

A Tale of Two Kuznets Curves: Inequality in the Old and New Globalizations

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Abstract: This paper suggests two versions of the cross-section Kuznets curve that are related to old and new waves of globalization. In the old wave of globalization, Europeans differentially spread around the globe. Endowments of crops and germs that resulted in a permanent European minority settlement are associated with high inequality and intermediate income. Where there was no European settlement, both inequality and income were low. Where Europeans came to constitute the overwhelming majority of the population, income was high but inequality was again low. The paper thus suggests that the variation in European settlement (which is correlated with income) provides an explanation for the cross-section Kuznets curve. European settlement is predicted well by crop endowments of different regions, mortality among the indigenous population, and mortality facing European settlers. The second version of the cross-section Kuznets curve is related to the new wave of globalization, that mostly involves trade in goods. It finds a cross-section inverted U relationship between inequality and openness to trade. The paper speculates that trade at low levels of openness involves natural resources associated with inequality, so more trade in these goods raises inequality. At higher levels of openness, trade may involve more labor-intensive manufactures and traded goods, so at higher levels, trade lowers inequality.

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Globalization is not a new phenomenon. As Lant Pritchett once said, the world has been a globe for a long time.

If globalization is the spread of people, technology, institutions, or goods from one region to another, then there are two distinct waves of globalization. The old wave of globalization was the conquest, colonization, or settlement of most of the rest of the world by Europeans after 1492 and lasting into the 20th century. The new wave of globalization is the boom in trade of goods since World War II and the entry of most societies in the world into this global trade. The old wave involved movement of people, specifically Europeans, to administer colonies or to settle. The new wave involves movements of goods in all directions, but mainly feeding the huge import demand and absorbing the export supply of the rich nations, still mainly those settled by Europeans. When we analyze the effect of globalization on inequality within countries, it is interesting to distinguish the effects of the old versus the new wave of globalization.

Both European emigration and trade in goods have an ambiguous effect on country inequality. To briefly summarize the argument of this paper, there is evidence for two different Kuznets curves corresponding to the old and new waves of globalization.

In the old wave of globalization, areas outside of Europe either wound up with (1) no permanent white settlers, (2) a minority of permanent white settlers, or (3) a majority of permanent white settlers. Regions of the world corresponding roughly to these outcomes are roughly (1) most of Africa and Asia, (2) Latin America, the Caribbean, southern Africa, and the American South, and (3) North America, Australia, and New Zealand. These three outcomes resulted in, respectively, (1) low income and low inequality, (2) middle income and high inequality, and (3) high income and low inequality. Hence, we have a Kuznets curve induced by differences across countries in the share of the European population (actually a Kuznets curve relationship between inequality and European share). These outcomes depended on historical circumstances such as pre-existing population density, crop endowments, and disease

transmission. Empirically, the Kuznets curve between income and European share in 1900 drives out the Kuznets curve in income and inequality.

Trade in the current wave of globalization also has an ambiguous effect on country inequality. Empirically, there turns out to be a Kuznets curve between inequality and openness (measured in the usual way as $(\text{Exports}+\text{Imports})/\text{GDP}$), which also drives out the usual Kuznets curve between income and inequality. The intuition behind this may be the following. If trade involves mineral exports or agricultural commodities, it is intensive in a factor – land or natural resources – that is usually unequally distributed. Many studies have drawn the link between commodity exporting and inequality.² On the other hand, if exports involve labor-intensive manufactures, it raises the returns to a factor that is mostly held by the poorest part of the population. Less open economies may mainly export commodities in which they have a strong comparative advantage, hence there may be an increasing relationship between trade and inequality at low levels of openness. As openness increases, it usually does so due to manufactures or services exports, and hence there may be a negative relationship between openness and inequality at high levels.

When the two Kuznets curves are combined in one regression for the determinants of inequality, both turn out to remain statistically significant. Both the old and the new globalizations (subject to the usual caveats about unclear causality) have something to do with the different inequality outcomes we observe today.

I. Literature Review on Old Globalization and Inequality

A standard depiction of the determinants of inequality is the Kuznets curve. The inverted U shaped relationship between inequality and per capita income is one of the most famous stylized facts in economics. An exhaustive empirical literature has generally *failed* to confirm it as a description of the time series evolution of inequality and per capita income, which was probably what Kuznets originally had in mind. However, many authors have found that the Kuznets curve

² See Easterly 2002

does seem to hold as cross-section relationship between inequality and development, which I will also confirm in this paper. For example, while Deininger and Squire 2000 argue for the use of longitudinal data, they note that “a large number of studies—Ahluwalia (1976), Papanek and Kyn (1986), Campano and Salvatore (1988), Bourguignon and Morrison (1990), Bourguignon (1994), Milanovic (1995) and Jha (1996)—have derived empirical ‘support’ for the Kuznets hypothesis using cross-country evidence.” Indeed, Deininger and Squire themselves find a cross-section Kuznets curve.³ The question then becomes what explains this empirical regularity.

I draw upon two strands of comparative economic history research to study the “old globalization” determinants of the cross-section Kuznets curve. The first by Engerman and Sokoloff (ES) (2001, 2002) and Sokoloff and Engerman (2001) discusses the different crop endowments of North and South America as an important determinant of the inequality and development outcomes. ES argues that the land endowments of Latin America and the Caribbean lent themselves to commodities featuring economies of scale and the use of slave labor (sugar cane being the classic example) and thus were historically associated with high inequality. In contrast, the endowments of North America lent themselves to commodities grown on family farms (wheat now the classic example) and thus promoted the growth of a large middle class. ES also point to extensive European immigration to North America as another factor that facilitated the emergence of a middle class, as opposed to more limited European immigration to Latin America, which meant that the original European colonizers held disproportionate wealth in a small number of families (e.g. the famous 14 families of El Salvador). ES in addition detail institutional mechanisms by which the European elite in Latin America and the Caribbean preserved their privileged position. The question then becomes what determined the differential flows of European immigration, with crop endowments again a candidate to explain the relative attractiveness of different lands to Europeans.

