September 2002
First draft

The Ricardian Vice:

Why Sala-i-Martin's calculations of world income inequality cannot be right [1]

Branko Milanovic[2]
Development Research Group
World Bank, Washington

ABSTRACT

This note discusses recent world income inequality calculations by Sala-i-Martin. It shows that the two main problems with which the author had to grapple (too few data to derive countries' income distributions, and sparseness of even such data in time) are not solved in a satisfactory fashion. They, and several other simplifying assumptions, make Sala-i-Martin results very dubious. We argue that Sala-i-Martin has ended up by producing a population-weighted inter-national distribution of income augmented by a constant shift parameter and not a distribution of income among world citizens.

[1] The two papers discussed here are: "The disturbing 'rise' in global income inequality" (version March 12, 2001) called here Paper No. 1, and "The world distribution of income (estimated from individual country distributions" (version May 1, 2002), called here Paper No. 2. Both papers can be downloaded from http://www.columbia.edu/~xs23/home.html.

[2] I am grateful to Prem Sangraula for excellent research assistance. The views expressed in the paper are author's own, and should not be attributed to the World Bank, or its affiliated organizations.

1. Different types of inter-national inequality

It has been well known for some time that inter-national inequality displays two contradictory features depending on whether we use population-weighted data or nor. As Figure 1 shows, if we use GDPs per capita with weights being the same for each country (Concept 1 inequality), there is a clear divergence in world incomes during the last twenty years. That divergence has been noticed by many researchers, and some like Mukand and Rodrik (2002) have wondered how to reconcile this divergence in outcomes with an apparent convergence in economic policy. But if we use another concept of inter-national inequality (Concept 2 inequality) where GDPs per capita are weighted by population sizes, inter-national inequality is displaying an exactly opposite pattern: it has been decreasing during the last twenty years. This too has been noticed by researchers including myself (Milanovic, 2002a), but prior to that by Melchior, Telle and Wiig (2000), Schultz (1998) etc.

Two points have not been widely appreciated though. First, that the decline in Concept 2 inequality over the last 20 years in entirely explained by China. As Figure 2 shows, once China is excluded, there is no decline—rather a mild increase. [3] Second, that this concept is only an approximation to what we would ideally like to measure, namely inequality across all individuals in the world. In concept 2 inequality, we, of course, assign to each Chinese the mean income of China, and to each American the mean income of the US. The ranking criterion in both Concept 1 and Concept 2 is GDP per capita: *nations* (not individuals!) are ranked by their GDP per capita. It is only seemingly that we include the 1.2 billion Chinese and the 300 million Americans. The within-country inequality is entirely ignored.

[3] Figures 1 and 2 are from Milanovic (2002a).

Figure 1. Inter-national inequality: unweighted (Concept 1)
and population weighted (Concept 2)

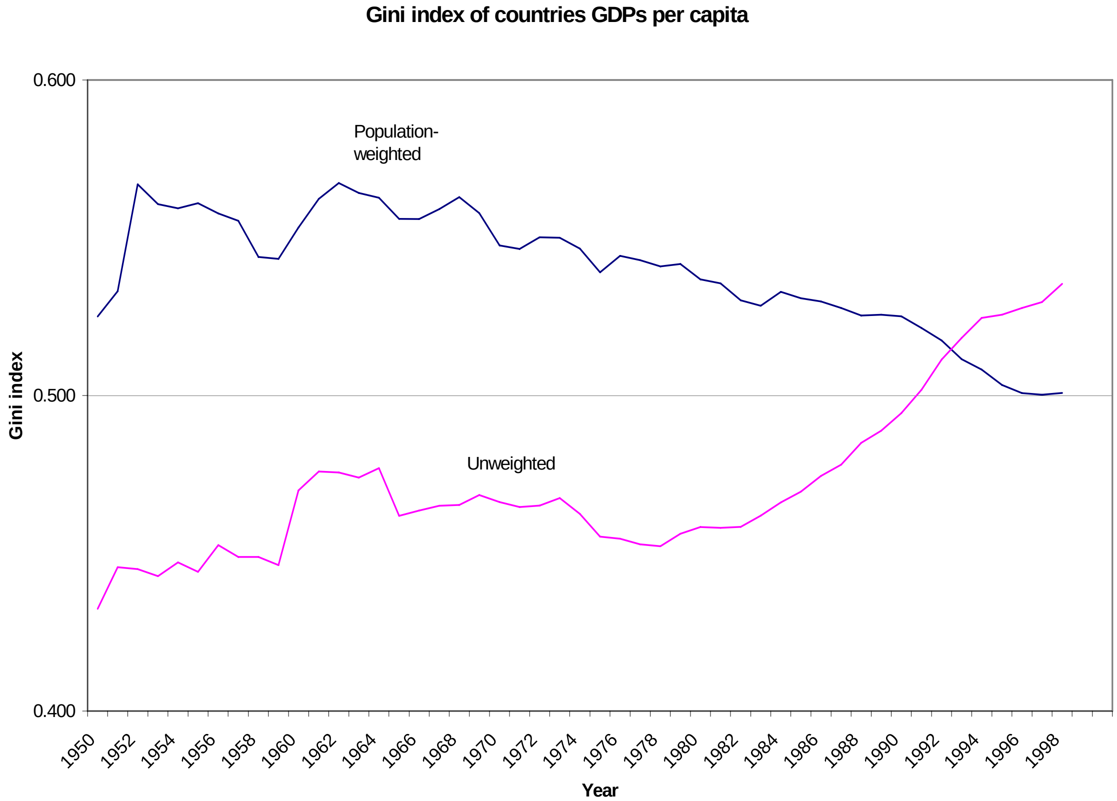
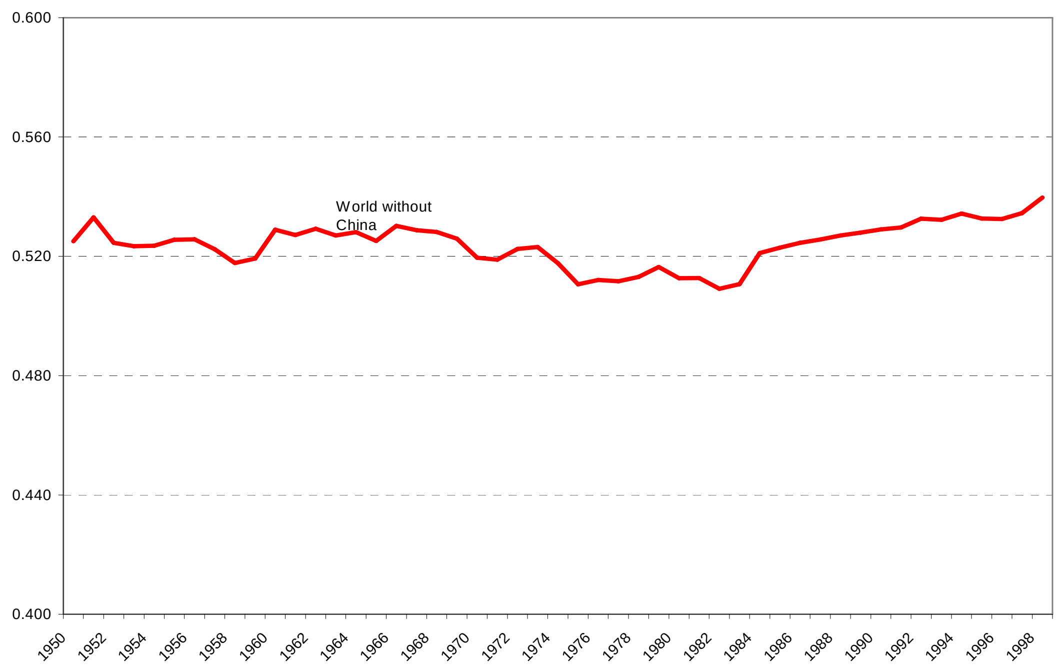


Figure 2. Inter-national population weighted inequality without China



So why was Concept 3 inequality (inequality across individuals of the world) not measured until very recently? The reason is that in order to measure it, one needs to have detailed households survey data from most of the countries of the world, hoping to cover at least 90 percent of world population and even more of world income. Moreover, one would need to actually have access to individual-level data for most of the countries in order to be able to check whether the welfare indicator (income or expenditure) is correctly defined, to create income or expenditure per capita values, to use survey-provided weights which are supposed to control for differences in response rates, and most importantly, to be able to "slice" the distribution data into a lot of income classes—into ten deciles, or even better into ventiles (20 classes), or more.

The number of household surveys, for many countries in the world, is quite limited. Even more limited is access to individual-level data because many countries are loath to release the detailed data to researchers. And, until fairly recently there were no surveys at all, or no reliable surveys for many large portions of the world. For example, no survey for China was available before 1982; there were no published survey results (much less access to individual-level data) for the former Soviet Union, and almost all of Africa had been "uncovered" by surveys until some 10 to 15 years ago. So, even if theoretically, one had access to all household surveys conducted in the world, she could not have been able to do much calculations before the mid- or late 1980's.

