Economic mobility in a colonial and post-colonial economy: the case of Indonesia[1]

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Summary

Recently, several studies discussed development and inequality in Indonesia in the long run. However, because of the lack of data, all of these studies focus on the macroeconomic level while paying less attention to individuals and the possibilities of economic mobility. The problem caused by the poor availability data became less serious recently, however, with the use of anthropometric data (heights). Data on heights provide a great opportunity to explain socio-economic developments over time even when economic indicators of welfare are not directly available.

In this paper we use height data as a proxy for economic position in order to identify the most important factors that affected the economic position of an individual, and also the changes in the role and importance of these factors. We find that ethnicity (and its derivative: birthplace) became less significant as a determinant of economic position after independence. Before independence the possibility to enter higher economic positions depended strongly on one's ethnicity. This decreased markedly after independence. Likewise, one's place of birth was a more important explanation for ending up in the lower economic classes before independence than afterwards. Only for the middle classes (the petty traders) do we find economic position remaining as determined by birth place and ethnicity as it had been before.

However, besides the removal of obstacles to economic mobility such as ethnicity and birthplace, other factors that increased social mobility, notably education and occupation, played a significant but changing role. Prior to independence, education could serve as a tool of economic mobility for the lower groups only, suggesting that higher schooled Indonesians had little access to high income occupations, which were dominated by the Europeans and Chinese. In the post-colonial period, however, education increased one's chances of entering any position in society. It seems that the sector of occupation was always an important determinant of social-economic position: both before and after independence being occupied in services or industry was beneficial for upward economic mobility. The magnitude of this effect was strongly reduced after independence, however, as the incomes in the different economic sectors converged, partly because the share of agriculture in total GDP diminished and partly because of an increase in non-agricultural by-employment.

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1. Introduction

Historical knowledge about economic stratification and the distribution of income in Indonesia is limited. Even though there is plenty of contemporary and later evidence on inequality (e.g. Steinmetz 1914; Booth 1988; Van Zanden 2003; Leigh and Van der Eng 2009) and the role of ethnicity (e.g. Meijer Ranneft and Huender 1926; Maddison 1989), very little is known on how ethnicity is related to economic mobility. Clearly, some occupations, especially in government, during the colonial period were *de facto* closed to Indonesians and Chinese; still there is enough evidence about rich Chinese and Indonesians (e.g. Meijer Ranneft and Huender 1926; Booth 1988). Hence, ethnicity cannot be the sole determinant of economic position. The same can be argued after independence. Even though "unity in diversity", the national motto of Indonesia, implies that ethnicity should play a smaller role in determining labour market outcomes, discrimination in the labour market exists even today. Indeed as Booth (1998, 89) argues "economic stratification along ethnic lines was pronounced in Indonesia by the early twentieth century, and in spite of the egalitarian rhetoric […], this stratification persisted into the post-1950 period."

In this study, we use stature as an indicator of economic position. This approach has become increasingly common in recent research also for Indonesia (Baten, Stegl, and Van der Eng 2010; Foldvari et al. 2010). The advantage of using heights is that the data, unlike other data on social/economic position, are easily available. An additional benefit is that the use of heights allows us to make inferences of income and economic position for periods when no income data are available. Finally, the use of heights makes it possible to create a consistent picture over time for a period with scarce and often unreliable data. A major methodological problem is, however, that the height of a person is determined mainly during the first 5 years of his life and, hence, largely indicative of the income of his parents and not of his own income. However, it is found that height is a good indicator of welfare both for the parents as for the person involved (the latter via correlation between parents and children's income and social status) (e.g. Herrnstein and Murray, 1996; Maralani and Mare 2004; Hertz 2005). Because we lack detailed data of intergenerational correlation of height, we used data from the 1990s from the Indonesia Family Life Surveys (IFLS 1-4) which provide data of the height of both fathers and sons. We found a significant positive statistical relationship between the height of sons and fathers[2]. From a methodological perspective it is noteworthy, that even if we believe that the relationship between the status of parents and children weakened over time, this causes no bias in the estimated parameters since we employ the height data as dependent variable[3]

[2] , We also tested the relationship between education and even occupation of fathers and sons and found statistically significant results for these as well. Hence, even if we were to argue that height is indicative of the income of the parents, we can also argue that children's education and occupation are proxies for parental education and occupation.

[3] A random measurement error in the dependent variable will not bias the coefficient estimates; it will only lower the R^2.

In this paper we use a set of socio-economic variables to explain economic status, proxied by heights, both before and after independence. In this way we hope to gauge an effect of changing political and social structure on the possible economic mobility in Indonesian society. To do so, in the next section we discuss the data. Section 3 then moves on to the development of income and height. We find that although there is a strong link between economic position and ethnicity, the changing role of ethnicity alone is not enough to explain the changes in the economic structure in the pre-and post colonial society. Therefore, in Section 4 we discuss other factors that contributed to the economic position. In Section 5 we then move to the possibilities of the different economic classes to use the factors that enhance (or limit) economic mobility. We end with a brief conclusion.

2. Constructing measures of height inequality

Recently, Foldvari et al. (2010) used a height dataset, constructed from Indonesian military data and Indonesia Family Life Surveys (IFLS), to generate a trend of heights in Java and the Outer Provinces over the twentieth century. We use an updated and expanded version of their dataset. These data, however, come with some problems, some of which already discussed in Foldvari et al. (2010) and about which we will therefore only make some passing remarks.

The most important problem with this dataset is that the military data only include males. Hence, we decided to include only males from the IFLS as well. Second, the military data have a height truncation since people below a certain height (ca. 150 cm) were unfit for army service. We therefore use a truncated regression for the pre-independence period in the next sections to correct for the missing observations.

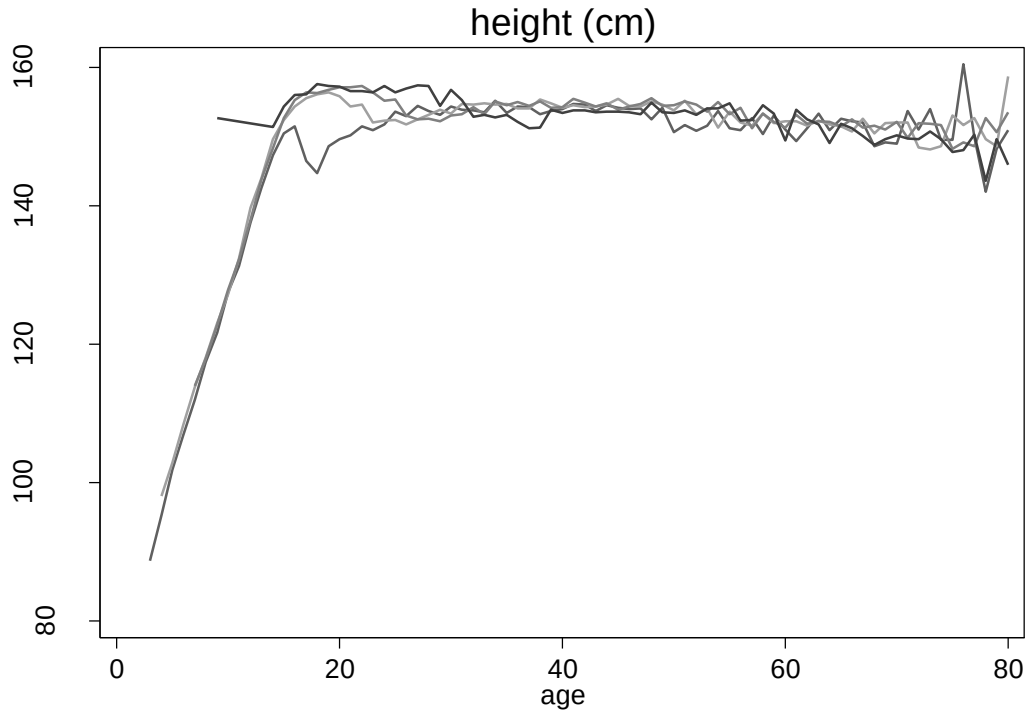
However, since the aim of this paper is to assess the change in economic position among different classes of society, we encounter a few problems that could be ignored by Foldvari et al. A first problem is migration. For the military data, migration is defined as the difference between birth place and place of last residence. However, we cannot do the same for the IFLS data, since many people migrate more than once in their life. It may be assumed that migration in ones youth has a different background than those at older ages. Indeed, one may expect that migration at younger ages is often driven by occupation (or marriage) while at older ages many people go to live with their children. The IFLS actually gives some information. We find that about 75% of all migrants migrated before age 50, most between the ages of 15 and 30. The main arguments for migrating were employment, marriage, and because one wants to live close to one's family. Before age 15 migrations largely take place because one moves together with ones parents while after age 50 sickness, death and living with one's family becomes more important. Since our data during the colonial period refer to the period between birth and signing up for military service, since the purpose of