³ see Kanbur 2000 for another survey of the long literature, along with some doubts about using aggregate data.

The second strand of the literature, by Acemoglu, Johnson, and Robinson (2001, 2002, 2003) stresses *germs* as being important determinants of comparative colonial history. European colonialists found different disease environments around the globe. In colonies with inhospitable germs and climates, the colonial powers established extractive institutions, so that a few colonialists could exploit natural resources. In colonies with hospitable climates and germs, colonial powers established settler institutions. AJR 2002 suggest another determinant of European settlement was the existing density of indigenous population. According to this view, the institutional structures created by the colonialists in response to the environment endure even with the end of colonialism. Easterly and Levine (2003) find that geographic variables like germs and crops matter for development only insofar as they affect institutions.

In their most recent paper (AJR 2003), these authors also discuss how mortality rates among the indigenous population in response to European germs (especially smallpox and measles) affected whether the European colonists were able to establish a foothold or even replace the native population, which again affected the historical formation of institutions.

These two strands of the literature are primarily concerned with the historical determinants of good institutions, and have not applied their insights to the Kuznets curve. In this paper, I suggest a very simple extension to their analysis which helps understand the Kuznets curve for countries outside of Europe.

I hypothesize inequality has an inverted U relationship to the share of the European population in countries outside Europe (which is correlated with income). Where there are no Europeans, inequality is that for the poor indigenous population, which is typically low. Where Europeans make up an intermediate fraction of the population, the unequal income between Europeans and non-European inhabitants will drive up inequality. Where the society is made up almost entirely of European settlers, inequality is that for the European population, which is again low.

Why did European settlement differ so much in the rest of the world outside Europe as Europeans emigrated in large numbers to the rest of the world after 1500? Following the previous literature, I suggest germs and crops as part of the answer. Like AJR, I take the mortality rates facing European settlers in different parts of the world as part of the story. However, it is not the whole story, as countries in tropical Latin America and the Caribbean with high mortality rates acquired European settlers, while countries with similar mortality rates in Africa and Asia did not. Also very important was the mortality rate facing the indigenous population after European contact. European germs decimated indigenous populations in the New World and in Australia and New Zealand, destroying resistance to European settlement. There was no corresponding epidemic introduced by Europeans in Africa or Asia.

Other factors affecting European settlement was the pre-existing density and urbanization of population in the areas to be colonized. Europeans found it a lot easier to establish settlements and control sparsely populated lands without cities (such as North America or Australia) than densely populated lands with cities (such as Asia). (Although data is absent, most historians agree Africa was also more densely settled and urbanized than North America and Australia/New Zealand, although less than Asia.) AJR use data on population density and urbanization in 1500 as a proxy for per capita income in areas to be colonized, which subsequently underwent a ‘reversal of fortune.’ My approach is not inconsistent, but my emphasis is on whether conditions favored European settlement, which is what is relevant for the Kuznets curve.

As a last set of determinants, I follow Engerman and Sokoloff and stress the role of crops. Some crops like wheat were attractive to European immigrants, who could start their own family farms growing wheat. It also helped that Europeans were familiar with the technology of wheat production, while they would be unfamiliar with tropical crops. Other crops, like sugarcane, only attracted small numbers of Europeans to be the planters and managers of large sugarcane plantations (which had economies of scale because of the necessity of building a sugar mill on

each plantation).⁴ The bulk of the labor force had to perform very hard labor in sugarcane harvesting, a prospect not attractive to Europeans who had the option of family farms elsewhere. This led to the use of forced labor – African slaves – in sugarcane growing areas, as opposed to extensive European immigration.⁵

I do not address in this paper the causal links that may lie behind the Kuznets curve. The relationship between inequality and long run growth or development has been a hotly debated subject in the growth literature. Even though I am able to find some exogenous determinants of inequality, it is not clear they pass the exclusion restrictions necessary for good instruments, and they may also operate through other endogenous variables like institutions.

II. Some Illustrative Cases of Old Globalization

This section gives some country examples of the argument. West Africa was known as the White Man's Grave because of the extremely high mortality facing Europeans. Ghana is a typical example (Table 1). Population density in tropical Africa in the pre-colonial period is hard to measure precisely, but historians generally agree it was higher than North America and lower than Asia. The relative crop endowment of wheat versus sugar cane (measured as the log of $(1+\text{share of arable land suitable for wheat})/(1+\text{share of arable land suitable for sugarcane})$) did not attract European wheat-farmers. Unlike New World indigenes, Africans were not unusually susceptible to European diseases (in contrast to the isolation of the Americas, there had been enough contact across the Sahara between Europe and Africa for Africans to develop resistance to the same microbes as Europeans). All of these factors militated against any significant permanent white presence in Ghana (or the rest of tropical Africa).

India is a different case, but similar outcome for white settlement. Mortality facing European settlers was much lower than in West Africa, but still higher than in North America. However, the extremely high population density of India and lack of differential susceptibility of Indians to

⁴ Sugar cane had to be processed within days of being cut and was a bulky low value item to transport; mills had high fixed costs; hence the historical development of the plantation system to produce sugar. See Abbot 1990 and Blume 1985.

⁵ See the classic on sugar and slavery in the English Caribbean by Dunn 1972

European germs made it impossible for India to become a European settler colony. Thus India wound up without a significant European population, low income, and low inequality.

South Africa is an interesting contrast to West Africa. The low mortality rate and the wheat-type crop endowment made it very attractive to white settlers. However, the moderate population density of Africans and their resistance to germs meant that whites were destined to remain a minority in the population. South Africa wound up with a middle income level and extremely high inequality. This is directly related to the white/black income ratio, which is on the order of 10 to 1.

A borderline case was Rhodesia/Zimbabwe, in which the white settlers made up a smaller share and whites still dominate the modern sector (even despite Mugabe's actions). Inequality today is very high in Zimbabwe, although the white share has fallen since 1900.