Several authors have, however, made some very broad approximations (Bourguignon, 1999; Chotikapanich, Valenzuela and Rao, 1997) without claiming too much precision for their estimates. Chotikapanich et al. explicitly treat it as a *pis-aller*, an approximation that is far from ideal and that is made necessary only because much better data are unavailable. Not only were many important countries not represented in the data (household surveys being non-existent or not available), but for those that had surveys, neither individual nor decile data were in many cases available. Thus researchers like Quah (1999),[4] and Chotikapanich, Valenzuela and Rao (1997) have had the following idea: why not use the information on the Gini coefficient and the mean income (or country's GDP) and then impose lognormal

[4] He has reapplied it recently to a study of India and China (Quah, 2002).

distribution (the most common distribution of income) or Pareto distribution (less common) and get an estimate of income levels at different percentiles (10th, 20th and so forth). This is essentially what Sala-i-Martin has done too.

The only study to have used only household surveys (3/4 of which were available at the individual level) to calculate directly Concept 3 inequality is Milanovic (2002).[5] [6]

2. Enter Sala-i-Martin

As mentioned, Sala-i-Martin does the same thing as Quah, Chotikapanich, Valenzuela and Rao —except that instead of ''imposing'' a lognormal (or any other distribution) on a few data points, he makes a non-parametric (kernel) estimate of each distribution based on quintile shares obtained from the Deininger-Squire (DS) data base.[7] (Deininger and Squire do give in their much-used data base, information not only on Gini coefficients but on quintile shares—although the country coverage of the latter statistics is less.)

Notice that once you have decided to either impose a distribution using a few data points, or to do a non-parametric estimation also using a few data points, there is nothing stopping you from estimating income levels at any point in income distribution: one does not need to stop at deciles or even centiles, one author went all the way to *millesimes*, estimating the distribution for each one-tenth of a percentile. But notice too that these are still very much *estimates*, guesses, and, as we shall show below, once they are made from very few data points, they are very rough and quite likely very inaccurate estimates as well. Actually, until

[5] The data he used can be downloaded from www.worldbank.org/research/inequality.

[6] It is curious that Sala-i-Martin while discussing several approximations to the calculation of Concept 3 inequality does not mention Milanovic's results at all. In Paper No. 1, Milanovic is cited in an altogether perfunctory manner; in Paper No.2, he is not even mentioned although was not expunged from the references—perhaps because the references were not revisited after Paper No.1.

[7] In Paper No. 1 the kernel function was applied to all data points (quintiles) of all countries taken together, that is, they were all lined together as in a string, and then a density function was estimated across all of them. In Paper No. 2 Sala-i-Martin improves on this approach by estimating a kernel function for each distribution separately—across the five quintile data for each country/year. This is the estimation of "kernel of quintiles" (Paper No. 1) vs. "kernel of kernels" (Paper No. 2), and the differences are found to be negligible (Paper No. 2, p. 16).

Sala-i-Martin recently entered the picture no-one has done what he has done, for no-one has so eagerly pushed the art of approximation as far. The reason was not that the data to use were not there (the Deininger-Squire data base has been available since 1995) nor that the methodology, as we have just mentioned, was unknown. It is simply that no one thought that the heroic assumption that ought to be made were defensible or justified—or in other words, that the results based on such heroic assumptions would make much sense.

Here is the list of data and countries as given by Sala-i-Martin (Paper No.1, p.10).

"Group A. Countries for which we have a time series of income shares by quintiles (by time series we mean that we have a number of observations over time, although we may not have observations for every year between 1970 and 1998).

Group B: countries for which we have only one observation between 1970 and 1998.

Group C. Countries for which we have NO observations of income shares."

There are 68 countries in the Group A accounting for 4.7 billion people. Then, "although shares estimated by Deininger and Squire and the World Bank, are not constant, they do not seem to experience large movements. If anything they seem to have small time trends. Using this information, we regress income shares to get a linear trend for ach country." (Paper No. 1, p. 10).

So, for group A for which there are observations, although, as it is delicately put, "we may not have observations for every year"—we shall see below, that there is only *one* country which has observations for all the years—missing country/years are approximated by linear extrapolation.

For group B of countries (29 countries, 315 million people in Paper No.2), income shares are assumed constant for the entire period (from one data point, information is extrapolated back and forth to all the years).

For group C countries (28 countries, 232 million people in Paper No. 2) all citizens are supposed to have GDP per capita of the country—that is, inequality is nil, and we are back to calculating Concept 2 inequality.[8]

There are some strange omission in the country coverage (given in the Appendix 2, Paper No.2) Thus, Russia is not included at all despite the fact that Deininger-Squire data base provides two observations and that the country is also included in WDI. Moreover, *none* of the former Soviet republics is included although most of them are in the DS database. Table 2 below shows, for example, that there are 11 former Soviet republics in the Deininger-Squire data base with a total of 25 observations (not counting the observations from WDI). It is very odd to leave them out. One may wonder if this omission was driven by the desire to eliminate ”troublesome” observations characterized by significant increases in income inequality: the Russian Gini, for example, jumps from 24 to 48, Ukrainian from 23 to 47, and all the others by about the same amount.. We shall see below that Sala-i-Martin's calculations essentially boil down to assuming within-country inequality to be fixed throughout the entire period, and if so, countries with large increases in inequality might not have been "suitable", as they would have pushed overall inequality up.

Sala-i-Martin discusses the non-inclusion of the former Soviet republics in a footnote in Paper No.2 (page 5), and claims (i) that these countries were not included because they did not exist prior to 1992, and (ii) that their omission does not bias world inequality. The first explanation is rather lame, as Estonia with 4, Latvia and Russia with 3, or Ukraine with 2 observations have greater or equal number of observations as (say) Egypt and Morocco which are both included. The same rules as applied elsewhere—extrapolate from two or three observations to all the years—could have been applied to them. The fact that they are "new" countries is totally irrelevant. The second explanation is wrong. Adding the Soviet republics, Bulgaria, and (former) Yugoslavia[9] together is adding more than 300 million people or more

[8] The number of people included in each Group differs somewhat between the two papers (cf. Paper No. 1, p. 10 and Paper No. 2, Appendix, p. 65).

[9] Bulgaria is not included despite the fact that it has more observations than any country save the United States. Again, its Gini in the early 1990's rises from about 21 to about 34. Yugoslavia (and its successor republics) is excluded despite having 9 observations. There are also some mysterious exclusions: Iran (4 observations), the

than 6% of world population and some 10% of world PPP income in the late 1980's. And as Milanovic (2002) shows, the transition countries (mostly former Soviet Union) account for about a half of the 2.8 Gini point increase of "true" (Concept 3) world inequality between 1988 and 1993. Thus Sala-i-Martin's omission of these observations certainly biases overall inequality down. The reader can simply refer to Sala-i-Martin's Gini values shown in Figure 4 below, and add for all the years after 1990, about 1½ Gini points. Instead of a clear downward trend, he would observe a stable Gini.

3. The Ricardian vice: fragmentary and sparse data overcome by making heroic and unwarranted assumptions

The description of the approach used by Sala-i-Martin already highlights the problems. The first problem has to do with very few data (quintiles) available to derive a distribution. We call this *fragmentary* data. The second problem has to do with the absence of even such fragmentary data for most of the years. These missed data then have to be filled in by extrapolations. We call this the problem of *sparse* data.

We shall discuss, first, how are entire distributions derived from only five data points available in DS database[10] and second, how are these sparse data combined in order to produce a semblance of a dense distribution in time, or in simple terms how Sala-i-Martin moves from having two or three observations for Egypt, Switzerland or Greece over the 29 year period to "pretending" that he has all of them. [11]

Bahamas (11 observations), Surinam (5 observations) and Vietnam (2 observations). Iran and Vietnam alone would have added more than 150 million people to Sala-i-Martin's sample: why were they dropped out?

[10] Sala-i-Martin writes that he is using both Deininger-Squire and World Development Indicators (WDI) quintile shares (Paper No.1, p. 10). He does not give the source for the latter (it must be various issues of WDI). They are also relatively few in number (compared to the Deininger-Squire compilation), and not as well documented. Thus, the entire discussion here will be based on the Deininger-Squire database version 2 which is also available on the Internet at http://www.worldbank.org/research/growth/dddeisqu.htm. The issue of documentation (in particular whether we deal with distribution of household income across households, or distribution of per capita income across individuals) is extremely important and is not adequately addressed in WDI.

[11] In terms of actual steps made by Sala-i-Martin, first comes the estimation of quintile shares for all the years and then the derivation of density kernel functions. But for discussion, it is easier to reverse the order.