migration is so different at later ages, and since most migrations take place at younger ages anyway, we decided to include only the last migration a person fulfilled below age 50.

A second problem is shrinkage at older ages. In the literature, often it is argued that people shrink after ca. age 40 (Galloway, 1988; Cline, Boyer and Burrows, 1989; Chandler and Bock, 1991). It is also argued that this shrinkage is the same among all ethnicities (Morgan 2010). Since the earliest IFLS survey is available in 1993, it implies that people that were born in the 1930s were between age 53 and 63 years old in that survey. Based on the data from Morgan (2010), Baten et al. (2010), followed by Foldvari et al. (2010), set shrinkage at 1 cm effectively for the 1930s. However, the proof that shrinkage is independent of ethnicity is not convincingly made yet. In addition, shrinkage may also depend on place of birth, education, or occupation. Since we use those variables to explain economic position, it is important to test whether shrinkage is indeed independent of such factors.

In order to get a better view on shrinkage, we use the IFLS data from the 4 surveys of 1993, 1997, 2000, and 2007. A person can thus be measured a maximum of 4 times (one time in every survey). For example, if someone was aged 40 in 1993, he was 44 in 1997, 47 in 2000, and 54 in the 2007 survey. In this way we can determine the role of shrinkage. The importance of shrinkage is shown in below Figure. As one can see, up to age 18 people

Figure 1: development of height by age (shrinkage)



Source: IFLS 1993; 1997; 2000; 2007

remain growing. It remains constant, however, up to ca. age 60. After age 60 it starts declining.

It is in itself already surprising that shrinkage is limited prior to age 60. However, the same information follows from Table 1. Following Morgan (2010), we regress height difference on age difference to test the effect of shrinkage over time. However, contrary to Morgan, we used a fixed effects panel specification. We find that after age 40 people

Table 1: Shrinkage after age 40

	dependent variable: height			
	.(1)	.(2)	.(3)	.(4)
Constant	160.02	160.43	158.67	160.6
	(647.57)	(859.30)	(154.32)	(141.09)
Agediff (age-40)	-0.037	0.014	0.043	-0.117
	(-1.81)	(0.34)	(0.61)	(-2.53)
ages included	age 40-70	age40-50	age50-60	age60-70
No obs.	14,804	7,387	5,054	3,356
R^2	0.013	0.002	0.001	0.004
	fixed effect	fixed effect	fixed effect	fixed effect
t-value in parenthesis				

shrink on average 0.037 cm per year, i.e. 1.11 cm between age 40 and age 70 (equation 1). However, this is not necessarily the same for each birth decade after age 40. Therefore, we tested it for age groups 40-50, 50-60 and 60-70 separately in equations 2-4. Indeed, we find no shrinkage below age 60. Only after age 60 we find significant coefficient for shrinkage (equation 4). Between age 60 and age 70 persons shrink on average 1.17 cm.

Unless one is interested in calculating a general trend in heights, if shrinkage after age 60 happens for all categories of people it is less important since this effect is picked up by time dummies in the regressions in the next sections. This will be different, however, if shrinkage is determined by other socio-economic factors like education, marital status, occupation, or ethnicity. This is tested in Table 2 and they all turn out to be insignificant. Equation 1 shows that in the regression education plays no role in shrinkage,

Table 2: Shrinkage at old age by education, marital status, ethnicity, occupation, and sex

dependent variable: height (cm)

	.(1)	.(2)	.(3)	.(4)	.(5)
Constant	160.04	160.63	160.34	160.09	154.49
	(649.01)	(144.87)	(684.21)	(653.56)	(985.82)
Agediff (age-40)	0.032	-0.174	-0.019	0.021	-0.097
	(0.39)	(-3.84)	(-0.51)	.(0.29)	(-5.94)
agediff*Dprimary education	-0.123				
	(-1.46)				
agediff*Dsecondary education	0.051				
	.(0.53)				
agediff*Dhigher education	-0.018				
	(-0.09)				
agediff*Dmarried		0.059			
		(0.90)			
agediff*Dsundanese			-0.082		
			(-1.57)		
agediff*Dball			-0.1		
			(-2.36)		
agediff*Dbatak			-0.156		
			(-1.86)		
agediff*Dbugis			0.076		
			.(0.49)		
agediff*Dchinese			0.216		
			(0.83)		
agediff*Dmadurese			-0.055		
			(-0.81)		
agediff*Dsasak			-0.176		
			(-1.57)		
agediff*Dadministrative/managerial worker				-0.005	
				(-0.02)	
agediff*Dclerical and related worker				-0.033	
				(-0.25)	
agediff*Dsales worker				-0.092	
				(-1.23)	
agediff*Dservice worker				-0.141	
				(-1.46)	
agediff*Dagricultural worker				-0.101	
				(-1.28)	
agediff*Dproduction worker				0.009	
				(0.10)	
agediff*Dmale					0.059
					.(2.26)
ages included	age 40-70	age 60-70	age 40-70	age 40-70	age 40-70
No obs.	14,720	3,356	11,743	12,566	14,271
R^2	0.007	0.005	0.0012	0.013	0.122
	fixed effect	fixed effect	fixed effect	fixed effect	fixed effect

Equation 3= Javanese omitted. Dummies for other ethnicities are not reported because their sample size is too small.
equation 5= professional/technical workers omitted

t-value in parentheses

i.e. higher educated people shrink as much as lower educated people. In equation 2 we find that the effect of marriage is insignificant. Hence, married men shrink at the same rate as unmarried men. Equation 3 shows the same information for ethnicity. We find that the role of ethnicity is insignificant except for Balinese and Bataks. Yet, since the difference is small and since the coefficients of all ethnicities combined are not significant, we argue here that ethnicity does not seem to play a role. Equation 4 then shows the effect of occupation. Again, we find no significant effect: more physical labour intensive occupations do not cause more shrinkage at older ages. Finally, equation 5 checks the role of sex. We find that women shrink more than men.[4]

In sum, we find that shrinkage takes place only from ca. age 60 onwards with roughly 0.117 cm per year. This is not influenced by other characteristics, except sex. However, our dataset focuses on men only. Therefore, we increase the height of all men of 60 years and older with 0.117 cm per year.