Latin America and the Caribbean wound up with the same outcome, but by a very different route. Indigenous Americans in Brazil, Colombia, and the Dominican Republic were killed in large numbers by European germs, enabling the Iberian colonizers to gain control of the American colonies. Population density was high enough in Colombia that people of indigenous or mixed origin nevertheless survived and kept the European elite as a minority of the population. Although we don't have data for Colombia, we have data for Mexico, Peru, Bolivia, and Guatemala that shows poverty rates are much higher among indigenous populations than among non-indigenous populations (Easterly and Levine 2002).

In Brazil and the Dominican Republic, the indigenous population was less dense and was mostly wiped out. However, a large non-European population was introduced through the slave trade to work on sugarcane plantations. From Brazil, we have strong empirical evidence of income differences between whites and blacks, even allowing for the imprecision of those labels. There was also limited European immigration to the Latin American and Caribbean colonies because of the lack of temperate crops like wheat and the relatively high mortality facing European settlers (although mortality was not as high in Colombia as in Ghana because

Europeans could settle in the mountains to escape some of the lowland tropical diseases). The Spanish authorities also actually limited European immigration during colonial times, but this may be an endogenous outcome that would not have occurred if there had been a huge demand by the Spanish to emigrate to the New World.

One difference between Latin America and the southern Africa settler colonies was that the indigenous/mestizo/mulatto/black groups did not feel as strong a sense of group identity (it is not usual to talk about Latin American “apartheid”) . There has been much less political mobilization, not to mention armed insurrection, along ethnic lines in Latin America than in southern Africa (although there are occasional stirrings, as current events in Bolivia show).

Finally, in North America, all of the factors contributed to a large white majority settler community. European germs (and European warfare) nearly wiped out the indigenous population, which was sparse to begin with. The fertile soils for growing wheat and other temperate crops attracted large numbers of white family farmers. The temperate climate also meant that the mortality rate facing European settlers was low. In the United States, only the introduction of African slavery kept whites from being nearly 100 percent of the population.

The American South presents an interesting intra-country exception of lower white share and higher inequality. The black-white income differences in the US are well known (blacks earn about 60 percent of whites), so racial composition in different counties of the US will be associated with inequality. Crops were an important part of the story, as crops like cotton and sugarcane were conducive to slavery in regions of the US where those crops predominated, whereas a crop like wheat was not associated with slavery. I will consider this variation econometrically below.

In Canada and Australia, the absence of slavery, the decimation of the sparse indigenous population, land suitable for wheat cultivation, and low mortality rates facing European settlers made for a nearly all white population. The outcome was low inequality and high income.

Table 1: Crops, Germs, and Settlers: Implications for Inequality in Selected Cases

case	GDP per capita, average 1960-2000	Settler mortality per 1000 population, 18 th & 19 th century	Population density, 1500	Urbanization, 1500	Share of European population in 1900	Decimated by European diseases	Adjusted Gini coefficient, 1960-2000	Adjusted share of top quintile in income, 1960-2000	Log differential suitable wheat to sugar acreage, 1999
LOW INEQUALITY, LOW INCOME, NO EUROPEAN SETTLEMENT									
<i>High settler mortality, intermediate population density, low indigenous mortality, low wheat/sugar ratio</i>									
Ghana	884	668	intermediate	intermediate	0	no	35.2	41.4	-0.008
<i>Intermediate settler mortality, high population density, low indigenous mortality, low wheat sugar ratio</i>									
India	937	49	23.807	8.5	0	no	34.4	38.9	-0.004
HIGH INEQUALITY, MIDDLE INCOME, EUROPEAN MINORITY									
<i>Low settler mortality, intermediate population density, low indigenous mortality, high wheat/sugar ratio</i>									
Rhodesia/ Zimbabwe	1182	15	Intermediate	intermediate	7	no	58.7	62.1	0.008
South Africa	2900	15	Intermediate	intermediate	22	no	60.5	62.3	0.109
<i>Intermediate settler mortality, intermediate population density, high indigenous mortality, low wheat/sugar ratio</i>									
Brazil	3664	71	0.119	0	40	yes	56.6	61.8	-0.049
Colombia	2752	71	0.961	7.9	20	yes	50.5	55.1	-0.095
Dominican Republic	2382	130	1.462	3	25	yes	47.9	51.9	-0.218
LOW INEQUALITY, HIGH INCOME, EUROPEAN MAJORITY									
<i>Cases: Low settler mortality, low population density, high indigenous mortality, high wheat/sugar land ratio</i>									
Australia	13661	9	0.026	0	98	yes	38.0	42.7	0.135
Canada	14106	16	0.022	0	99	yes	33.2	39.4	0.102
USA	15140	15	0.087	0	88	yes	38.2	43.3	0.383

Another interesting set of cases are those regions that did NOT acquire significant white settlers.

For instance, AJR note that the Pilgrims decided to settle in the American colonies instead of

Guyana partially because of the high mortality rates in Guyana. Similarly, Sokoloff and

Engermann 2000 note that a Puritan colony on Providence Island off the coast of Nicaragua did

not last long.⁶ It is interesting that there was substantial white settlement in Kenya, Angola, and

⁶ These examples are taken from Easterly and Levine 2003.

Mozambique during their respective colonial periods. None of these settlements survived the onset of independence, as white settlers had not reached a critical mass whereby they could establish economically and politically powerful elites in the new states. (It is interesting that in some cases where whites were expelled or fled, the mixed race population formed a new elite, as in Angola or Haiti.) The higher mortality, less attractive crops, and density and disease resistance of the indigenous population in Kenya, Angola, and Mozambique kept the European numbers low relative to the total population.

III. The Econometrics of Old Globalization

This section performs econometric testing of the hypothesis of the hypothesis advocated above. The data for inequality comes from the large data set assembled by WIDER (2002). This dataset builds on the earlier collection of Deininger and Squire (1999), much of which is now reported in the World Development Indicators (2003). I use two measures of inequality from the WIDER dataset: the Gini coefficient and the share of the top quintile.