To derive an entire distribution based on five data points is extremely hazardous. Consider the example of China where Sala-i-Martin has the following five quintile shares for 1992. They are (0.062, 0.1672, 0.3253, 0.5835 and 1). Based on such five values (and GDP per capita) Sala-i-Martin estimates a kernel density function. But to derive a distribution based on five data points is to subject oneself to a very large degree of error. Depending on the smoothing techniques (bandwidth) and the assumption one makes (what type of kernel density function), vastly different results can be obtained—all compatible with the five numbers we have. Moreover, even if different kernels yield similar results, it still does not guarantee that we have "guessed" right—simply because income density function is an empirical function where, with five numbers we have, we cannot at all be sure to have approximated it correctly. We know that the bottom 20% of people of China receive 6.2% of total income. But this value is consistent with the bottom decile receiving 2% of total income, or 2.5%, or even only 1%. For the top, it is even worse, and that is where most of the mistake (and bias) lies. We know that the top quintile gets 41.65% of income. But how about the top decile? Do they get only 23% percent—which should be consistent with a relatively equal distribution—or perhaps 28 percent. [12] On per capita basis, the difference amounts to about 20 percent of income for about 120 million people or 2 percent of world population. And how about the top ventile (5 percent)? The margin of error is even greater there.

Or, take the United States, where the top quintile in 1996 receives 48.9 percent of total income, and the fourth quintile gets 27.8 percent. Applying the same logic: does the top decile get 25 percent of total income (just minimally more than the ninth decile), or a little under 35 percent? The difference in their average income estimate is 40 percent, and per capita income of the top decile may range between $PPP 69,700 and $PPP 97,580 per capita per year. [13] Whether we choose one or another income for these 300 million people, probably the richest in the world, will make a difference to our inequality calculations.

---

[12] We know that they cannot get more. The average income of the fouth quintile is (0.5853-0.3253)/0.2=1.29 times greater than the mean. The ninth decile thus must receive more than 1.29*10=12.9 percent of total income, which limits the top decile to less than 28.7 percent (41.65-12.9).

[13] Calculated by taking the 1996 GDP per capita (27,880 in 1995 international dollars) and multiplying by factors or 2.5 and 3.5. (If the top decile gets between 25 and 35 percent of total US income, then average per capita income of its members is between 2.5 and 3.5 times the US average.)

Of course, the problem does not entirely disappear if we had deciles or ventiles, but it becomes much less severe. It has been, for example, shown that with 10 to 12 data points (well distributed so that they "cover" the entire income distribution) the "true" Gini can be approximated within 1-2 percent of its value (Davies and Shorrocks, 1989; Jenkins 1988). But the degree of error increases rapidly as the number of data points available declines. Suppose that we had only two data points for China. The share received by the people below the median, and by those above. Would one then believe that income distribution could be approximated—although even that can be done—from such a tiny source?

(2) Let us now move to the sparseness of the data which is an even more serious problem. Table 1 shows the actual years and countries for which Sala-i-Martin has his (fragmentary) data.[14] A black box indicates that an observation is available. First note that the average number of observations for Group A and B countries is 5.5 out of 27 (years), which means, that—for the countries for which data *are* available—only about 20 percent of country/years are filled. Second, if we require, not unreasonably for a study that claims to have derived income inequality statistics for each year over the period, that a country should have observations for at least 2/3 of the time (that is, to have more than 18 observations), we are left with a total of six economies: USA, Bulgaria, Taiwan Province of China, Great Britain, Canada and Japan. [15] (The list of countries and number of observations is shown in Table 2.) Only one economy—the US—has observations for all the years.

To compare this with a different data source, I use the same type of table (Table 3) to show the data available to me for the derivation of "true" world income distribution around the years 1988, 1993 and more recently 1998 (see Milanovic, 2002, and Milanovic, 2002a). (Note that my calculations are "benchmarked" in 1988, 1993 and 1998, so I need surveys from three years only, and not from the consecutive years. For example, if I have the US data for 1988, 1993 and 1998, this is all that I need.) For the country/years where I had access to

[14] The period covered by the Deininger-Squire database runs up to 1996. Sala-i-Martin's data (thanks to WDIs) extend into 1998. The difference cannot but be minor.

[15] And to complicate matters further, the Japanese surveys from which these data are derived are not nationally representative because they leave out farmers and one-person households, that is, one person in ten (see Tachibanaki and Yagi, 1997). And Bulgaria is, as we have seen, not included.

the individual-level data, the square is colored red. For the country/years where I had access to the grouped data (which were always at least deciles)[16], the squares are filled in black. [17]

Now, the pictures are quite telling. But since we are concerned with Sala-i-Martin's data here, the question of interest is how these sparse data are "connected" for in reality Sala-i-Martin presents to the reader a result as if there we *no blanks* at all in his data base. As we already know, he gets round blank spots by extrapolating forward and backward in time the results obtained from the years for which he has the data. Thus the Chilean black boxes for the years 1981, 1989 and 1994 are to be used to fill the blank spots for all earlier and later years (24 in total) assuming that quintile shares follow a linear trend. [18]

But the extrapolations are not at all obvious. Consider the data for China's fourth quintile (used here because of China's obvious importance) over the period 1980-92. There seems to be an increasing tendency—but, on the other hand, isn't it driven by the value for 1991 when after the Tian-An Men massacre, there was a tightening of government policies and a reduction of inequalities, and didn't the value in 1992 already go back to where it was in 1986? Sala-i-Martin chooses to draw a straight line: the fourth quintile in all years, shown here as well as all the way back to 1970 (when the first national survey was 10 years into future!) will have a share of 25 percent of China's income. Voila! Thus, Table 1 get filled with black dots. For many countries quintile shares exhibit a large variability: rather than moving in predictable ways, or being stable, they "jump" all around (see Sala-i-Martin Appendix Figures, Paper No.2, or Brazil in Figure 3 here). One is reminded of Samuelson's quip: "yes, you can draw them as straight lines, but only with a very thick chalk."

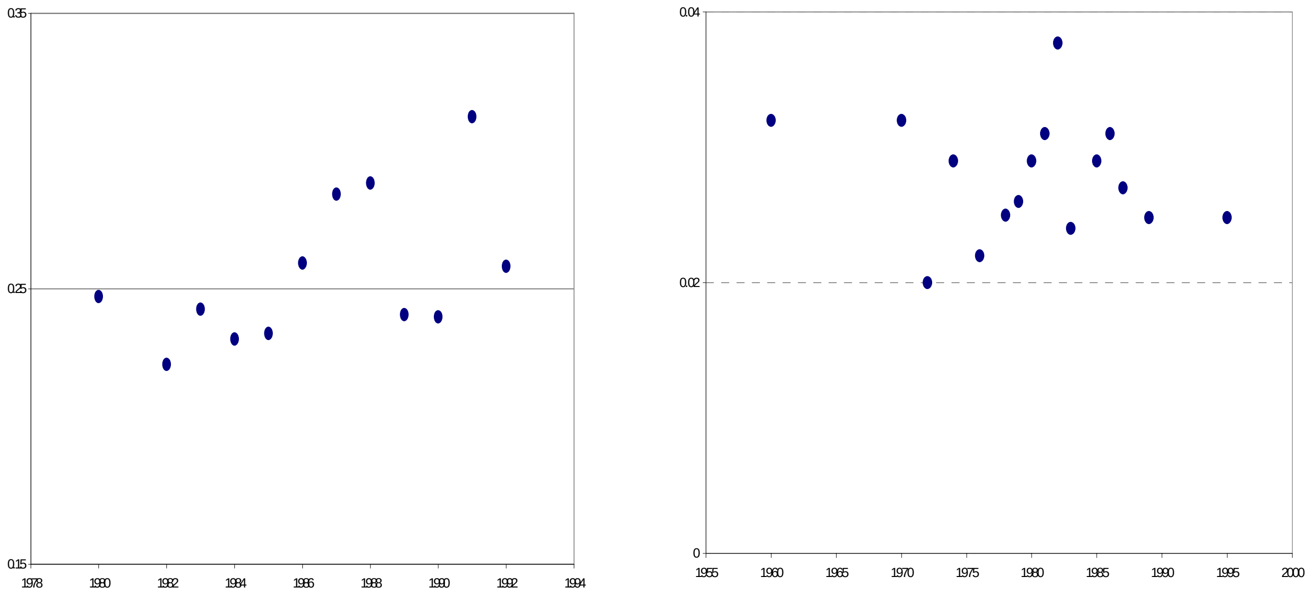
---

[16] There are exceptions in 1988 only, where for 14 countries I had quintiles.