A third problem in the data is the omission of Europeans prior to independence in the data. Foldvari et al. (2010) used unweighted data of Indonesians and Chinese under the assertion that they made up the largest part of colonial society and, in any case, the role of Europeans was marginalized after independence. Yet, even though Europeans indeed made up only ca. 0.2% of the total population (Boomgaard and Gooszen 1991) in the late colonial period, they had privileged position in terms of income, education, or occupation. Indeed, Polak (1979) and Maddison (1989) showed that per capita GDP for Europeans was about 50 to 70 times as high as for Indonesians. Since our aim is to look at the economic position of people within society, we include a sample of Europeans joining the Royal Dutch Indies Army (KNIL) and that were born in Indonesia.[5] It is important to note that the vast majority of Europeans came from urban Java: 82.3% of these Europeans are from Java, more or less equally spread over West, Central, and East Java. Another 10% was born on Sumatra, and the remainder on various other places in the archipelago.

This leaves us a fourth problem. The data on Europeans are relatively abundant before the 1920s, while the observations of Indonesians decreases further back in time. Consequently the relative share of Europeans in our dataset increases further back in time. In the 1890s this share is even 40% while the actual share in the population is only around 0.3%. We have the same problem with Chinese. The actual share of Chinese in the total population is around 1.5%, while the share of Chinese by birth decades fluctuates strongly. Therefore, we use Boomgaard and Gooszen (1991) to calculate the share of the Chinese and European and Indonesians in the total population by birth decade. This is divided by the

[4] The total average decline of height of women is around 2.9 cm up to age 70, possibly because of loss of calcium after menopause. This seems to be confirmed by a French test which showed that 70.9% of women showed a height decline of around 3 cm (Brooks 2010). This suggests height decline among women to be also independent of ethnicity.

[5] KNIL archive 2.10.50, inv nr. 418-443. We included the whole inventory of 441-443 and for the rest we included the First 50 observations of the even numbered inventories.

number of observations of Chinese, Europeans, and Indonesians respectively by birth decade. This creates separate weights for each group per birth decade. After 1930, when the data are from the IFLS, all weights are set at 1.

The resulting dataset contains data on education, ethnicity, occupation, height, place of birth, place of last residence, migration, and religion. Table 3 reports some of the descriptors. Clearly, as outlined above, there is a strong change in the shares of Europeans, Chinese, and Europeans before and after independence. Partly, this is caused by oversampling of Europeans and Chinese prior to independence and partly by the emigration of many Europeans from Indonesia in the 1940s and 1950s (Beets *et al.* 2002). Place of birth does not deviate strongly when divided into core (Java and Madura) and periphery (Outer Provinces). This also shows that recruits did not overwhelmingly come from Java, as is sometimes suggested for the Indonesian military data.

Table 3: Percentage distribution of height data

		Military data (1890-1929)	IFLS (1930-1990)
ethnicity	Europeans	10.5%	0.0%
	Chinese	3.3%	0.9%
	Indonesian	86.2%	99.1%
Place of birth	Java and Madura	59.2%	60.1%
	Outer Provinces	40.8%	40.0%
religion	Islam	52.8%	88.1%
	Protestant	33.2%	4.3%
	Catholic	9.7%	1.8%
	Buddhism	2.4%	0.8%
	Other	1.9%	5.0%
Education	no education	3.1%	2.9%
	primary education	88.9%	52.4%
	secondary education	8.0%	37.3%
	higher education	0.0%	7.4%
Occupation	Agriculture	59.5%	39.2%
	Industry	18.6%	35.1%
	Trade	6.0%	15.7%
	Other services	15.9%	10.0%

Note: percentage of available data. Since not all categories are included, the shares do not necessarily sum op to 100%

Within this subdivision, however, there is more heterogeneity, which makes it necessary for estimating a long run trend in height to include a dummy for birth region.

Concerning the other variables, Table 3 shows that religion is always dominated by the Islam, but before independence the share of Protestants is much bigger in our sample than in the actual population, largely because of the presence of Europeans and Moluccans. Education clearly shows a strong development over time. Before independence the vast majority had either no, or only primary education, while after independence a strong growth in secondary and higher education took place. However, we still have to be aware that before independence the share of people with "no education" is underreported. Finally, the occupational structure is actually quite representative (e.g. Marks 2009, 72). This in itself is telling since our data before independence relate to military recruits who, by definition, are relatively young and therefore can be expected to have a different occupational structure than older persons. Hence, it seems that occupational mobility prior to independence was limited.

3. Economic development versus economic mobility: height, ethnicity, and income

It is clear that economic development in Indonesia was significant in the twentieth century which improved the standard of living of most Indonesians. Whereas the number of people living in extreme poverty declined from 52% in 1925 to 21% in 1999 (Van Leeuwen and Foldvari 2009), per capita GDP increased from 991 till 3,147 GK dollars (Maddison 2007). Obviously this also affected the economic structure, especially by an increase in the number of persons employed in the service sector (Marks 2007, 72). Also social indicators changed: average years of education increased from 0.6 to 7.4 years (Van Leeuwen 2007) while life expectancy at birth increased from roughly 25 to 62 years (Van Leeuwen 2007, 10). These developments considerably improved the standard of living of the average Indonesian. However, it does not necessarily say something about economic mobility: it is very well possible that even within this increasingly prosperous economy economic mobility, defined as changing per capita income, was as limited as it had been a century ago.

To analyse economic mobility, we use height as described in the previous Section as an indicator of income.[6] Little evidence as there is for Indonesia, it seems that the development of height over time has been quite uneven, suggesting that changes in the distribution of heights (and thus economic position) have taken place over time.

On the magnitude and the reasons of this change little is known. A few studies, however, do provide some additional information. Baten et al. find in general that people in Java and Sumatra are taller before independence. After independence, even though Java is

[6] For a similar use of height as an indicator of income see also Baten, Stegl, and Van der Eng (2010) and Foldvari et al. (2010).

still taller, Sumatra fell behind. A similar conclusion is reached by Foldvari et al. (2010, footnote 3) who argue that there was a strong regional pattern with a fallback of Sumatra

Table 4: height trend in Indonesia, Java, and the Outer Provinces 1890-1990

	dependent variable: height (cm)					
	.(1)	.(2)	.(3)	.(4)	.(5)	.(6)
constant	161.92	159.436	160.92	158.86	160.87	159.18
	(247.10)	(448.33)	(122.37)	(394.52)	(107.85)	(85.87)
1900s	0.713		2.456		-0.168	
	(0.86)		(1.55)		(-0.17)	
1910s	0.364		1.31		-0.108	
	(0.60)		(1.01)		(-0.16)	
1920s	-0.754		0.006		-0.926	
	(-1.29)		(0.00)		(-1.42)	
1940s		0.82		1.036		0.511
		(2.35)		(2.49)		(0.82)
1950s		2.052		2.471		1.191
		(6.62)		(6.62)		(2.18)
1960s		2.88		3.426		1.806
		(9.62)		(9.63)		(3.36)
1970s		3.409		4.188		1.873
		(11.35)		(11.71)		(3.51)
1980s		4.273		5.182		2.621
		(14.15)		(14.30)		(4.93)
ethnicity*	1139.32	7.32	2350.47	26.42	226.06	10.48
	.(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
birthplace**	44.9	8.05	5.39	5.93	24.08	4.57
	(0.000)	(0.000)	(0.250)	(0.001)	(0.004)	(0.000)
No obs.	9,156	9,482	5,427	5,926	3,799	3,556
Region	Indonesia	Indonesia	Java	Java	Outer Provinces	Outer Provinces
R^2	N/A	0.059	N/A	0.076	N/A	0.052
period	1890-1930	1930-1990	1890-1930	1930-1990	1890-1930	1930-1990
Regression	truncreg	reg	truncreg	reg	truncreg	reg