The cross-country inequality data have been criticized by Atkinson and Brandolini (2001) as being inconsistent across countries in methodology and sample universe. The WIDER dataset has the advantage that it clearly records whether the income distribution statistics refer to earnings, income, or expenditure. For income, they record whether it is gross income or net income. I use these classifications to adjust measures of inequality with estimated dummy variables for each category of survey methodology. I then subtract the coefficients on the dummies from the Gini coefficient or the top quintile share to adjust all statistics to their gross income equivalent. This procedure is far from perfect, as Atkinson and Brandolini (2001) point out, but it makes the best of a bad data situation. I then average whatever Gini coefficients (or top quintile shares) are available from 1960 to 2000 (most of them in the last two decades) to get one cross-section observation per country.

The data on per capita income come from Summers and Heston as updated through 2000 by the Global Development Network Growth Database (2003). The data on the share of whites

(people of European origin) in 1900 comes from AJR. I check it against the recent collection of ethnic data by Alesina et al. (2003) and find the series comparable (correlation coefficient of .86). Still this data has to be taken with some serious caveats. The ethnic classification of who is “white” is far from ironclad. In Latin America particularly, the distinction between white, mestizo, mulatto, black, indio, etc. is often fuzzy. However, the existence of a long-lasting elite of European origin is not really disputed.

The first regression in Table 2 shows how the Gini coefficient follows a Kuznets curve with no other controls, in the cross country sample of countries outside Europe (excluding Communist or ex-Communist countries, whose inequality is systemically low). Income and income squared are strongly significant, although the R-squared is low (obviously there is more to inequality and development than just the Kuznets curve). The turning point is \$1343.

The dataset from the World Development Indicators also displays a strong cross-section Kuznets curve, as does the original Deininger and Squire dataset (results not shown). The Luxembourg Income Survey (the favored dataset of Atkinson and Brandolini) does not display any relationship between inequality and income, but that does not contradict the message of this paper since the LIS sample is mostly developed countries made up of Europeans.

The next regression shows the alternative of using the European share and its square as determinants of the Gini coefficient. There is a Kuznets curve in European share, which actually fits the data better than the income Kuznets curve (the R-squared doubles, although it is still low).

When both income and European share are entered, the share of the white population in 1900 and its square drives out the significance of the income and income squared terms. There is now a Kuznets curve in the white share, with a turning point of around 40 percent white. The white share is correlated with income (correlation coefficient = .55 in the non-socialist, non-Europe sample).

The bottom part of Table 2 does the same regressions for the share of the top quintile in income. Again income and income squared show a Kuznets curve for inequality, with a turning

point at per capita income of \$1381. The white share and its square are highly significant when entered instead, and they drive out income and income squared when entered at the same time.

Table 2: Regression with robust standard errors

		Constant	lgdppc	lgdppc squared	European 1900	European 1900 squared	Number of obs	R-squared	Turning point for per capita income	Turning point for European share
Dependent variable: Gini Coefficient averaged over 1960-2000										
Regression 1	coefficient	-43.814	25.360	-1.760			79	0.085	1343	
	<i>std. error</i>	50.400	12.826	0.805						
	<i>t-stat</i>	-0.870	1.980	-2.190						
	<i>p-value</i>	0.387	0.052	0.032						
Regression 2	coefficient	44.087			33.577	-45.476	64	0.173		0.369
	<i>std. error</i>	1.670			10.464	10.087				
	<i>t-stat</i>	26.400			3.210	-4.510				
	<i>p-value</i>	0.000			0.002	0.000				
Regression 3	coefficient	81.620	-8.034	0.390	40.978	-49.464	62	0.197	wrong signs	0.414
	<i>std. error</i>	77.073	19.734	1.231	15.598	15.431				
	<i>t-stat</i>	1.060	-0.410	0.320	2.630	-3.210				
	<i>p-value</i>	0.294	0.685	0.752	0.011	0.002				
Dependent variable: share of top quintile in income, averaged over 1960-2000										
Regression 1	coefficient	-59.422	30.796	-2.130			79	0.121	1381	
	<i>std. error</i>	49.020	12.668	0.811						
	<i>t-stat</i>	-1.210	2.430	-2.630						
	<i>p-value</i>	0.229	0.017	0.010						
Regression 2	coefficient	48.206			32.047	-42.216	64	0.156		0.380
	<i>std. error</i>	1.541			9.019	8.630				
	<i>t-stat</i>	31.290			3.550	-4.890				
	<i>p-value</i>	0.000			0.001	0.000				
Regression 3	coefficient	3.711	14.860	-1.190	39.004	-38.028	62	0.233	516	0.513
	<i>std. error</i>	82.221	22.113	1.480	14.640	13.801				
	<i>t-stat</i>	0.050	0.670	-0.800	2.660	-2.760				
	<i>p-value</i>	0.964	0.504	0.425	0.010	0.008				