[17] The data are available at www.worldbank.org/research/inequality. The average number of observations was 10.8 in 1988, 11.4 in 1993 and 15.1 in 1998. The number of surveys used to derive the estimates was: in 1988, 102 (out of which 37 were conducted in the benchmark year); in 1993, 120 (39 in the benchmark year); in the 1998 yet incomplete results, 114 surveys (51 in the benchmark year).

[18] Sala-i-Martin must have felt, one would surmise, vaguely uncomfortable about these wild extrapolation as nowhere in his two papers does he give the number of observations available by country. And few things would have been easier (or more useful) to the reader than to add such essential information to the Appendix table (in Paper No.2) where all countries and their populations (sic!) are listed. Equally revealing is the fact that in Paper No.1, Appendix Table 1 lists all the countries and Groups to which they belong but again fails to provide the number of observations.

Figure 3. Income share of the fourth quintile in China (left) and first quintile in Brazil (right)



Source: Deininger-Squire data base Version 2.

So, after being treated to an estimate of the entire distribution from five data points, we are now led for another leap into the unknown. These rather dubious estimates are now extrapolated to years vastly apart to get estimates of quintile shares throughout the entire period. Here is the enormity of the assumptions. Data on income of the top 20% of (say) Chileans in the year 1994 are used not only to infer the income of the top decile, or of the top ventile in *that* year, they are also used to infer income of the bottom quintile and of the bottom decile and of the bottom 15% or whatever (that is, of the entire distribution) in *other years*. [19] And thus for every country.

We have seen that for Group A and B countries (97 countries), observations are available for, on average, only 5.5 out of 27 years. [20] For 28 countries in Group C, there are no data at all. This means that the overall time coverage is 15.8 percent—leaving aside the

[19] This is because an n-th quintile share in year t, influences our linear approximation of that and all other quintile shares (since the five shares have to add up to 1) in all years for which one does the extrapolations.

[20] Calculated from the DS data base Version 2 that goes up to 1996. Nothing of substance is likely to be changed by the extension to 1998.

former Soviet republics, Vietnam, Iran etc. which are not included at all.[21] If in addition, we assume that for a distribution to be reasonably well described, we need ten data points (ten deciles), the ideal number of data-points becomes 27 times 125 times 10 = 33750. Instead, Sala-i-Martin has 2667 data points,[22] or 7.9 percent.

Here is the deep-rooted problem with Sala-i-Martin's calculations. He overcomes the problem of fragmentary data by imposing a distribution on it. Given the very few data points he has, it is a dramatic oversimplification with an unknown bias. But in addition, he faces the problem of data sparseness. He overcomes it by extending in time these arbitrary estimations obtained from the country/years for which he had the data! Arbitrariness piled on arbitrariness. "He then piled one simplifying assumption upon another until, having really settled everything by these assumptions, he was left with only a few aggregate variables between which, given these assumptions, he set up simpler one-way relations so that, in the end, the desired results emerged almost as tautologies." Thus Schumpeter (1980 [1954], p. 472-3) defined the Ricardian vice.

In conclusion, to calculate true world inequality there is no shortcut from using the individual level data complemented (when individual data are unavailable) with grouped data with at least decile shares. To do anything else, introduces a large and unknown degree of arbitrariness in the results. This, combined with other problems (discussed below) and the general issues that plague such calculations *even* if one had access to all individual-level data (unequal reliability of surveys, differences in definitions of welfare aggregates and the like) makes the noise element dominate, by far, the signal.

4. Other technical problems

There are three other technical problems with Sala-i-Martin's calculations, but since some of them appear in other studies (including mine) and are reasonably well known, we need not discuss them at length.

---

[21] Out of total maximum number of country/years we would like to have, 27 times 125 = 3375, there are only 97 times 5.5 = 533 observations.

[22] 97 x 5.5 x 5.

The first is the use of GDP per capita rather then survey means. This was done by other authors as well (Chotikapanich, Valenzuela and Rao, 1997; Schultz 1998; Bhalla, 2001). There are two problems with this approach. First, it introduces an inconsistency: we use and trust household survey data for the distributions, but we do not believe their means. In other words, surveys are good in guessing the distribution, but miss the mean (level). Some like Surjit Bhalla have insisted on this issue by claiming that survey means (as in India) underestimate the true income, and have then erected the differences between the survey means and GDP per capita into a topic driving almost an entire book. Second, the use of GDP per capita means that we implicitly believe that over- or under-estimation of income by surveys is proportional to reported income. If GDP per capita is 20 percent higher than the survey mean, by raising all survey incomes by 20 percent we are claiming that under-reporting is proportional to reported income. But, from the literature (see Deaton, 1997), we know that this is not the case: if there is misstatement of survey incomes, it is most at low ends (where people are missed by surveys) and top ends (where people hide their incomes). In conclusion, if we do not believe survey levels, and want to correct them, adjusting them by the same percentage across board is very crude and most likely wrong.

The second problem is mixing of income and expenditure data. This is the problem present in Milanovic (2002) as well. It was made unavoidable by the fact that countries "specialize" in having either income or expenditure surveys, and then the coverage of the whole world by either income or expenditure surveys alone becomes impossible. Sala-i-Martin, as well as the Deininger-Squire database, also mixes the two sources, since his quintiles are in some cases derived from expenditure (or consumption) shares, and in some from income shares.

The third, and a very serious problem, may be peculiar to Sala-i-Martin. I say "may" because it is not entirely clear whether this problem exists in his work or not. The problem is the mixing of quintile shares obtained from distributions of households with quintiles derived from distributions of individuals. In one case, there is a distribution of households by household income, that is D(H|Yh) and in another, distribution of persons by household per capita income D(p|Yp). [23] The latter is, of course, the one that we want to use. Sala-i-Martin does not mention this issue which leaves the possibility that he has used, in order to increase his number of observations, both sources (since they are both present—and documented—in DS). The use of the wrong distribution D(H|Yh) would make a total mess of world inequality calculations as now the issues of family size (vastly different between countries) and inconsistency in the recipient units would entirely vitiate the calculations, making them meaningless. Simply imagine that the five data points indicating distribution of *households* by total household income in a country in year X is now interpreted as the same as (i) distribution of *people* by their per capita income, and is used to guess (ii) the entire income distribution of *people* for year X, and (iii) for several years forward and backward. One would hope that at least we have been spared this simplifying assumption.

5. The bottom line

The bottom line is that it is not surprising that Concept 3 inequality as calculated by Sala-i-Martin behaves almost identically as the Concept 2 inequality (see Figure 4) . This is because the "fitting" of distributions based on very fragmentary data, plus the extrapolation in time, had emptied out almost all variability from the within-country component. Basically, within-country inequality is fixed—by elimination of "troublesome" countries and by minimizing variability of distributions. It is this within-country inequality, which superimposed onto Concept 2 inequality, yields inequality among world's individuals. If within-country inequality is fixed (and countries' relative positions do not change much),[24] then what is superimposed on the Concept 2 inequality is simply a shift parameter. And one may recall that if we were to add only the transition economies' large increases in inequality—and declines in output—that alone would raise the overall Gini by 1.5 points.[25]

---

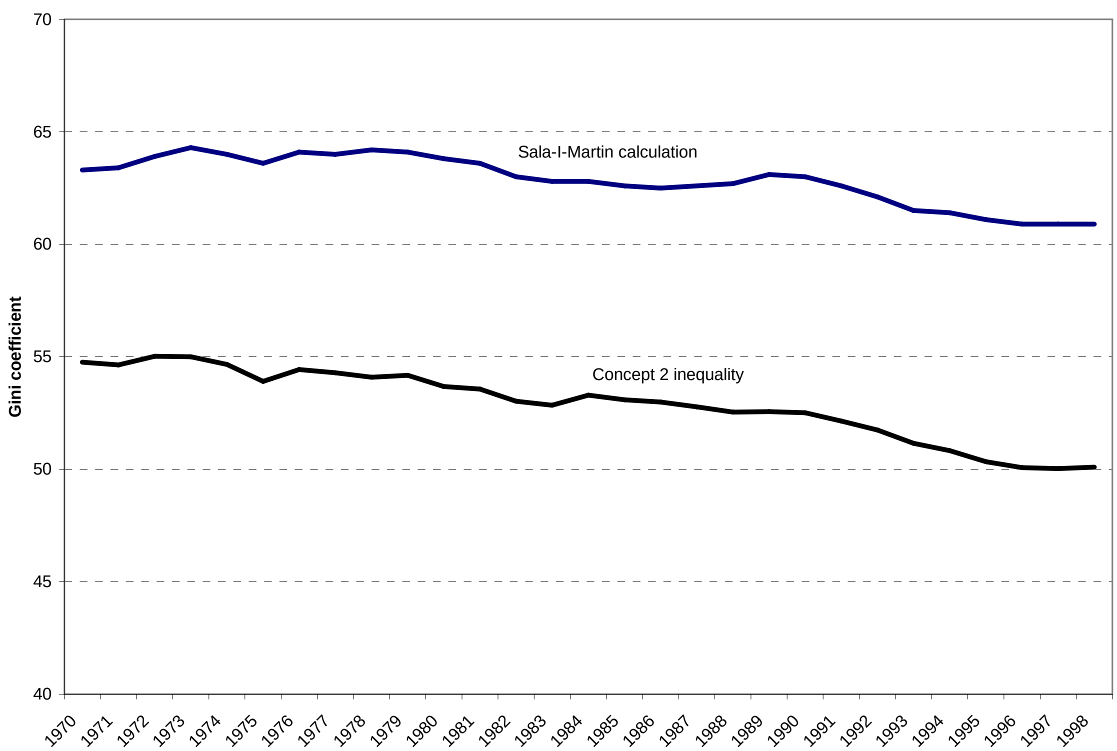
[23] To complicate matters further, there are also distributions of households by household per capita income D(H|Yp).