* test statistics and p values of joint significance test. chi-squared-test for truncreg, F-test for reg. Equation 1: 19 restrictions; equation 2: 18; equation 3: 12 restrictions; equation 4: 14 restrictions; equation 5: 18 restrictions; equation 6: 14 restrictions. (probability in parentheses)

** test statistics and p values of joint significance test. chi-squared-test for truncreg, F-test for reg. Equation 1: 14 restrictions; equation 2: 11 restrictions; equation 3: 4 restrictions; equation 4: 3 restrictions; equation 5: 9 restrictions; equation 6: 7 restrictions. (probability in parentheses)

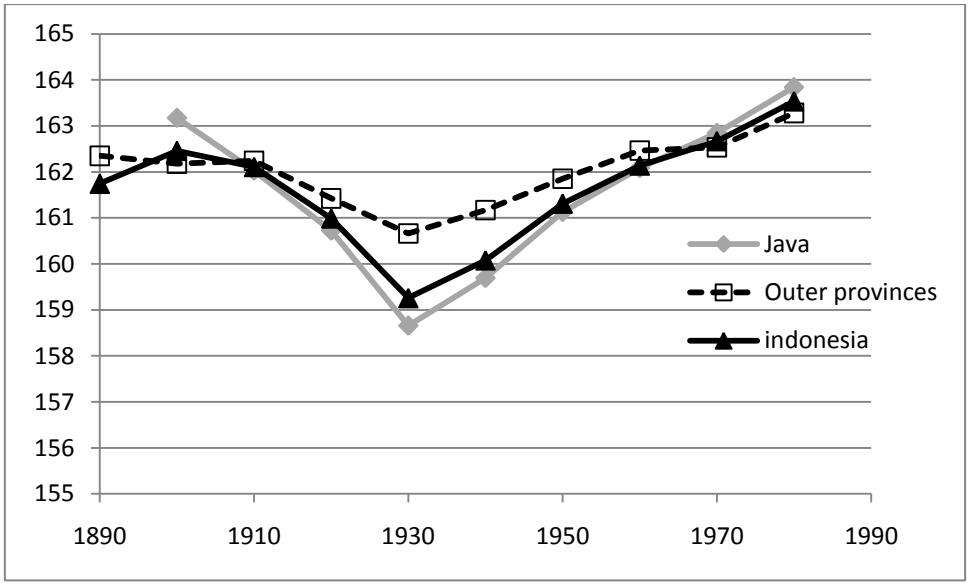
t-value in parenthesis

versus the remainder of the Outer Provinces after independence. This suggests that there was a differential height development by ethnicity as well, given that Java was overwhelmingly populate by Javanese and Sundanese while especially the Outer Provinces is strongly ethnically fragmented.[7]

Since our sample differs from those of Foldvari et al., by including more (and cleaned) data after 1930, more data on Europeans before 1930, and a weighting scheme to correct for oversampling of Europeans and Chinese, we start by following them in reporting heights for the outer provinces, Java and Indonesia. For the period prior to 1930, we use a truncated regression since the height data are left truncated because of a minimum height requirement in the military data. The truncation was set at 150 cm, below which no recruits were enlisted. In the regression we used only time invariant variables like ethnicity and birthplace since their changing composition over time may obscure height trends. We omitted time varying variables like education or occupation from the regression since they change with economic and social development and, hence, pick up the long-run height increase.

Table 4 gives the coefficients. Interestingly, with the exception of Java during the colonial period, all joint significance tests for place of birth and ethnicity are significant. The result is plotted in below graph. The main conclusion is that both the Outer Provinces and

Figure 2: regional height development in Indonesia, 1890-1990



Note: based on Table 4, benchmarked on 1970.

[7] In addition, there is evidence of strong growth in west Sumatra (Esmara 1971, 32). This suggests that, since average heights decreased relative to Java, inequality in Western Sumatra in the First decades after Independence increased.

Java moved in the same direction. But the decline in heights was less in the Outer Provinces than in Java. As Figure 2 shows, this is clearly caused by a larger fallback in the 1930s and 1940s in Java compared to the Outer Provinces. Indeed, up to the late 1980s per capita GDP had been higher in the Outer Provinces than in Java (Foldvari et al. 2010). The depression in Indonesia hit per capita income in the Outer Provinces harder than Java, because of its higher export income (Polak 1979, 83). However, this did neither lower food consumption because of abundant land, nor let it GDP/cap in the Outer Islands drop below that of Java. This may be partly explained by the higher per capita productivity in the Outer Provinces which, according to Broek (1940, 193), gives a person in the Outer Provinces "a much better chance than the Javanese to raise his standard of living." Indeed, Polak (1979, Table 15.6) shows that per capita income in the Outer Provinces was on average about 30% higher. This was worsened by the Japanese arrival. Even though they hardly demanded any rice, the rice shortage of ca. 260,000 tonnes that hit Indonesia was mainly due to misadministration of inexperienced Japanese officials (Saito 1994, 10; Kahin 2003, 104).

However, whereas the development in the different regions in the short run may have deviated, in the long run they all tended to converge (see for example Figure 2). The same was not true for ethnical composition though, where differences tended to be more persistent (Table 4). However, in Table 5, where we also include other socio-economic variables that may determine height, we find that, even though ethnicity remains significant after independence in determining height, its importance is diminishing. Since this does not seem to be the case in Table 4 where we excluded any time variant variables, , an easy explanation is that the sources of income during the colonial regime were more ethnically fragmented than afterwards when education and occupation increased in importance. Indeed, Polak (1979, Table 15.6) estimated that for 1930 per capita income for "Foreign Asiatics" (largely Chinese) was about 5 times that of Indonesians and that of Europeans 46 times. Interestingly, whereas per capita income of Europeans and Indonesians was higher in the Outer Provinces compared to Java, for Chinese the reverse was true. This was possibly caused by the dominance of Chinese in small trade, which was more beneficial on Java.

Yet, even if between-group income inequality of Chinese, Europeans, and Chinese completely disappeared after independence, the difference in height persisted. Not only did the inclusion of occupation and education in the regression reduce the effect of birthplace and ethnicity (see Table 5), but even within these ethnic groups there was pungent income inequality. For example Van Zanden (2003) estimates the income Ginis for Indonesians, Europeans and Chinese to be 0.32, 0.61, and 0.63 respectively.[8] Booth (1988, 326) showed that 45 years later the same applied with Ginis of 0.37, 0.51, and 0.53 respectively. Indeed, Booth (1998, 109) shows that the assessed income per capita of the 5% of the Indonesian

[8] Updated data are used to calculate these Ginis. The data were obtained from the Global Price and Income History Group website: http://gpih.ucdavis.edu/Distribution.htm

population that paid income tax around 1930 was much higher than the average per capita income as calculated by Polak (1979), suggesting a relatively wealthy upper class.

This suggests that the distribution of height (and income) underwent some changes after Independence, but that this change was not as marked as might be suspected. Although the role of ethnicity in economic position declined, other factors must have remained in place affecting an individual's ability to move to a higher economic position. These potential factors will be discussed in the next Section.

4. Factors affecting economic mobility

In the previous Section we found that the role of ethnicity declined after independence. But it also became clear that ethnicity alone does not provide a sufficient explanation for the changing height structure within the population. After all, even within apparent homogenous groups inequality could be large. Therefore, we test in table 5 what other factors may influence the distribution of heights. We include socio-economic descriptors such as migration[9], religion, occupation, and education.