Note: European and Communist or ex-Communist Countries Excluded from Database

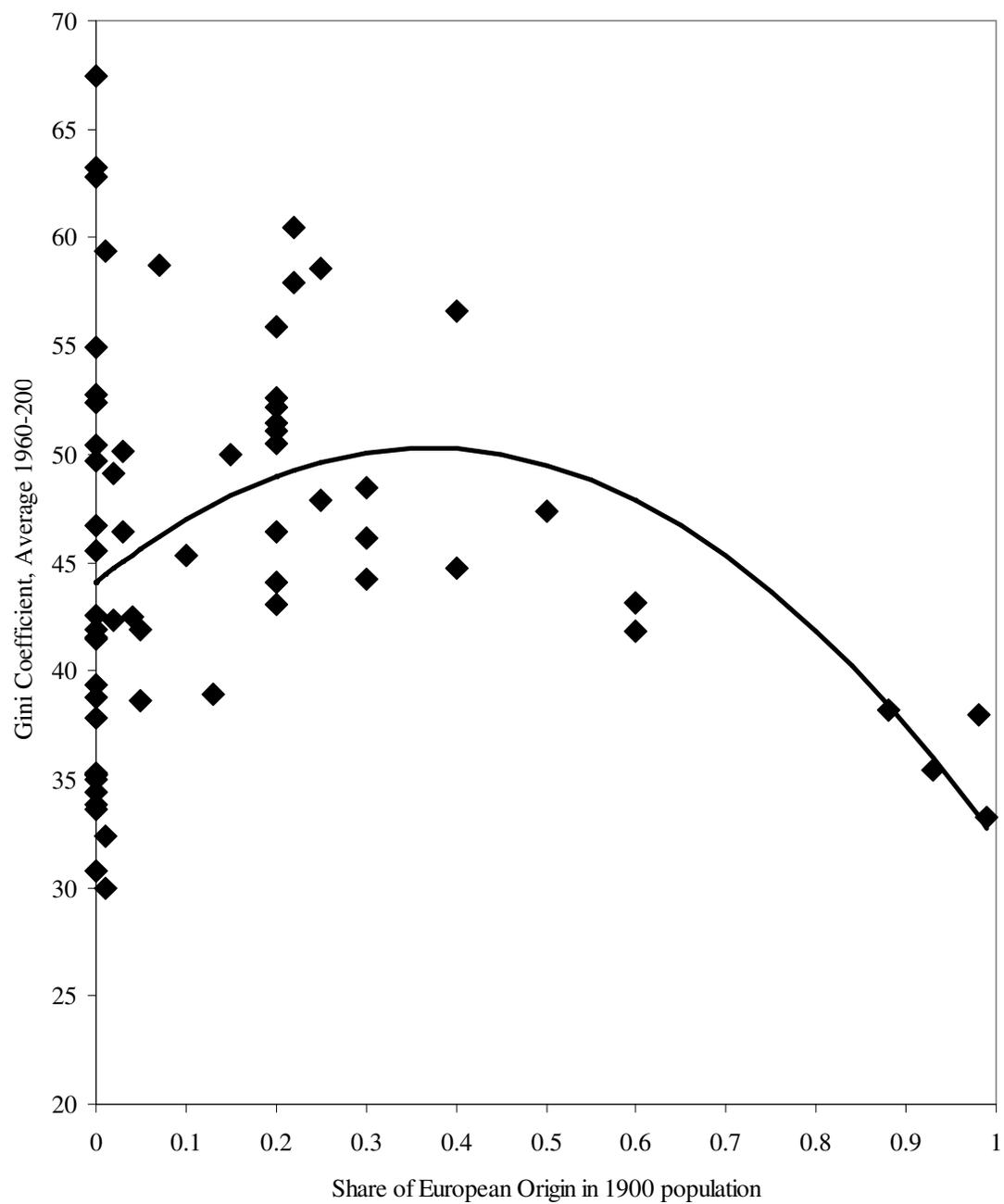
Figure 1: The Kuznets curve in the Gini coefficient and white share

Table 3 shows results on the determinants of the share of Europeans in the population, testing the hypotheses advanced in the case study section. The datasets here are unfortunately quite small. The data on acreage suitable for wheat and sugar cultivation, as a percent of total arable land, comes from FAO (1999). The variable is defined as $\text{Log} [(1+\text{proportion of land suitable for wheat})/(1+\text{proportion of land suitable for sugarcane})]$. This data is consistent with historical patterns of crop production. Mitchell (1988) has historical data on acreage sown in different crops for most of the 20th century, before the agriculture sector diminished in importance in some economies. The same relative measure of acreage sown in wheat to acreage sown in sugar can be calculated for 1920 for 27 countries (except using actual acreage instead of acreage estimated to be suitable). The correlation with the same measure for 1999 is .57 and is highly significant.

The variable *distequat* measures the distance of the country from the equator as a zero to one measure (latitude of 45 degrees implies *distequat*=.5). This variable is included as a control to test whether the other variables are picking up tropical location

The estimated rate of indigenous mortality as a result of European germs is taken from McEvedy and Jones (1978), the same source used by AJR for population density. I take the population change from 1500 to 1600 as an indicator of indigenous mortality. Since Europeans make up a trivial part of the population still in 1600, this is a reasonable indicator of the decline in indigenous populations. For the colonies in which Europeans settled later, Australia, New Zealand, the United States and Canada, I take the change in indigenous population from 1500 to 1900. Here McEvedy and Jones (1978) do estimate directly the indigenous population.⁷

Naturally these numbers are based on fragmentary evidence and are subject to a high degree of error. Nevertheless, the historical record abundantly documents this high mortality throughout these areas. Ramnofsky (1992) documents the mortality in the Southeastern United States after the expedition of Hernando de Soto (1538-1541) introduced smallpox and measles to the area.

⁷ They omitted an estimate of the indigenous population of the United States in 1900, which I got from the Bureau of the Census, Historical Statistics of the United States.

The number of native towns, based on archaeological evidence, dropped from 50 in the lower Mississippi valley between 1450 and 1550 to 10 in 1600. A similar decline was recorded in villages of the interior Southeast. On the island of Hispaniola, estimates of the native Taino population in 1500 range from 400,000 to 2 million. By 1518, after European germs and Spanish mistreatment of the population, there were only 16,000 Tainos remaining (Keegan 1992). There is the well-known story of the epidemic among the Aztecs that weakened their resistance against Cortés and his small band of Spanish conquistadores.

Cotton Mather likewise attributed the success of Europeans in Massachusetts to an epidemic that swept New England in 1616-1617 *before* the Pilgrims landed, with germs introduced by pre-Pilgrim European explorers. The European settlers of Roanoke Island, who paved the way for the first successful American colony at Jamestown, noted that when they visited an Indian town, “with a few dayes after our departure...that people began to die very fast, and many in short space” (Crosby 1972). Francis Parkman’s classic history of French Canada noted the complete disappearance of Indian tribes from one wave of French explorers to the next.

