Inequality, resources and growth: evidence from post-1900 Latin America

New earnings Gini series and some implications

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May 2012

Abstract

This is a first step in a study about the role played by inequality and resource dependency on the economic growth performance of the six leading Latin American economies (LA-6) over the long term. Here we present and discuss a new set of consistent yearly earnings inequality estimates constructed with real wage data. We identify an "N" shaped pattern between 1900 and 2000 and an "M" shaped one when the period is extended to 2010, with turning points circa 1920, 1960 and 2000. Our series are an improved version of those previously constructed for five countries by FitzGerald (2008) up to 2000 with a similar methodology. They also proved to be broadly consistent with Williamson´s inequality ratios during the 1900-40 period. An Appendix is included with detailed comments on methods and sources used for the assembling of a new dataset of real wages in agriculture, manufacturing and the urban sector.[1] The next step is the use of the inequality series, together with newly constructed indicators of resource dependency, to test their growth implications in a five-year panel data regression based on a two-equation estimating framework.

Paper to be presented at the

Conference on Trade, Poverty and Growth in History

Madrid, 17-18 May 2012

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[1] Assembling this set of real wages for the LA-6 since 1900 in a relatively short time was only made possible by the generous help provided by a number of colleagues, a "cybernetic tribe" to whom I am very grateful. During the stage of data collection I was very lucky to be able to reach (perhaps to their regret) Jeffry Williamson, Henry Willebald, Leticia Arroyo, and Ewout Frankema for advice, suggestions, and data. At a country level, I am greatly in debt to Eustáquio Reis for sharing with me his wage data for Brazil and illuminating my way in the task of constructing the series for the country (though any mistakes are mine). Marcelo Abreu was a source, as always, of knowledge and clarity. Mario Matus and José Díaz gave me support in my search for data for Chile. María del Pilar López Uribe generously shared with me her wage series for Colombia and offered valuable observations. Brian McBeth helped me with data and comments for the early decades in Venezuela. I am also grateful to Mar Rubio for help on Mexico's oil data during the revolution.

1. Introduction

This in-progress paper is a continuation of a research effort (as part of the OxLAD project) that looks at the determinants of economic growth in the six largest economies in Latin America (Argentina, Brazil, Chile, Colombia, Mexico, Venezuela, or LA-6) post 1900. In a previous contribution (Astorga, 2010) we used a two-equation system to estimate jointly economic growth and investment, while controlling for trade openness (measured as a trade share on GDP) and other drivers. We found evidence of an overall negative conditional correlation between trade openness and GDP per head growth, but at the same time that openness had a positive link via investment.

Now, we would like to build upon this estimating framework to explore the role played by two interrelated factors on the economic growth outcome in the LA-6 over the long term: inequality and resource dependency. By doing so, some light can be shed on important questions. Has inequality been a serious impediment to growth in the region? If so, to what extent was inequality the consequence of resource dependency? A common belief is that high inequality in Latin America has been an important drag on long term growth but no rigorous evidence has been presented to support this claim. Also a recurrent topic both in academia and policy circles is that of the role of natural resources in economic growth and development. Have natural resources been a curse or a blessing for the Latin American economies? Was the model of integration to the global economy based on natural resources a contributing factor to increased inequality?

To my knowledge, there is no quantitative multi-country study dealing with the triad resources (trade)- inequality-growth over the whole XXth century in the region (with economic growth in the left-hand side of the regression equation). There are some works addressing similar issues in the region – particularly on the effects of factor endowments and trade on inequality - during the First Globalisation (e.g., Willebald, 2011; Arroyo, 2008; Williamson, 1999; Williamson & Bértola, 2003; Bértola et al 2010) and for the post 1970 period (e.g., Cornia 2011; López & Perry, 2008; Szequely & Sámano, 2012). The main reason for the absence of a long-span quantitative work involving inequality in the region was, until recently, the lack of consistent inequality estimates for the period.

Meanwhile, the study on resource dependency has a long tradition. The vent for surplus argument and the staple theory see a largely beneficial role for natural resources (Innis, 1930; Myint, 1958), particularly relevant during the first globalization period at the time when the land frontiers were expanding and mineral reservoirs discovered and exploited. An important lesson that Wright and Czelusta (2004) extracts from the successful resourced-based US development is that what matters most for resource-based development is not the inherent character of the resource, but the nature of the associated learning process. But more recently, particularly after the oil boom or early 1970s, the prevailing view is that resource dependency has become a curse for growth in many developing countries (e.g., Gelb, 1986; Neary & W, 1986; Sachs and Wagner, 2001; Isam et al., 2005; and Frankel 2010 for a recent survey). And for Latin American economies, particularly those rich in oil (Karl, 1997; Auty, 2001). Though Maloney (2002) argues the relative failure of Latin American countries in benefiting from natural resources is to be found in deficiencies in learning and technological adoption.

In what follows we give more details on the implications of considering inequality for economic growth in the region. We will deal with resource dependence in the next version of this paper which will also include a new set of measures including a Herfindhal index of export concentration since 1900 covering the top five commodities (see Annex 2), and natural resource exports by worker.