We find that, after inclusion of other variables, the role of ethnicity diminishes further after independence. For the colonial period ethnicity dummies still yield highly significant coefficient while after independence the combined significance declined strongly (even though it is still just significant at 5%). Indeed, whereas before independence Bataks, Manadonese, Moluccans, and Europeans were taller (and Dayaks shorter) than Javanese, after independence only Chinese were taller. These results are not surprising since the Batak (North Sumatra), Manadonese (North Sulawesi) and Moluccans were all early Christianized and had had ties with Europeans for long (Schouten 1993, 104; Steenbrink 2003, 189) while the Dayaks were largely living isolated in inner Kalimantan. Indeed, the Census 1930 (Vol. VII, Table 15) shows that 60% of the Ambonese men, 25% of the Batak, and 97% of the Manadonese were either protestant or Catholic. Furthermore, the food habits were different. The Bataks, for example, had the custom to keep at least a twelve month supply of paddy in store while social prestige was derived from the possession of livestock (Penny and Singarimbun 1967, 38-39). This development led even in the 1960s to a higher per capita income of the Batak farmers than of the Javanese (Penny and Singariumbun, 1967, 40). Equally, Chinese had a generally privileged position as traders, even after independence.

[9] We exclude migration here because it is insignificant and its inclusion would halve our sample size. However, migration turned out to be insignificant when we tested it. It is interesting though, that , for the post-colonial period, migration away from Java has a negative sign and away from the Outer provinces a positive sign. This is exactly the reverse for the colonial period. This seems to suggest that during the colonial period the rich were the ones that migrated from java (height increases if one migrates) while the poor migrated from the Outer Provinces (height decreases when one migrates) while the reverse was true after independence. However, these coefficients were insignificant. We will return to this issue in the next Section.

Table 5: determinants of height

	dependent variable: height (cm)	
	.(1)	.(2)
constant	162.19	158.52
	.(141.34)	.(260.33)
1900s	-0.755	
	.(-0.58)	
1910s	-0.948	
	.(-0.95)	
1920s	-2.079	
	(-2.13)	
1940s		0.605
		.(1.65)
1950s		1.657
		.(5.05)
1960s		1.847
		.(5.60)
1970s		2.048
		.(5.30)
1980s		2.982
		.(3.31)
ethnicity[1]	113.43	1.70
	.(0.000)	.(0.040)
birthplace[2]	34.84	1.83
	.(0.002)	.(0.051)
religion[3]	2.60	0.60
	.(0.761)	.(0.698)
Dprimary education[4]	0.667	0.372
	.(1.57)	.(0.74)
Dsecondary education[4]	3.552	1.997
	.(3.67)	.(3.79)
Dhigher education[4]		2.662
		.(3.97)
Dindustry[5]	0.171	0.685
	.(0.71)	.(3.18)
Dtrade[5]	-0.045	0.274
	(-0.12)	.(1.03)
Dother service[5]	0.539	1.181
	.(2.05)	.(3.62)
No obs.	4,268	4,647
R^2	N/A	0.071
period	1890-1930	1930-1990
Regression	truncreg	reg

[1] ch2 for truncreg, F-test for reg. Equation 1: 18 restrictions; equation 2: 16
[2] ch2 for truncreg, F-test for reg. Equation 1: 14 restriuctions; equation 2: 10
[3] ch2 for truncreg, F-test for reg. Equation 1: 5 restriuctions; equation 2: 5
[4] No education is omitted
[5] agriculture is omitted
t-value in parenthesis

Since the increase in height over time in Table 5 is lower than in Table 4, the other variables must pick up part of this increase. Indeed, we find that education is significant, both before and after independence. Yet, whereas during the colonial period the strongest effect comes from secondary education, after independence this role is taken up by higher education (although secondary education is still significant). Partly, this can be explained by the absence of higher education facilities in Indonesia until the 1920s and partly because the fast increase of enrolments in secondary education in the 1950s-1980s, reducing the potential labour market benefits (Van Leeuwen 2007) and partly because there was an increasing demand for tertiary educated workers (Manning 1998, 141)

Indeed, before independence the gross enrolment in primary education of Europeans was above 100%, while that of Chinese was around 15% and of Indonesians around 10%. For secondary education, the same figures were 30, 2, and 0.6% respectively. Partly, this can be attributed to the limited prospects of advancement for the non-European population (e.g. Kahin 2003). Indeed, if we look at the occupational distribution by ethnicity in the 1930 census of the Netherlands Indies, we can see (see Table 6 below) that on Java 50% of the Europeans were working in "other services", consisting largely of government service. In the

Table 6 Male occupations by ethnicity and region, 1930

	Java and Madura				Outer Provinces			
	Indonesians	Europeans	Chinese	Other Asians	Indonesians	Europeans	Chinese	Other Asians
Agriculture	67.3%	20.2%	9.2%	2.3%	83.3%	40.8%	44.9%	29.5%
Industry	11.2%	6.1%	20.8%	8.2%	6.8%	4.3%	19.5%	14.4%
Trade	6.3%	14.3%	57.4%	75.6%	3.0%	10.8%	23.1%	42.0%
other services	5.4%	50.3%	5.9%	8.4%	4.2%	41.3%	4.5%	9.0%
Unspecified	9.8%	9.0%	6.7%	5.6%	2.6%	2.9%	8.0%	5.1%

Source: Volkstelling 1930, Vol. VIII, Table 18

Outer provinces the figure was lower, largely because many Europeans were working on estates and, hence, in agriculture. The percentages of Chinese and Indonesians working in government services are much lower. This had considerable effects on the education of their children as well since for Indonesians roughly 70% of the children in Western education had parents working in government service (Hollandsch-Inlandsche Onderwijscomissie 1930, Table IV-V). For the Chinese this figure was, with ca. 8%, much lower. However, many more Chinese worked for their own account, possibly in small shops, and sent their children to European education. Indeed, it is clear that a large percentage of Chinese and other Asian population worked in trade, while the Chinese also had an important position in industry. Indonesians dominated agriculture. Occupation was therefore highly divided by ethnicity (Lindblad, 1993, 236) with spill-over effects into education.

Since the more important and lucrative job opportunities either require capital (e.g. to be a trader) or education (e.g. to enter government service), occupation as a barrier to

economic mobility is likely to be more significant for the top income than for the low income agricultural groups. This implies that a reduction in agricultural employment most likely will increase the share of people that can achieve economic mobility by changing jobs. Yet, after Independence, we can see that up to the 1960s, agriculture hardly declined, while industry lost ground versus services (Jones 1966, 53-54). This trend is visible both in Java and the Outer Islands (Van der Eng 2002, Table 7.4). Only between 1961 and 1990 we see that the employment shares in both industry and services increased versus agriculture. Whereas agriculture had made up 76.3% in 1930, and 74.2% in 1961, it had decline to 50.5% in 1990. However, this does not seem to make much difference for the ethnic composition of the higher value added occupations: even though Europeans were effectively removed from their positions after independence, Chinese still work overwhelmingly in trade and industry, while Javanese still worked for 34% in agriculture on Java and 54% in the Outer Islands. Hence, the vast majority of those working in agriculture are Indonesians. The only increase in effect of occupation can thus be caused by the change in economic structure over time (i.e. the reduction of the share of low value added agricultural employment). This is also acknowledged by Van der Eng (2002, 147) who shows that many people working in agriculture had non-rural by-employment.