The indigenous mortality from the introduction of European diseases is only positive for most of the countries of the New World, Australia, and New Zealand. Of course, there are many other differences between the Americas, Australia, and New Zealand, on one hand, and Africa and Asia, on the other hand. The variable could be proxying for these other differences. Still, the decimation of the indigenous population in the New World, Australia, and New Zealand is arguably one of the most important differences from Africa and Asia (Diamond 1997 argued for differential responses to germs as one of the most important forces in history). There is also some explanatory power from variations in indigenous mortality within the set of positive mortality countries.

The data on the mortality rates facing European settlers in the 18th and 19th century and the population density and urbanization ratios in 1500 are taken from AJR (2001, 2002). It goes without saying, as AJR acknowledge, that these data should be interpreted with even more than

the usual caution attached to cross country data. In reviewing the data in the sources used by AJR, I have found a number of questionable entries, but I am using their data in the present version under the assumption that errors are random.

In the larger sample that excludes the measures of population density and urbanization, the wheat-sugar crop acreage differential, the indigenous mortality rate, and the European settler mortality rate are all significant with the predicted signs. The distance from equator is entered as a check to see whether these variables are simply picking up tropical latitude, but this variable is insignificant. Countries with a high proportion of land suitable for wheat as opposed to sugarcane, a high mortality rate among the indigenous population from European germs, and a low mortality rate facing European settlers have a high share of people of European origin today.

The measures of population density or urbanization in 1500, when included one at a time, are highly significant. The pre-existing population density or urbanization is apparently a good measure of the resistance to European settlement, influencing importantly the outcome. Unfortunately, this variable is only available for a small sample that limits its usefulness in this study.

The settler mortality variable is no longer significant when population density or urbanization are included. Indigenous mortality is always significant, and the latitude variable is never significant. The crops variable – the relative measure of acreage suitable for wheat to acreage suitable for sugarcane -- is always significant. The hypothesis that European settlers were attracted by particular crop endowments –like land suitable for growing wheat – and not by other crop endowments –like sugarcane -- receives strong support from the regressions. The R-squareds in Table 3 are quite high, suggesting all of these factors combined have considerable explanatory power for where Europeans settled outside of Europe.

Table 3: Regression with robust standard errors for share of Europeans in 1900

		constant	log wheat sugar suitable acreage differential	log settler mortality, 19th century	indigenous mortality rate, 1500- 1900	distance from equator	log population density 1500	urban share, 1500	Number of obs	R- squared
Regression 1	coefficient	0.277	0.608	-0.049	0.504	0.324			54	0.713
	std. error	0.105	0.174	0.017	0.124	0.241				
	t-stat	2.630	3.490	-2.950	4.060	1.350				
	p-value	0.011	0.001	0.005	0.000	0.184				
Regression 2	coefficient	0.341	0.351	-0.047	0.252	0.398	-0.087		32	0.882
	std. error	0.237	0.136	0.048	0.082	0.226	0.012			
	t-stat	1.440	2.580	-0.970	3.080	1.760	-7.470			
	p-value	0.163	0.016	0.339	0.005	0.091	0.000			
Regression 3	coefficient	0.618	0.548	-0.092	0.379	0.188		-0.015	32	0.732
	std. error	0.274	0.199	0.056	0.125	0.304		0.007		
	t-stat	2.250	2.750	-1.650	3.040	0.620		-2.170		
	p-value	0.033	0.011	0.110	0.005	0.542		0.040		

IV. *Crops, Whites, and Inequality in US data*

This study also assembled a dataset on crop production in US counties. The crop variables are dummy variables that take on the value 1 if any of the crop is produced in the county, and zero otherwise. The objective is to see if the pattern of particular crop endowments affecting inequality and income in a way that produces the Kuznets curve with US data. The data on inequality, per capita income and white and black composition is from US census data from the 2000 census for 3,395 US counties.

The first fact is that there is no inverted U relationship between inequality (measured by the log of the ratio of the mean income to the median income) and per capita income. Perhaps the US lacks counties poor enough or nonwhite enough to produce the upward sloping portion of the Kuznets curve. Table 5 shows strong evidence of a downward sloping relationship between income and inequality over the entire sample (although a quadratic term -- not shown-- indicates some bottoming out of the relationship at very high income).

The next section of Table 5 shows the role of crops in explaining this negative relationship between income per capita and inequality. I use as the inequality measure the only one that can be constructed from the census data – the ratio of mean to median income. The crops historically associated with slavery – rice, sugar, and cotton – continue to be associated with high inequality today.⁸ The crop historically associated with family farms, free labor, and attracting European immigrants – wheat – has a strong negative effect on inequality. European immigrants went overwhelmingly to the North, both before and after the civil war (a typical example is the Scandinavians migrating to the prime wheat producing areas of the northern Great Plains).

The areas featuring rice, sugar, and cotton are also the poorer areas of the US. No doubt this is part of the legacy of low human capital among the former slaves, explained in part by the poor institutions through which whites repressed black political voice and education.

⁸ Engerman and Sokoloff make this association between these crops and slavery in the US. Rice and cotton do not appear to be associated with slavery or inequality elsewhere in the world.

Table 6 shows the response of the white share and black share to the crop endowments of US counties (I show both regressions because significant proportions of other ethnic groups in the US prevent white and black shares from being tautologically related). The regression strongly confirms that wheat production is associated with high white settlement, while cotton, rice, and sugar continue to be associated with black settlement – presumably reflecting the legacy of slavery.

The American South is yet another case where a white elite (albeit not as small a minority as in Latin America, the Caribbean, and South Africa) is associated with low average income and high inequality. The legacy of slavery and Jim Crow continues to show up in the US data today.