[24] Note that even if all within-country distributions are unchanged, but some countries grow faster (or slower) than others (so that their relative position changes), inequality between individuals of the world will change too.

[25] The omission of former Communist countries is critically important in order to generate a downward trend in world inequality after 1990 (but is, of course, only one of many assumptions which produce the final result). Yet the treatment of the Communist countries is emblematic of another approach I criticized in "Two faces of globalization…": selective choice of evidence by partisans of "globalization as we know it." China is always

It is not surprising then that the evolution through time of what is ostensibly a Concept 3 inequality will be the same as the evolution in time of the Concept 2 inequality—as indeed we see in Figure 4. One might conclude that what Sala-i-Martin has ended up by producing is inequality between population-weighted GDPs per capita which simply masquerades as inequality between individuals, or more exactly, a Concept 2 inequality with a constant shift parameter.

Figure 4. Sala-i-Martin Concept 3 inequality and inter-national population weighted inequality

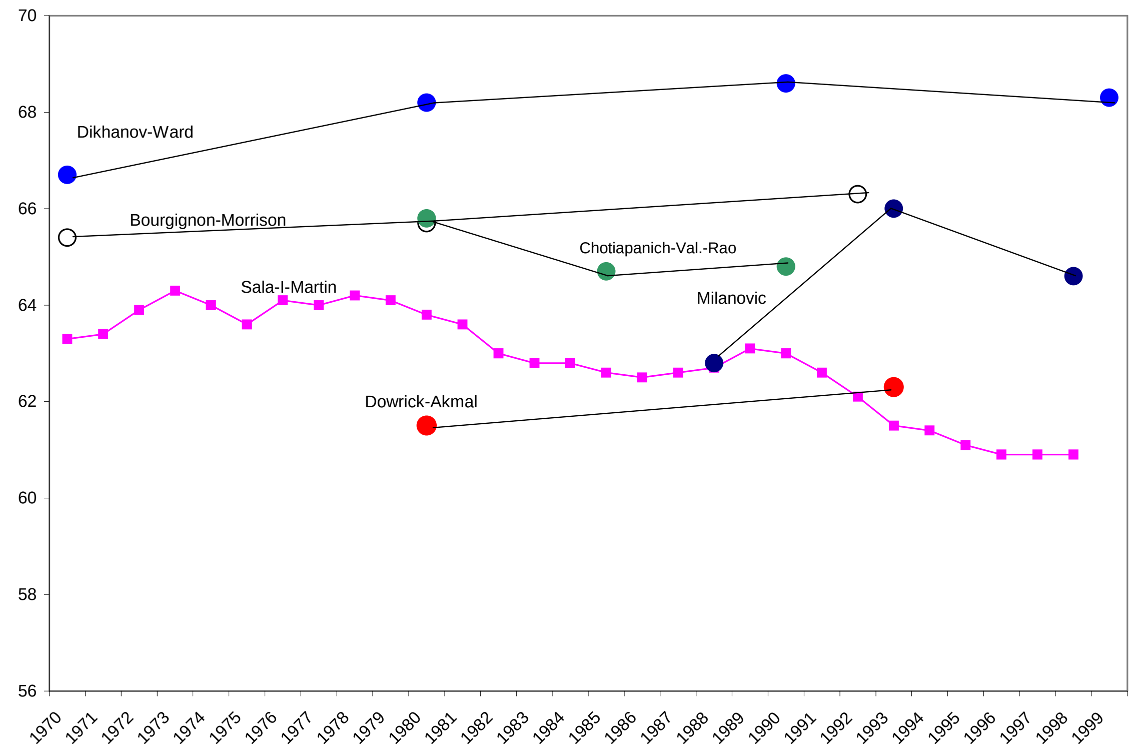


While Sala-i-Martin's results move in parallel with the Concept 2 inequality, they move out of step with all other calculations of *Concept 3* inequality. Figure 5 confronts Sala-i-Martin's results with other authors who have tried to calculate world inequality among individuals. Sala-i-Martin's is the only calculation that shows inequality steadily decreasing during the last 30 years. All others show inequality on the rise, or going up and down without an apparent trend. Sala-i-Martin results give also, by far, the lowest Gini of all other

included in their calculations, Russia almost never (although as economic performance of Russia improves, it might "qualify").

calculations. Around 1993, the median estimate of other calculations is between Gini of 64-65. Sala-i-Martin's Gini is 61.

Figure 5. Sala-i-Martin's calculations confronted to others



Sources: Milanovic (2002 and for 1998 estimate from 2002a), Bourguignon and Morrisson (1999), Dikhonov and Ward (2001), Dowrick and Akmal (2001).

Sala-i-Martin has succumbed to the temptation of piling one assumption upon another with the result that neither the author, nor the reader can any longer tell which is the part of each assumptions, individually or all them together, in deriving the final result. Here are, in summary, the Ricardian building blocks used by Sala-i-Martin in his calculations:

1. Delete (when possible) countries with "disturbing rises" in inequality.

2. Use five data points to approximate entire distributions.

3. When these five data points are not available (84 percent of the time), extrapolate backward and forward in time. When only one observation is available; assume

distributions stays the same; when there is no observation at all, assume everybody in the country has the same income.

4. Treat distributions of household income across households as if they were distributions of household per capita income across individuals.

5. Mix National accounts data (GDP per capita) and household survey data.

6. Mix expenditure and income data.

and produce world income distribution across individuals of the world for the last thirty years. To paraphrase, “never was so much calculated with so little.” And, unfortunately, it shows.

REFERENCES:

Bourguignon, Francois and Christian Morrisson (1999). "The size distribution of income among world citizens, 1820-1990", manuscript (June).

Bhalla, Surjit (2002), *Imagine there is no country*, manuscript.

Chotikapanich, D., Valenzuela, R. and Rao, D.S.P. (1997). "Global and regional inequality in the distribution of income: estimation with limited and incomplete data." *Empirical Economics*, vol. 22, pp. 533-546.

Davies, J.M. and Shorrocks A.F. (1989), "Optimal grouping of income and wealth data", *Journal of econometrics*, vol. 42, 1989, pp. 97-108.

Deaton, Angus (1997), *Analysis of Household Surveys*, Oxford University Press and the World Bank.

Dikhanov, Yuri and Michael Ward (2001), "Evolution of the Global Distribution of Income, 1970-99", August 2001 draft.

Dowrick, Steve and Muhammed Akmal (2001), "Contradictory Trends in Global Income Inequality: A Tale of Two Biases", draft 29 March 2001, available from http://ecocomm.anu.edu.au/economics/staff/dowrick/dowrick.html.

Jenkins, Stephen (1988), "Reranking and the analysis of income redistribution", *Scottish Journal of Political Economy,* vol.35, No. 1, February.

Melchior, Arne, Kjetil Telle and Henrik Wiig (2000), "Globalisation and Inequality: World Income Distribution and Living Standards, 1960-1998", Royal Norwegian Ministry of Foreign Affairs, Studies on Foreign Policy Issues, Report 6B:2000, October.

Milanovic, Branko (2002a), "Worlds apart: the twentieth century's promise that failed", manuscript, downloaded from www.worldbank.research/inequality.

Milanovic, Branko (2000), "True world income distribution, 1988 and 1993: First calculation based on household surveys alone" *Economic Journal,* January 2002.

Mukand, Sharun and Dani Rodrik (2002). "In search of the holy grail: policy convergence, experimentation, and economic performance", mimeo, January 2002, can be downloaded from http://ksghome.harvard.edu/~.drodrik.academic.ksg/papers.html.

Quah, Danny (1997), "Empirics for growth and distribution: stratification, polarization and convergence clubs", London School of Economics and Political Science, Center for Economic Performance Discussion Paper No. 324, pp. 1-29.