As above discussion shows, just as the removal of ethnic barriers decreased obstacles to economic mobility as shown in Section 3, increasing education as well as better access to non-agricultural occupations are identified as channels through which one can improve one's economic position. Yet, this does not say anything about the actual economic mobility. For example, even though people with a higher level of education may have a better economic position (i.e. they are taller), this does neither imply that a lower class labourer had equal access to education nor that, even if he had access, it would improve his economic position. The same applies to occupation: even though non-agricultural occupations could lead to improvement in one's economic position, it is still unclear if the lower classes had access to such occupations. One can imagine that the same applies to migration and even ethnicity. This will be discussed in the next Section.

5. Economic mobility in a colonial and post-colonial economy

As pointed out in the previous Sections, various socio-economic factors influence the economic position of an individual and, hence, the distribution of income (and height, being a proxy of income). The fact that these factors influence the distribution does not necessarily tell us something about economic mobility. After all, if, for example, education is only available for the upper classes and will lead them to increase their income relative to the rest of the population, this will cause a positive coefficient for education but it will not lead to increasing economic mobility.

We can divide the socio-economic factors in those that may limit economic mobility and those that have the potential to increase economic mobility. The first category contains the time independent factors like ethnicity and birthplace. None of these factors can be influenced by the person involved. They may function as a limit for economic mobility when the labour market is ethnically segregated as we have argued in the previous sections. The second category consists of time variant socio-economic factors like migration, education, and occupation. These factors can be changed/improved and as such offer a way for improving one's economic position. Yet, this is only true if these factors have a significant effect on the economic position.

In order to analyse the role of each of these socio-economic factors, we need to determine if they significantly determine a person's chance to improve one's economic position in society. In other words, we need to determine if increasing (or decreasing) a socio-economic factor increases ones chance of belonging to the top incomes, the latter being proxied by heights. For the time invariant factors this means that we have to determine if they become less significant over time, i.e. that they do not act as a limit to economic mobility anymore. For the time variant factors, we have to determine whether they apply to all economic classes equally. In order to do so, we use a logit regression to test the chance that a person belongs to the top x% incomes. In this way we can test what is the role of each factor in the chance that one belongs to the top x% of the population. As pointed out, if the time variant factors are significant, this means for example that the chance is bigger that certain ethnicities belong to the top incomes. Hence, this means that there are blockages to economic mobility. On the other hand, when time variant factors such as education are significant in order to reach the top incomes, this implies that by improving ones education one can increase the chance of reaching a higher income. Hence, this improves economic mobility. Figures 3 and 4 report the combined significance p-values by factor for the colonial and post-colonial period respectively. When the p-value drops below 10% this implies that the combined effects of that factor is significant.

We start with the time invariant factors that may block social mobility. In both periods, religion is never significant. Before independence ethnicity is only significant for the top incomes, and birthplace for the lowest income. After independence, though, both place of birth and ethnicity are only significant for the middle incomes. If we look at the time variant variables, we find that for both the colonial and post-colonial period occupation is only significant for the higher economic classes in society. Education, though, is only

Figure 3: Before independence (p-values of combined significance)

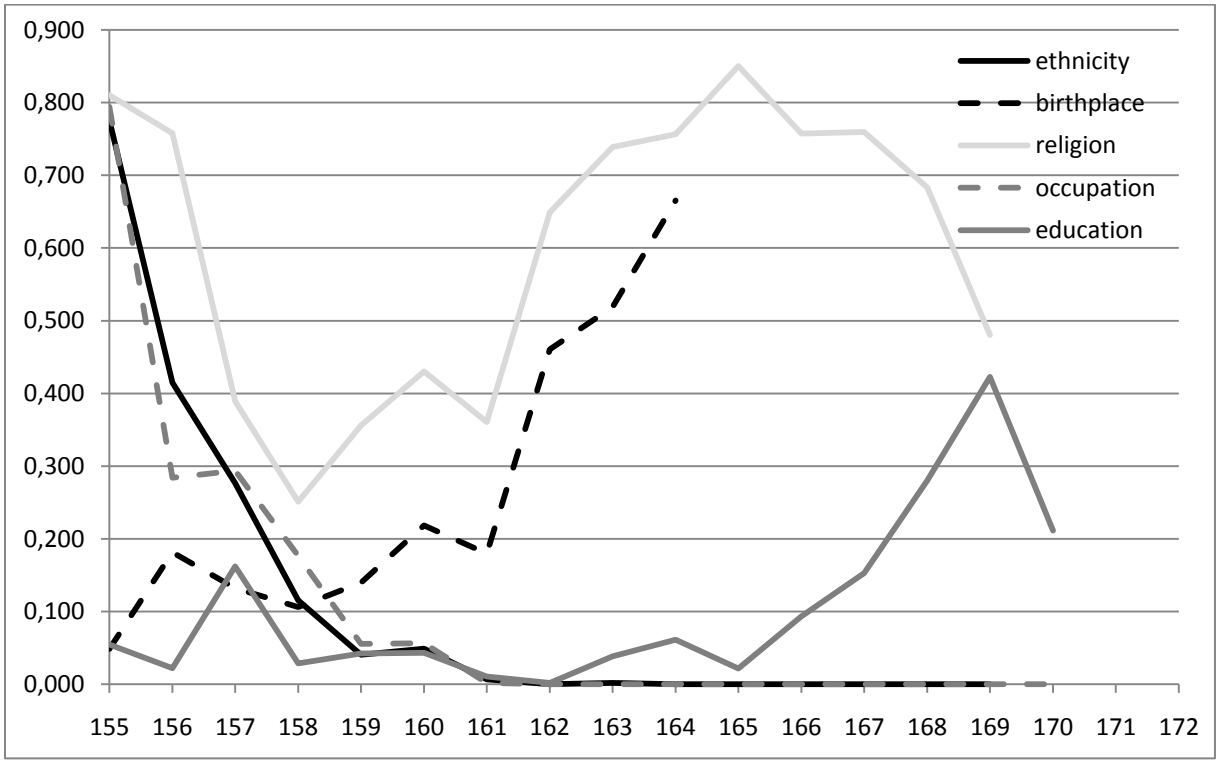
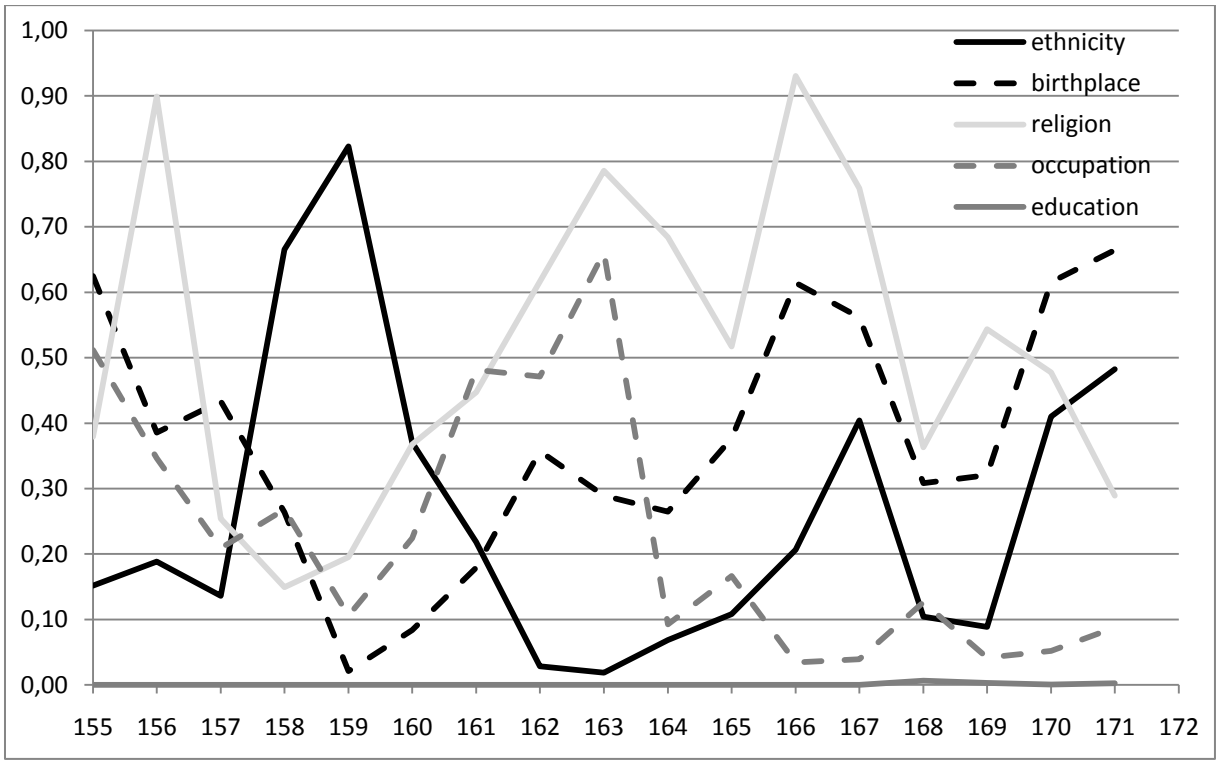