Table 5: Regressions for inequality and per capita income on crop dummies in US county data

	Regression for log of mean to median on per capita income		Regression for log of mean to median on crops		Regression for log of per capita income on crops	
	Coef.	t-stat	Coef.	t-stat	Coef.	t-stat
log per capita income	-0.1676	-15.45				
cotton dummy			0.0823	17.79	-0.1158	-12.85
wheat dummy			-0.0359	-11.29	-0.0044	-0.59
rice dummy			0.0643	6.86	-0.0730	-3.95
sugar dummy			0.0335	2.45	-0.1035	-2.60
cons	1.8638	17.6	0.2380	88.03	9.7646	1620.61
R-squared	0.1428		0.1429		0.0504	
Number of observations	3395		3395		3395	

T-stats calculated using robust standard errors

Table 6: Regression across counties in the US (2000 census) for white and black shares as a function of crop endowments

	Regression for white share of population		Regression for black share of population	
	Coef.	t-stat	Coef.	t-stat
cotton dummy	-0.1878	-23.48	0.1701	18.3
wheat dummy	0.0260	4.78	-0.0352	-8.03
rice dummy	-0.0716	-3.93	0.0840	4.07
sugar dummy	-0.1257	-3.88	0.0914	2.82
_cons	0.8615	194.26	0.0742	20.13
R-squared	0.1767		0.2127	
Number of obs	3395		3395	

Regression run with robust standard errors

IV. Does historical inequality perpetuate itself?

A key question is whether inequality perpetuates itself across time, implying the effect of old globalization on inequality still matters today. There is unfortunately little data on inequality in the white minority or settler colonies, but we do have some qualitative case studies and anecdotes. Engerman and Sokoloff stressed the white elite's manipulation of institutions to maintain their dominant position and income share in Latin America. In countries like Mexico, Chile, and Peru up through the early 20th century, land was redistributed away from indigenous populations towards a small group of white landowners who controlled legal institutions. In Mexico in 1910, 2.4 percent of household heads owned land (compared to about 75 percent of farmers in the US around the same time).⁹ The favoritism towards the elite also showed up in Latin American laws regulating establishment of corporations, financial institutions, patents, and industrial policies. Grants of new charters for banks and corporations were controlled in favor of insiders in Latin America. Patent fees in the late 19th century in Brazil, British Guiana (today's Guyana), Mexico, and Peru were over \$400 (Khan and Sokoloff 2002), which is between 2.5 and 9.5 times their annual per capita incomes in contemporaneous dollars. In contrast, North America adopted earlier a broad franchise for voting, equal protection before the law, widespread distribution of public lands and mineral rights, cheap patent fees (\$35 in US in the late 19th century), relatively easy entry for new banks and corporations, and a big government push on schooling. The work of ES follows a long history literature that postulates domination by the elite white owners of *encomiendas* (land grants from the crown accompanied by feudal rights over the indigenous population) as the "original sin" of Latin American underdevelopment (Chasteen 2000).¹⁰

ES suggest that the elite in Latin America opposed democracy and mass investment in human capital because they were afraid of the poor majority gaining power (people with more

⁹ Correspondence with Kenneth Sokoloff.

¹⁰ This section is based on a similar description in Easterly and Levine 2003.

human capital are more politically active). Bourguignon and Verdier 2000 have a theoretical model with the same prediction. The elite feared in particular that the majority would use power to redistribute income and rents away from the elite towards the majority.

An example of inequality repressing broad-based development and perpetuating itself is the Mexican state of Chiapas, where the Zapatista rebellion that broke out on January 1, 1994 was only the latest installment in a long-running conflict between landowners and peasants. The Governor of Chiapas, Absalón Castellanos Domínguez, said in 1982 “We have no middle class; there are the rich, who are very rich, and the poor, who are very poor.” The quote by Castellanos summarizes the income distribution in Chiapas, which has an ethnic dimension since the upper class are white and the poor majority are Mayan indigenous peoples. The quote is all the more poignant since Castellanos himself belonged to an old and wealthy landowning family and, as a military man, was involved in an army massacre of peasants in 1980.¹¹ Landowners run coffee, cotton, and sugar plantations with peasant labor. Many observers have noted the “sordid association” among landowners and their *pistoleros*, party bosses, the army, and the police, all of whom agree on the use of force to repress peasant rights (for example, depriving peasants of land to which they are legally entitled). Amnesty International noted “a pattern of apparently deliberate political killings” of supporters and leaders of independent peasant organizations. At one point, four successive leaders of the peasant organization *Casa del Pueblo* were assassinated.

In the Northeast of Brazil, a centuries-old sugarcane industry was associated with high inequality, low human capital, poor institutions, and general underdevelopment (the “major underdeveloped region in the Western Hemisphere.”) The sugarcane plantation (including the all important sugar mill) was owned by Europeans. The labor force consisted of African slaves; after emancipation in 1888, the labor force has consisted of their descendants. The landowners supported professional and agricultural schools but opposed mass education. As late as 1960, three-fourths of the adult population of the Northeast was illiterate and less than 3 percent

¹¹ p. 246-247, Benjamin 1996.

finished primary school. Populist politicians came to power in the Northeast in the early 60s, but their redistributive measures were reversed after Brazil's military coup in 1964.¹² The backwardness of the Northeast has proven resistant to aid programs by both the Brazilian government and outside agencies like the World Bank, which has funded development programs in the Northeast since the 1970s. A 1997 World Bank review noted that development programs in the Northeast were "unable to achieve their original objectives."¹³ As of the most recent studies, the poverty rate in Northeast is more than 5 times that in Sao Paulo (Fiess and Verner 2001).

The most obvious example of a white minority adopting institutions that did not promote widely shared development is the apartheid system in South Africa. This example is so well known that little needs to be said – apartheid denied blacks voting rights, violently repressed political activism by the black majority, and denied black Africans the right to own land in some of the more fertile regions of the country, perpetuating inequality.

Little likewise needs to be said about the American version of apartheid in the Jim Crow years in the South (not to mention the antebellum slavery regime). The white elite took away from blacks the right to vote as well as security of property and person, along with consigning them to inferior schools and other public services.