Contemporaneous inequality-growth link: an "inverted U" and other letters

The Kuznets curve hypothesis predicts an inverted U in the relationship between GDP per capita and inequality, with inequality increasing first as development (industrialisation) proceeds to reach a turning point and then will be reduce once economies reach a higher stage in their development path. Cross country studies (usually post 1960 at best) are inconclusive about the presence of a Kuznets curve - although the Kuznets hypothesis should be tested with time series or panel data. In some cases where such regularity is found, additional testing shows that is not robust to the inclusion of a dummy for Latin America. So this statistical result is taken as proof that an inverted U pattern in cross-country studies is a data illusion due to Latin American countries that are middle income and very unequal for reasons that has more to do with their colonial past than to the Kuznets hypothesis (Milanovic, 2011).

There are at least other two competing explanations for changes in income inequality: the Heckscher-Ohlin theory (H-O) and the Keynesian theory (FitzGerald, 2008).
The H-O model indicates that for a resource-rich economy with concentrated ownership such as Latin America, freer trade would result in a worsening income distribution. On the contrary a move towards is likely to lead to the opposite result to the extent that labour is a relative scarce resource. This approach implies a potentially changing inequality in response to variations in the relative abundance of resource endowments and in the degree of trade openness. The Keynesian explanation would imply that major changes in macroeconomic demand and investment affects employment and real wages, and so that booms would be associated with improved inequality and bust with a deterioration .

However, as FitzGerald (2008) points out, all three explanations predict a rather similar "N" shape for the evolution of inequality in Latin America over the XXth century. The Kuznets approach would not imply in this case a typical inverted U pattern because the industrialization process stagnated in the last quarter of the last century and workforce growth swell the urban informal sector with a likely worsening in inequality. Form the point of view of the H-O model, the trade-strategy cycle in the region with opening in the early decades, protection after the Great Depression and trade opening again in the last two decades would also be consistent with an "N" shape. Finally, the Keynesian explanation would imply a deterioration in the inter-war period as the region was dominated by adjustment and recession, improvement in the decades that followed the WWII and a final worsening of inequality in the two decades after the debt crisis.[2]

By contrast, the institutionalist approach would imply a stable inequality over time in Latin America because of the lingering effects associated with an institutional fabric that perpetuated inequality since the colonial period (Engerman and Sokoloff, 2000, 2002). But this prediction is somehow at odds with evidence on inequality during the first globalisation which indicates a rising trend from circa 1870 to 1920 in countries in the Southern Cone (Williamson, 1999, Bértola et al, 2008, 2010). Although the final

[2] Interestingly, Milanovic (2011) also identified a similar pattern in inequality (though he talks about a "reclined letter S") in the evolution of inequality in West Europeans countries and the US, with the declining portion of the "inverted U" curve transformed into a rising portion since the Thatcher-Reagan era.

decades of the last century shows high and roughly unchanged inequality, little is known about what happen in the middle decades.

Initial inequality and subsequent growth

Another task at hand is studying the potential impact of initial inequality on subsequent growth (e.g., Deininger & Squire, 1997; Barro, 2000). Four main factors are stressed in the literature, mostly operating via investment: credit-market imperfections, political economy (e.g. Alesina & Rodrick, 1994), social unrest (e.g., Alesina & Perotti, 1996), and savings rates. Because of offsetting forces, the net effect of inequality on investment and growth is ambiguous in theory, so an empirical work is necessary to clarify the significance and direction of the effect. Consistent with this ambiguity in theory, the findings of cross-country and panel regressions for a more recent period (post 1960) tend not to be robust (Barro, 2000; Benabou, 1996; Rodriguez, 2000).

To shed some light on this connection for the LA-6, we will test for the impact of inequality on growth both directly and via investment. The finding in Astorga (2010) of a significant and positive link between openness and investment suggests that the inequality may have acted to reinforce this link (a potentially growth benefit), or else that any negative impact is largely offset by forces such us market size and technological innovation. But this is something that needs to be confirmed by the data.

2. Methodology and data issues

Williamson (1999, 2002) estimated inequality indices as a ratio of GDP per worker to unskilled wages for the pre-WW2 period for a set of countries in the periphery (including Argentina, Brazil, Chile and Uruguay). Based on Williamson's inequality indicators, Prados de la Escosura (2007) constructed pseudo Ginis over the last century for Argentina, Brazil, Chile and Uruguay (and adding Colombia and Mexico since 1913). Frankema (2008) studied the pattern of change in the distribution of factor income in Argentina, Brazil and Mexico for the 1870-1940 period and long trends in wage inequality in the period 1913-2000 but only in the urban formal sector.

Williamson's pioneering work offers broad indicators of income distribution for a selected group of countries in the region, but they do not differentiate labour by skill

level, or allow for changing sectoral allocation of the labour force over time. These limitations are addressed in a set of estimates of earning dispersion for four skill groups that can be used to generate Gini coefficients (FitzGerald, 2008) for the 1900-2000 period for Argentina, Brazil, Chile, Colombia and Mexico. Although these values are approximations of the "true" income inequality, they have the advantage to make use of the long-run data available in a form that ensures consistency over time and between countries. However, one potential shortcoming of FitzGerald's earnings Ginis is that they rely on sectoral series of output per economically active person to estimate earnings levels in two of the four skills groups (see below). This implies well-functioning markets, a strong assumption for a developing region.