Quah, Danny (1999), "6 x 10^9: Some Dynamics of Global Inequality and Growth", typescript, December 1999, downloaded from < http://econ.lse.ac.uk/staff/dquah/p/9912sbn.pdf>

Quah, Danny (1999), "Calculations of world income distribution", unpublished notes.

Quah, Danny (2002), "One third of the world's growth and inequality", mimeo, March 2002.

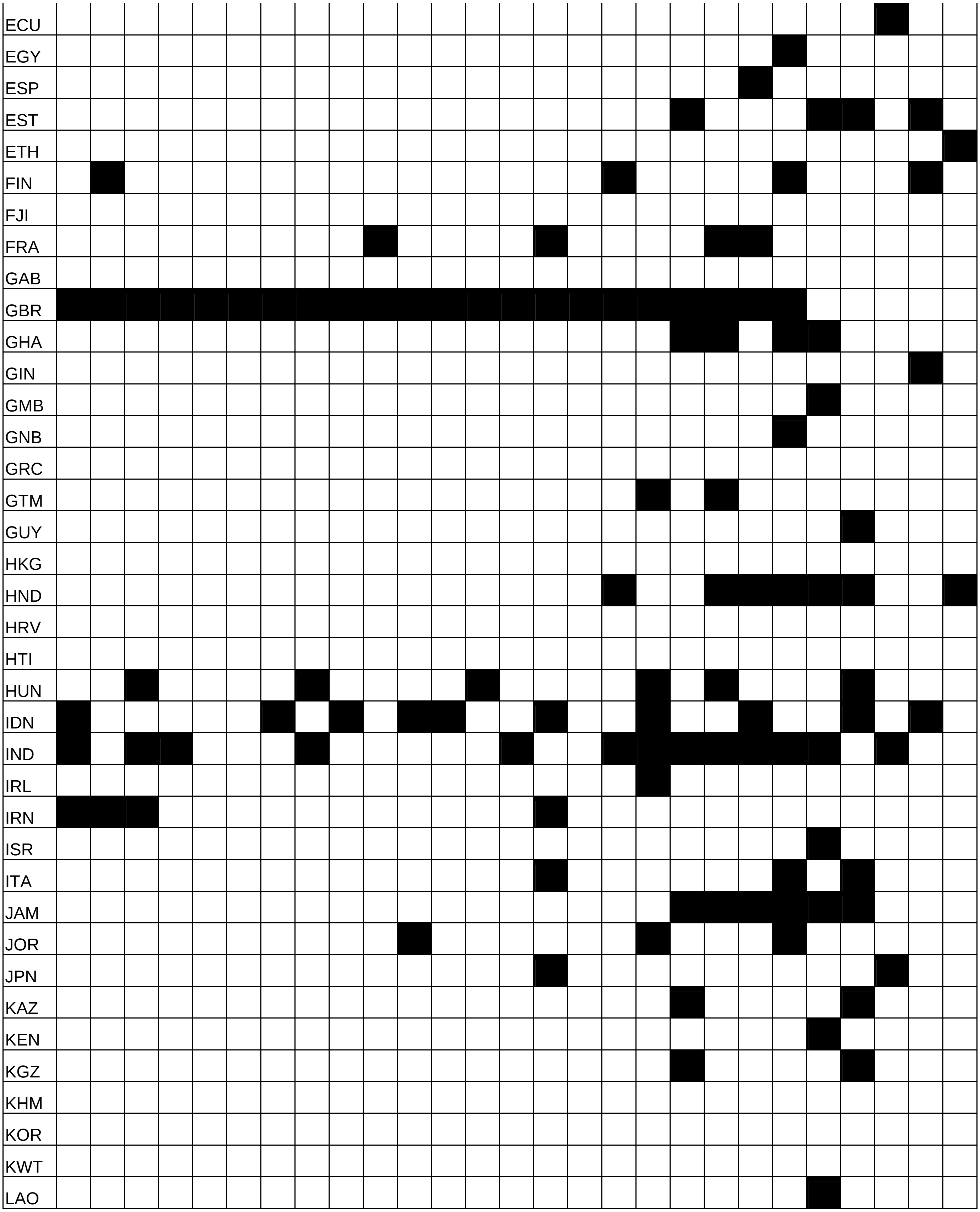
Schultz, T. P. (1998). "Inequality in the distribution of personal income in the world: how it is changing and why." *Journal of Population Economics*, vol. 11, No. 3, pp. 307-344.

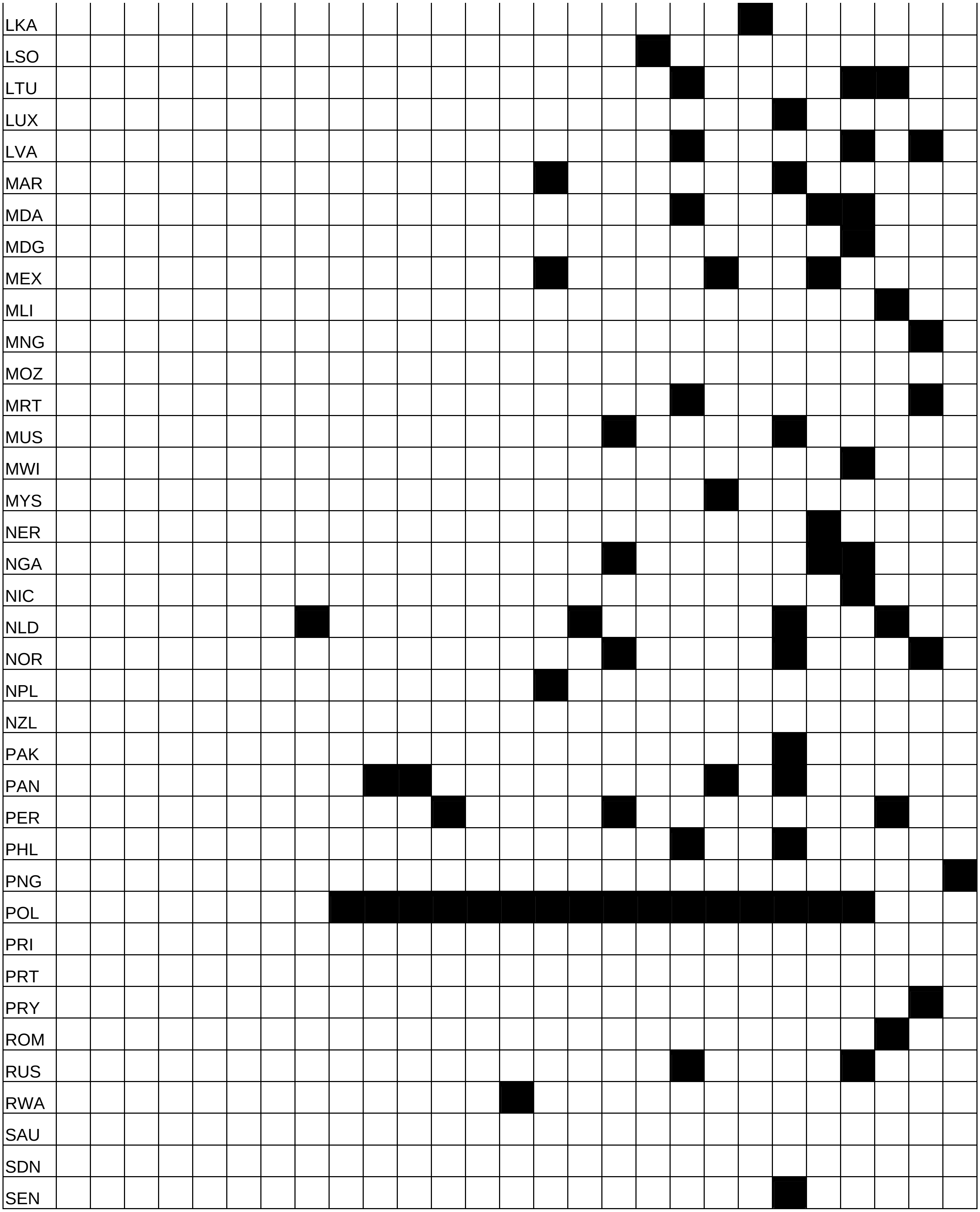
Schumpeter, Joseph (1980[1954]), "History of economic analysis, New York: Oxford University Press.

Tachibanaki, Toshiaki and Tadashi Yagi (1997), "Distribution of economic well-being in Japan: towards a more unequal society" in Peter Gottschalk, Bjorn Gustafson, and Edward Palmer (eds.) *Changing patterns in the distribution of economic welfare. An international perspective*, Cambridge University Press, pp. 108-131.