V. *New globalization: is there a trade and inequality Kuznets curve?*

Trade in the current wave of globalization also has an ambiguous effect on country inequality. Empirically, there turns out to be a Kuznets curve between inequality and openness (measured in the usual way as $(\text{Exports} + \text{Imports}) / \text{GDP}$), which also drives out the usual Kuznets curve between income and inequality. The intuition behind this may be the following. If trade involves mineral exports or agricultural commodities, it is intensive in a factor – land or natural resources – that is usually unequally distributed. Many studies have drawn the link between commodity exporting and inequality. On the other hand, if exports involve labor-intensive

¹² This description and the quote are from Taylor 1978.

¹³ World Bank, Implementation Completion Report, Northeast Rural Development Program, 1997 (Report No. 16765)

manufactures, it raises the returns to a factor that is mostly held by the poorest part of the population. Less open economies may mainly export commodities in which they have a strong comparative advantage, hence there may be an increasing relationship between trade and inequality at low levels of openness. As openness increases, it usually does so due to manufactures or services exports, and hence there may be a negative relationship between openness and inequality at high levels.

Of course, it would be desirable to investigate this supposition in more detail by getting direct data on the composition of trade at different openness levels and seeing if primary exports and manufactures/services vary with openness in a way consistent with the speculation above. It also would be interesting to test primary exports and manufacturing/services exports separately in the regression. Some preliminary attempts to enter dummies for primary exporting countries did not find any clear results – the primary export dummy was not significant, while the inverted U in trade share remained significant. I will investigate this more in future research.

The inverted U in trade share remains significant when income and income squared are entered in the inequality equation. The latter terms are not significant.

When I enter both the “old globalization” Kuznets curve and the “new globalization” Kuznets curve, both are significant. That is, the terms European share, European share squared, Trade share, and trade share squared are all individually significant. There is an inverted U relationship BOTH between inequality and European share and between inequality and trade share, controlling for the other inverted U. The Kuznets curve in trade share remains significant when I drop 4 extremely high openness observations above 125 percent of GDP (Hong Kong and Singapore are the most extreme, with very high trade share and low inequality).

Table 7: Regression of Inequality on trade share and other determinants with robust standard errors (all regressions exclude European and Socialist countries)

		constant	tradedgp	tradedgp ^2	lgdppc	lgdppc ^2	europa share 1900	europa share 1900 ^2	Number of obs	R- squared	Turning point for trade share	Turning point for income/ European share
Dependent variable: Gini Coefficient												
Regression 1												
1	coefficient	40.071	0.120	-0.0004					84	0.070	151	
	<i>std. error</i>	2.252	0.043	0.000								
	<i>t-stat</i>	17.790	2.790	-3.250								
	<i>p-value</i>	0.000	0.007	0.002								
Regression 2												
2	coefficient	-19.195	0.100	-0.0003	17.939	-1.299			79	0.132	171	999
	<i>std. error</i>	51.329	0.047	0.000	13.273	0.835						
	<i>t-stat</i>	-0.370	2.140	-2.220	1.350	-1.550						
	<i>p-value</i>	0.710	0.036	0.029	0.181	0.124						
Regression 3												
3	coefficient	39.518	0.105	-0.0004			33.985	-44.458	64	0.223	145	0.382
	<i>std. error</i>	2.893	0.049	0.000			10.625	10.321				
	<i>t-stat</i>	13.660	2.150	-2.620			3.200	-4.310				
	<i>p-value</i>	0.000	0.036	0.011			0.002	0.000				
Regression 4												
4	coefficient	33.159	0.336	-0.0021			34.513	-44.534	60	0.246	81	0.387
	<i>std. error</i>	4.126	0.141	0.001			10.854	10.914				
	<i>t-stat</i>	8.040	2.380	-1.970			3.180	-4.080				
	<i>p-value</i>	0.000	0.021	0.053			0.002	0.000				
Dependent variable: Income share of top quintile												
Regression 1												
1	coefficient	44.515	0.145	-0.0007					83	0.214	107	
	<i>std. error</i>	1.974	0.039	0.000								
	<i>t-stat</i>	22.550	3.720	-6.180								
	<i>p-value</i>	0.000	0.000	0.000								
Regression 2												
2	coefficient	-22.850	0.129	-0.0006	19.499	-1.369			79	0.270	110	1236
	<i>std. error</i>	46.927	0.044	0.000	12.122	0.760						
	<i>t-stat</i>	-0.490	2.960	-4.690	1.610	-1.800						
	<i>p-value</i>	0.628	0.004	0.000	0.112	0.075						
Regression 3												
3	coefficient	43.725	0.137	-0.0007			30.680	-40.345	64	0.413	103	0.380
	<i>std. error</i>	2.405	0.043	0.000			9.079	8.957				
	<i>t-stat</i>	18.180	3.170	-5.620			3.380	-4.500				
	<i>p-value</i>	0.000	0.002	0.000			0.001	0.000				
Regression 4												
4	coefficient	40.562	0.255	-0.0016			31.0522	-40.588	60	0.264	82	0.383
	<i>std. error</i>	3.742	0.125	0.001			9.28476	9.368				
	<i>t-stat</i>	10.840	2.050	-1.740			3.340	-4.330				
	<i>p-value</i>	0.000	0.045	0.087			0.001	0.000				

Note: tradedgp constrained < 125

Note: tradedgp constrained < 125

VI. Conclusions

One of the dominant forces of modern history is the migration of Europeans to areas outside Europe. One of the dominant forces in today's global economy is the boom in world trade since World War II. Both old and new globalizations have had consequences for country inequality. One of the daunting obstacles today to the successful spread of free markets and development is the high inequality of some developing countries, where the majority feels that "all the gains go to the rich."

This paper of course does not argue for an explanation of inequality by old and new globalizations alone. There are many cases of non-European elites in developing countries associated with high inequality. The success of East Asia in attaining high income with low inequality is not explained by the story about European settlement in this paper, although the high openness of East Asia could be an important factor. But then there is also more going on with inequality than trade. This paper does not intend to be an exhaustive depiction of cross-country differences in inequality. What it does show is that the half - century- old Kuznets curve is alive and well in the cross-section data, and this paper suggests two important factors from globalization contributing to this robust stylized fact.

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