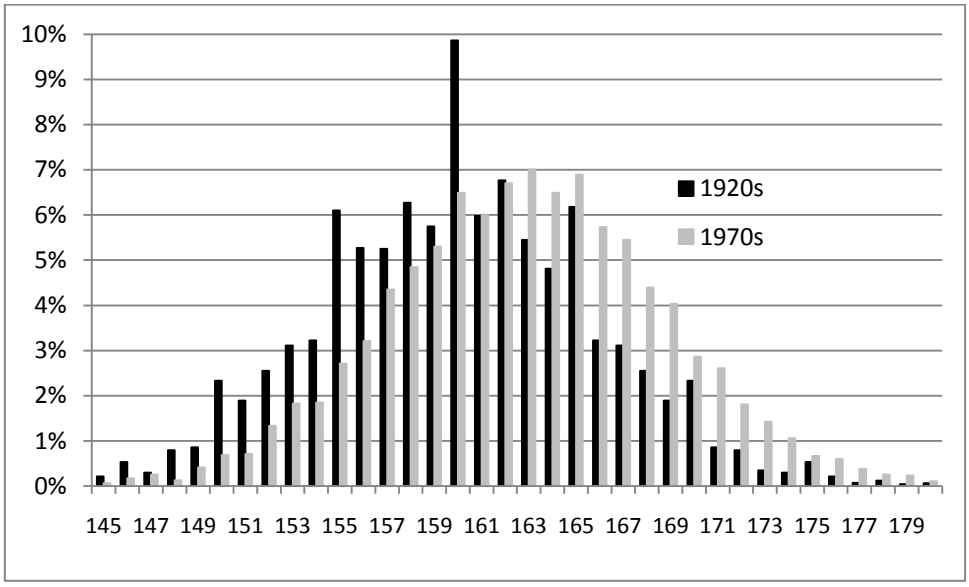
Figure 4: After independence (p-values of combined significance)



significant for the bottom income groups during the colonial period. After independence education became significant for all incomes.

In order to interpret these results, it is important to calculate what percentage of the population they affect. In order to calculate what the percentage of the population is affected by these factors, we have to estimate the distribution of heights in the colonial and post-colonial period (see figure 5). For the post-colonial period, the calculation is straightforward since we have all the data from the dataset. However, for the colonial period, our sample is weighted and truncated by height. Hence, we use the weights to calculate the population share by height. If we assume that the population distribution has a log-normal distribution, the truncated part (prior to 155 cm) is mirrored with the top shares.[10]

Figure 5: Height distribution for males in the colonial and post-colonial period



In sum, we find that the shape in both periods represent a normal distribution. Furthermore, we find that for the post-colonial period there is a shift to the right (people get taller). Using Figure 5, we can calculate what share of the population is affected by the socio-economic factors. For example, if we find that a factor is only significant for the population above 160 cm, we can calculate from Figure 5 that for the colonial period affects 45.7% and after independence 64.7% of the population.

[10] One might argue that this creates a bias when the distribution is skewed. However, Foldvari et al. (2010) showed that there is only a small difference between a normality assumption and the inclusion of a skew.

We start with migration which is not reported in above Figures since, as pointed out in the previous Section, its inclusion would halve our sample. We did run the logit regressions including migration separately, however. As pointed out in the previous Section, using our complete sample, neither migration from Java to the Outer Provinces nor vice versa had a significant effect on the total income distribution before or after independence. This changes, however, if we look at it in terms of economic position. For the colonial period, migration from Java to the Outer Province is positive (but just not significant at 10%) for the lower economic classes. For the higher classes, it is negative and significant, suggesting that any migration from Java to the Outer Provinces during the colonial period only happened by people of low economic status but that there was not a strong driving force. This is confirmed by Van Lottum and Marks (2010, 11) who show that transmigration had little explanatory power in the 1930s. Only after 1990 it became significant, but with little impact on over-all welfare. Migration from the Outer Provinces to Java is negative and significant for the lower classes, suggesting that those few who actually made the migration from the Outer Provinces to urban Java reduced their chances of increasing their economic position. This is reinforced when we include distance of migration. This is clearly negative and significant, suggesting that for the poor distance did play a role, as is also argued by Van Lottum and Marks (2010, 12). For the higher classes, though, the coefficient is positive and significant, suggesting that it were largely the people of higher economic status that moved to Java and managed to increase their economic position. In addition, the rich were also not affected by a significant effect of distance. Clearly, migratory distance is a variable that is only significant for the lower economic classes. After independence, no coefficient is significant anymore, either migration from Java to the Outer Provinces, from the Outer Provinces to Java, or distance. Clearly, this does not suggest that there is no migration, it only says that migration was unconnected with improvement in one's economic position. One possible argument is brought forward by Van Lottum and Marks who argue that markets in that period were less efficient since the effect of wage differential on migration became less important as well.

As such, after Independence, migration is clearly not a tool for improving one's economic position. Before Independence, if one were living in the Outer Provinces there was little possibility to improve your position by migration since migration was open largely for the richer and distance was an important factor. Only the richer classes in the Outer Provinces had the opportunity to improve their fate by migrating to Java.

Van Lottum and Marks argue that migration often happened only at a short distance because of cultural differences. Probably one of the most important cultural differences is religion. Most parts of the country are dominated by Muslims, but especially in Minahassa and Moluccans are Christians, while some other regions have Buddhist and Hindu populations. However, we find in above Figures that the combined effect of religion is never a strong determinant of economic position. If we look at the individual religions, we do find for the colonial period that especially Buddhists and Hindus have a higher chance of

belonging to the groups just below the absolute top incomes. The absolute top incomes were most likely filled by Europeans and was, hence, more likely to be determined by ethnicity.

No matter how marginal the effect of religion on economic position, an interesting question is what the connection is between both variables. One possible argument is that religion may have an effect on heights because of different diet. However, we find very little evidence this is the case. First, this effect only exists for those people just below the top incomes. Furthermore, it seems unlikely that only Buddhists and Hindus had different food habits. Also Baten and Blum (2010) find no evidence of the effects of country and region dummies (so also not for Hindus and/or Buddhist countries) while Guntupalli and Baten (2006, 595) find that Muslims in India are shorter than high Caste Hindu's, but taller than all other Hindu men. Finally, the effect of the Buddhist and Hindu religion on economic position disappears after independence, which makes it unlikely that these groups have a structurally different diet.