Table 1. Quintiles available in Deininger-Squire data base
(cases where recipients are persons) and used by Sala-i-Martin

code	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
AGO																											
ALB																											
ARG																											
ARM																				■							
AUS						■									■					■				■			
AUT																		■									
BEL																							■				
BEN																											
BFA																										■	
BGD																				■			■				
BGR	■	■	■	■	■	■	■	■	■	■	■	■		■	■	■	■	■	■	■	■	■	■	■			
BHS																											
BLR																			■							■	
BOL																					■						
BRA			■						■	■				■		■				■						■	
BRB																											
BWA																											
CAF																							■				
CAN						■										■									■		
CHE													■														
CHL											■									■					■		
CHN											■		■	■	■	■	■	■	■	■	■	■	■				
CIV																■	■	■	■							■	
CMR														■													
COG																											
COL					■																	■				■	
CRI												■					■			■							■
CSK	■			■			■	■			■	■				■			■								
CZE																						■	■	■	■		
DEU															■					■					■		
DJI																											■
DNK														■									■		■		
DOM							■								■					■			■				
DZA																			■							■	


ECU
EGY
ESP
EST
ETH
FIN
FJI
FRA
GAB
GBR
GHA
GIN
GMB
GNB
GRC
GTM
GUY
HKG
HND
HRV
HTI
HUN
IDN
IND
IRL
IRN
ISR
ITA
JAM
JOR
JPN
KAZ
KEN
KGZ
KHM
KOR
KWT
LAO


LKA
LSO
LTU
LUX
LVA
MAR
MDA
MDG
MEX
MLI
MNG
MOZ
MRT
MUS
MWI
MYS
NER
NGA
NIC
NLD
NOR
NPL
NZL
PAK
PAN
PER
PHL
PNG
POL
PRI
PRT
PRY
ROM
RUS
RWA
SAU
SDN
SEN

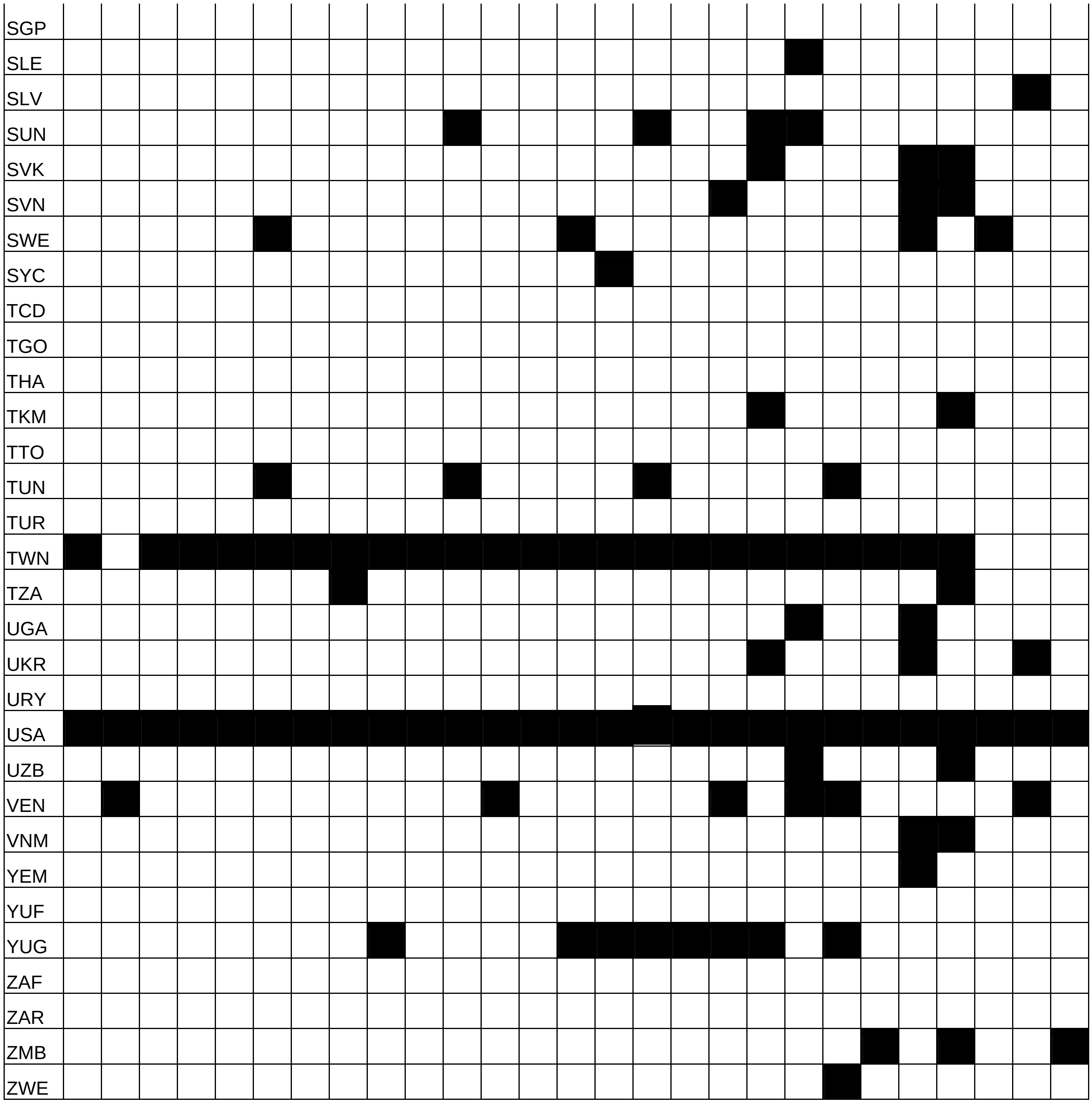
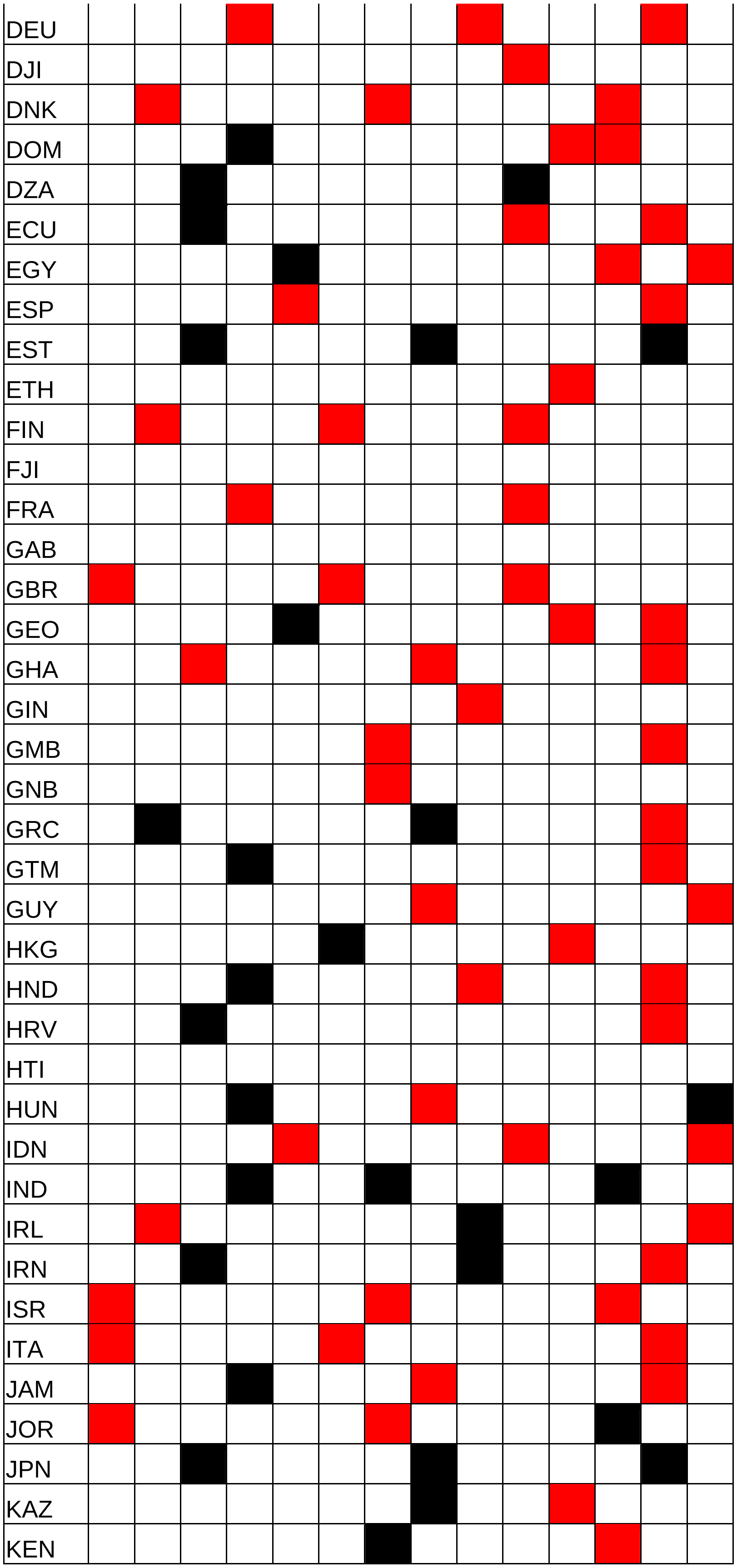

