Ed.), Jacob Mincer: A Pioneer of Modern Labour Economics, Springer Publishing, 127-145.
Li, H., Zhang, J., Sin, L.T., Zhao, Y. (2006), Relative earnings of husbands and wives in urban China, China Economic Review, 17, 412-431.
Liu, P.-W., Zhang, J., Chong, S.-C. (2004), Occupational segregation and wage differentials between natives and immigrants: evidence from Hong Kong, Journal of Development Economics, 73, 395-413.
Liu, Z. (2005), Institution and inequality: the hukou system in China, Journal of Comparative Economics, 33, 133-157.
Lu, Z., Song, S. (2006), Rural-urban migration and wage determination: The case of Tianjin, China, China Economic Review, 17, 337-345.
Mazumdar, J. (1981), The Urban Labor Market and Income Distribution: A Study of Malaysia, Oxford University Press, Oxford.
Meng, X. (2004), Economic restructuring and income inequality in urban China, Review of Income and Wealth, Series 50, 3, 357-379.
Mincer, J. (1958), Investment in Human Capital and Personal Income Distribution, Journal of Political Economy, 66, 281-302.
Mincer, J. (1962), On-the-Job Training: Costs, Returns and Some Implications, Journal of Political Economy, 70, 50-79.
Mincer, J. (1974), Schooling, Experience and Earnings, New York: Columbia University Press for the National Bureau of Economic Research.
Mouw, T. (2003), Social Capital and Finding a Job: Do Contacts Matter? American Sociological Review, 68, 868-898.
Murphy, K.M., Welch, F. (1990), Empirical Age-Earnings Profiles, Journal of Labor Economics, 8(2), 202-229.
Ng, Y.C. (2004), Economic development, human capital, and gender earnings differentials in China, Economics of Education Review, 23(6), 587-603.
Ng, Y. C. (2007), Gender Earnings Differentials And Regional Economic Development in Urban China 1988-97, Review of Income and Wealth, Series 53, 1, 148-166.
Oaxaca, R. (1973), Male-female wage differentials in urban labour markets, International Economic Review, 9(3), 693-709.
Oaxaca, R., Ransom, R. (1994), On discrimination and the decomposition of wage differentials, Journal of Econometrics, 61, 5-21.
Psacharoppoulos, G.; Patrinos, A. (2002), Returns to Investment in Education: a Further Update, The World Bank Working Paper 2881.
Shorrocks, A.F. (1980), The Class of Additively Decomposable Inequality Measures, Econometrica, 48(3), 613-626.
Shu, X. (2005), Market Transition and Gender Segregation in Urban China, Social Science Quarterly, 86, 1299-1323.
Sicular, T., Ximing, Y., Gustafsson, B., Shi, L. (2007), The Urban--Rural Income Gap And Inequality In China, Review of Income and Wealth, 53(1), 93-126.
Tanzi, V. (1998), Fundamental Determinants of Inequality and the Role of Government, IMF Working Paper 98/178.
Theil, H. (1967), Economics and Information Theory, North Holland Publishing.

Wan, A.T.K. (2006), On discrimination and the status of immigrants in the Hong Kong labour market, Economic Bulletins, 10(6), 1-17.
Wan, A.T.K. (2006), On discrimination and the status of immigrants in the Hong Kong labour market, Economic Bulletins, 10(6), 1-17.
Xiao, Y. (2002), Determinants of salary growth in Shenzhen, China: an analysis of formal education, on-the-job training, and adult education with a three-level model, Economics of Education Review, 21, 557-577.
Xue, J., Gries, T. (2007), Human Capital Accumulation and Income Distribution in Urban China : The Case of Shenzhen, The Economic Science, 2007 (12), 101-115.
Yang, D.T. (2005), Determinants of schooling returns during transition: evidence from Chinese cities, Journal of Comparative Economics, 33, 244-264.
Yueh, L.Y. (2004), Wage Reforms in China During the 1990s, Asian Economic Journal, 18(2), 149-164.
Zhang, J., Zhao, Y, Park, A., Song, X. (2005), Economic returns to schooling in urban China, 1988 to 2001, Journal of Comparative Economics, 33, 790-752.