It therefore looks that before Independence Hindus and Buddhists had either middle class occupations or on average higher education than the Muslim population. Indeed, if we estimate cross effects, we find that if Buddhist or Hindus have at least primary education, the chance reduces significantly that they will end up with a low economic position. Unfortunately, no subdivision of literacy by religion is given for Indonesia. We know, though, that many Chinese were Buddhist/Confucianists and their literacy was clearly higher than that of the Indonesian, largely Muslim, population. For Hindus, we do not have specific evidence, even though, based on Indian data The 1930 Census (p. 29) it can be shown that literacy among Hindu's was indeed higher than among Muslims. The strong rise in education after independence must have removed this difference among religions. Indeed, after independence, only Catholics seem to have a bigger chance of being in the top, but that is small effect. Hence, even though religion is never a powerful determinant of economic mobility, before Independence Buddhist and Hindu men with at least primary schooling were better equipped to improve themselves economically. This effect, however, is small and disappears after Independence.

Neither religion nor migration thus seems to have a strong effect on economic mobility. However, as pointed out, this may be partly because they are correlated with either birthplace or ethnicity. Especially the role of the Europeans during the colonial period must have limited the possibilities of economic mobility for the other ethnicities. We can see in Figure 3 that before Independence birthplace and ethnicity as indicators of economic mobility show a remarkable (and opposite) pattern: where ethnicity is only significant for the top 62%, birthplace is only significant for the bottom 38%. Hence, people were either affected by ethnicity (top) or birthplace (bottom). But did independence actually lead to a society in which these time invariant blockages of economic mobility was removed? The answer is "partially". If we look at figure 4 we can see that after Independence only the

middle 52.7% of the population was affected by either birthplace or migration while the top and 12% and the bottom 34% were unaffected. A possible reason for this complete reversal of the pattern of the colonial period may be that especially the disappearance from Europeans out the top of society had a reducing effect on the role of ethnicity in the top categories. For the bottom, ethnicity had never played a role. It did not matter, and still does not matter, what your ethnicity is when you are a poor labourer. During the colonial period, however, the position of a poor lower class worker was strongly determined by his birthplace: one could not simply move from Java to the Outer Provinces if wages there were higher. Nor was there the realistic option of following education in a city far away from your home town. Clearly, this changed after independence with more integrated labour markets and increasing educational opportunities. All in all, the role of ethnicity and birthplace diminished for the top and bottom of society, but remained intact for the middle groups, possibly because these were largely self-employed and small traders. These categories of labourers had often family enterprises and as such their occupations remained longer ethnically fragmented. Also, they are stronger bound to their place of birth since that is where their business is located.

Clearly, whereas there was almost no effect of migration and religion on economic position, the over-all role of ethnicity and birthplace on economic mobility was strong before Independence. After Independence, though, the role of ethnicity and birthplace weakened, suggesting increasing opportunities for the lower economic classes to improve their position. These opportunities, though, could only be used if the lower economic classes had access to education to improve their standing and if the higher class occupations were open to lower class persons as well.

We start with education. Figure 3 and 4 show that before independence only the bottom 86.6% benefited from education, possibly because higher class jobs that required education were partly ethnically determined (e.g. Kahin 2003, 52), everyone profited after independence. As expected, because of the ethnic fragmentation during the colonial period, increased education for the lower classes did not allow you to enter the top 13.4% economic positions. The removal of the Europeans (and to a limited extent the Chinese) from these higher (government) positions meant that education also became relevant to enter economic positions of all levels. Indeed, as argued by Van Leeuwen (2007, 94-95), "[…] the increase in expenditure on education prior to 1960 was mainly caused by government expenditure. It was only after 1960 that private expenditure also started to contribute to a larger extent to the increase in overall expenditure. As private expenditure is a better reflection of the population's attitude towards education, this suggests […] that the economic benefits increased because lower class persons had access to higher skilled jobs, a situation that was less likely to occur under colonial rule where most jobs requiring high skills were filled by Europeans." Education indeed became a vehicle for economic mobility.

But the lack of ethnic barriers and the increasing importance of education to enter high class positions only have a limited effect if the choice of occupation is dependent on one's economic position. Indeed, if only low skilled, poorly paid jobs were open for children of poor parents, increases in education and reduction of ethnic barriers to economic mobility will only have had a small effect in increasing their chances for upward economic mobility. In Figures 3 and 4 we find that having certain occupations did affect the chances to move to higher paid jobs even though this effect was smaller after Independence (top 61% versus the top 45%). Especially having a job in industry and trade increased once chances for upward economic mobility. Clearly, as we have seen, during the colonial period, trade, industry and government occupations were dominated by Europeans and Chinese. After, independence, especially trade remained ethnically fragmented, as we saw above. However, the over-all effect of occupation on economic mobility became less important, possibly because of a convergence in income (income inequality decreases). Yet, this process took largely place from the 1980s onwards and is therefore a relatively recent phenomenon. Indeed, as argued by Manning (1998, 138-139) up to the 1980s "'differential between sectors remained large and surprisingly stable over time. […] [w]ages of less-educated employees were highest in the government and small enclave mining sectors and lowest in agriculture." The reason that we still find a reduction in the effect of occupation after Independence is a strong decrease in the share of low productivity agriculture (Manning 1998, 155) and the situation that a relatively large of people who were working in agriculture had industrial or service by-employment, which increased their income Van der Eng (2002, 147).

6. Conclusion

In this paper we discuss the possibility for economic mobility in Indonesia before and after independence. We find that before independence the role of ethnicity was bigger than thereafter. Religion did not affect height, while the education and occupation were significant even though their effect was smaller before than after independence. This suggests that policy was more ethnically fragmented during colonisation.

This is not the whole story, however. Even though height may be affected by ethnicity, education, and occupation, this may not be indicative of economic mobility. For example, the role of education may be highly positive and significant for the lower classes, but as long as it does not allow access to high class occupations, economic mobility is limited. Therefore, we also calculated how each factor influenced one's chance to end up in the top x% of the population in terms of height and economic position.

Calculating the effect of ethnicity on the chance to progress to the top x% of the population, we find that before independence ethnicity is significant for the top (and not the bottom). Apparently there was little difference among common labourers from any

ethnicities while one needed to be of a certain ethnicity (i.e. European or Chinese) to enter the higher positions. A related variable, birthplace, however, shows an opposite pattern: for the lowest economic classes it is significant, but not for the highest. This probably shows a lack of "movement options" for the lower classes. They remained bounded to their own region, with possibly differential incomes. This is also shown when we look at migration: only upper class persons could easily migrate without taking account of distance. After independence, though, we find that both birthplace and ethnicity are only significant for the middle classes, possibly because these were often self-employed and family enterprises and hence had closer ties with both birthplace and ethnicity.

The barriers to economic mobility such as ethnicity are thus clearly reduced (but not totally removed) after independence. However, during the post-colonial period the changing labour market structure also offered other ways to improve one's position. While before independence increasing levels of education only increased one's access to the bottom 84% economic positions, after independence education also allowed access to the top positions. Equally, having a job in industry and services increased one's chance on a top economic position both before and after independence. Yet, after independence, mean income in different occupation converged, largely because the share of people in agriculture decreased strongly while industrial and services by-employment for agricultural workers increased. This lowered the effect of occupational stratification on economic position.

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