SGP
SLE
SLV
SUN
SVK
SVN
SWE
SYC
TCD
TGO
THA
TKM
TTO
TUN
TUR
TWN
TZA
UGA
UKR
URY
USA
UZB
VEN
VNM
YEM
YUF
YUG
ZAF
ZAR
ZMB
ZWE

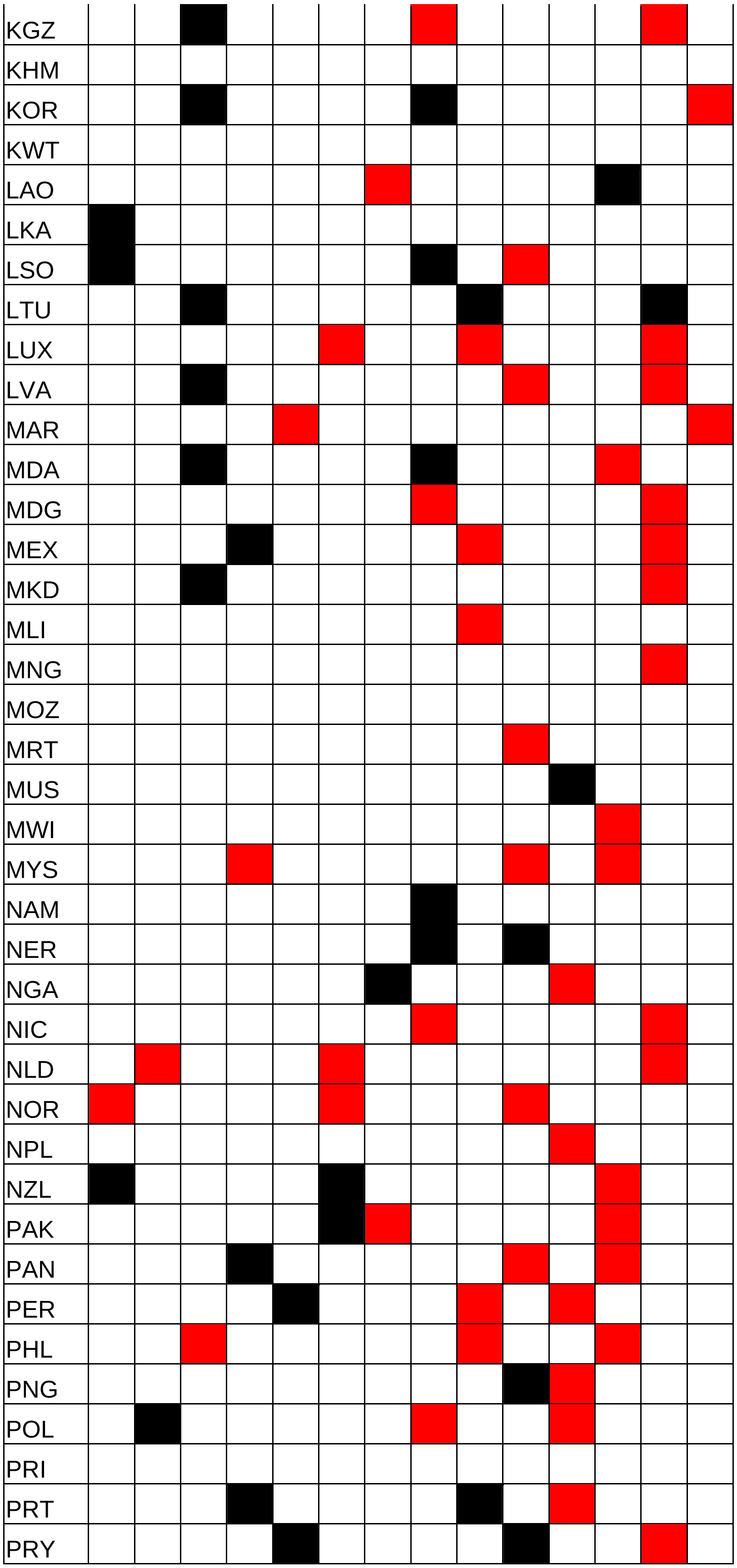
Table 2. List of economies and number of observations in Deininger-Squire data base (version 2), period 1970-96

United States of America	27	Panama	5	Turkey	2
Bulgaria	24	Surinam	5	Tanzania	2
Taiwan Province of China	23	Czech Rep	4	Uganda	2
United Kingdom	22	Dominican Rep	4	Uzbekistan	2
Canada	18	Estonia	4	Vietnam	2
Japan	18	Ghana	4	Burkina Faso	1
Poland	17	Iran	4	Bolivia	1
Italy	16	Peru	4	Barbados	1
Brazil	15	Philippines	4	Botswana	1
Sweden	15	Portugal	4	Central African Rep	1
Finland	13	Tunisia	4	Chele	1
India	13	Zimbabwe	4	Cameroon	1
Netherland	13	Belgium	4	Djibouti	1
China	12	Chile	4	Ecuador	1
New Zealand	12	Greece	3	Ethopia	1
Australia	11	Guatemala	3	Fiji	1
Bahamas	11	Ireland	3	Guinea	1
Indonesia	10	Jordan	3	Gambia	1
Venejuela	10	Lithuania	3	Guinea Bissau	1
Costa Rica	9	Latvia	3	Guyana	1
Yugoslavia	9	Moldova	3	Israel	1
Bangladesh	8	Mauritius	3	Kenya	1
Colombia	8	Nigeria	3	Lao	1
Czechoslovakia	8	Romania	3	Lesotho	1
Spain	8	Slovakia	3	Madagascar	1
Jamaica	8	Slovenia	3	Mali	1
Norway	8	Trinidad & Tobago	3	Mongolia	1
Pakistan	8	Ukraine	3	Malawi	1
Germany	7	Belarus	2	Niger	1
Hong Kong	7	Algeria	2	Nicaragua	1
Honduras	7	Egypt	2	Nepal	1
Hungary	7	Gabon	2	Papua New Guinea	1
Korea, South	7	Kazakhstan	2	Paraguay	1
Sri Lanka	7	Kyrgyz	2	Rwanda	1
Denmark	6	Luxembourg	2	Senegal	1
France	6	Morocco	2	Sierra leone	1
Malaysia	6	Mauritania	2	Yemen	1
Singapore	6	Puerto Rica	2	South Africa	1
Thailand	6	Russia	2	Switzerland	1
Cote d'Ivoire	5	El Salvador	2	Armenia	1
México	5	Seychelles	2	Austria	1
		Turkmenistan	2		

Table 3: Household surveys and data sources used to derive "true" word income distribution in Milanovic (2000)

code	86	87	88	89	90	91	92	93	94	95	96	97	98	99
AGO														
ALB														
ANT														
ARG														
ARM														
AUS														
AUT														
AZE														
BDI														
BEL														
BEN														
BFA														
BGD														
BGR														
BHS														
BIH														
BLR														
BOL														
BRA														
BRB														
BWA														
CAF														
CAN														
CHE														
CHL														
CHN														
CIV														
CMR														
COG														
COL														
COM														
CRI														
CSK														
CYP														
CZE														


DEU
DJI
DNK
DOM
DZA
ECU
EGY
ESP
EST
ETH
FIN
FJI
FRA
GAB
GBR
GEO
GHA
GIN
GMB
GNB
GRC
GTM
GUY
HKG
HND
HRV
HTI
HUN
IDN
IND
IRL
IRN
ISR
ITA
JAM
JOR
JPN
KAZ
KEN


KGZ
KHM
KOR
KWT
LAO
LKA
LSO
LTU
LUX
LVA
MAR
MDA
MDG
MEX
MKD
MLI
MNG
MOZ
MRT
MUS
MWI
MYS
NAM
NER
NGA
NIC
NLD
NOR
NPL
NZL
PAK
PAN
PER
PHL
PNG
POL
PRI
PRT
PRY

ROM														
RUS														
RWA														
SAU														
SDN														
SEN														
SGP														
SLE														
SLV														
SVK														
SVN														
SWE														
SWZ														
SYC														
TCD														
TGO														
THA														
TJK														
TKM														
TTO														
TUN														
TUR														
TWN														
TZA														
UGA														
UKR														
URY														
USA														
UZB														
VEN														
VNM														
YEM														
YUG														
ZAF														
ZAR														
ZMB														
ZWE														

Red color: access to individual-level household survey (micro data)

Black color: access to grouped decile data