We will build on FitzGerald work aiming to make improvements to his earnings Gini estimates by using real wage series in agriculture and manufacturing rather than sectoral labour productivities. In addition, we estimate a similar series for Venezuela. That brings the total of countries to six, allowing for the use of panel data analysis to examine the growth consequences of inequality in the region.[3] Next we summarises the procedure used by FitzGerald (2008) to construct his earnings Ginis, and highlight which modifications we are introducing to calculate our series.

Methodology for the revised and extended earnings Ginis

The economically active population (EAP) is divided into four groups, which are themselves an aggregation of the categories used in the Panorama Social published annually by the UN Economic Commission for Latin America and the Caribbean. These four groups are shown in Table 1 below, which summarizes the ECLAC estimates for Latin America as a whole in 2000, which is the baseline for the estimations of the EAPs by group. The key variables are the share (n_i) of each group in the EAP, and the ratio (y_i) of mean income in that group to that for the EAP as a whole. From Table 1 it is also clear that apart from income, a key difference between the groups is their mean years of education, which can be taken as an indicator of the skills associated with that occupational category.

[3] We are considering adding Uruguay to our sample of countries. Two important data obstacles have been removed recently to make this possible. The estimation of Ginis for the whole period by Luis Bértola (2008) and new investment series from Xavier Tafunell.

Table 1: *Employment and earnings by occupational categories*
Latin America, 2000

i	Category	Share of EAP(n_i)	Income ratio to average (y_i)	Education (years)
1	Employers, managers and professionals	0.09	3.34	11
2	Technicians, administrators	0.14	1.21	8
3	Urban workers, artisans etc	0.41	0.85	6
4	Rural workers and servants	0.36	0.49	3

Source: UN/ECLAC Panorama Social 2000.

Then a functional income distribution defined as:

$$\sum_i n_i y_i = 1$$

The model is thus based on labour (wages) and capital (profits) only - although by implication natural resource rents privately gained are in Group 1 incomes.

There are relevant series for EAP by broad production sector based on primary census and enrolment data in OxLAD. These permit an estimation of the four EAP shares (n_i) for 1900-2010 taking 2000 as the base year, and applying four indicators (i.e. indexes with 2000 base) as follows:

- Group 1 (employers, managers and professionals). The indicator is the stock of university graduates as a proportion of the total of those with primary education. The stock of educational graduates is found using the perpetual inventory method applied to the data on enrolment in primary and tertiary education.
- Group 2 (technicians and administrators). The indicator is total employment in manufacturing and public administration as a proportion of the EAP. Manufacturing employment comes from census data and public administration employment is estimated from levels of government expenditure.
- Group 3 (urban workers, artisans etc) are estimated as the residual from the other three groups. This is not just a statistical convenience, but is rather intended to reflect t he process of internal migration, with the urban 'informal' sector acting as a sponge for surplus underemployed labour in the economy.
- Group 4 (rural labour and domestic servants). The indicator is the agricultural share of the EAP, from census data. This includes not only agricultural workers as such,

but also small farmers (i.e. peasants) and family labour on a non-wage basis. Rural women are the main source of domestic servants.

Relative income levels (y_i) are expressed as the ratio of average income in that Group to the mean for the whole EAP.

- Group 1. The aggregate income share for the group is defined as the residual after aggregate incomes for the other three groups: this is then divided by the respective proportion of the EAP to yield the relative income level:

$$y_1 = \left\{1 - \sum_{2}^{4} n_i y_i \right\} / n_1$$

- Group 2. Income levels of this group are calculated based on real wage series in manufacturing (see Annex 1). While FitzGerald uses the trend in non-agricultural productivity (sourced from OxLAD implying that labour markets in this category clear and thus changes in relative earnings reflect changes in productivity.
- Group 3. Earnings levels in this group are estimated from real wages series for urban unskilled labour (see Annex 1), which in many cases is the official minimum wage, and scaled to the overall GDP/EAP ratio. This measure is essentially that used by Williamson (1999).
- Group 4. Earnings levels are estimated using the series of real wages in agriculture (see Annex 1) as reflecting earnings by unskilled workers in rural areas. FitzGerald uses the trend in agricultural labour productivity (sourced from OxLAD) implying that labour markets in this category clear.

The 'trapezoid method' is employed to estimate the 'four group' Gini coefficient (G_f) from a spline function derived from the data generated by the model (Gastwirth & Glauberman, 1976):

$$G_f = 1 - [y_4 n_4 (2 - n_4) + y_3 n_3 \{2(1 - n_4) - n_3\} + y_2 n_2 (n_2 + 2n_1) + y_1 n_1^2]$$

As FitzGeral points out, because this Gini is for the personal incomes of only four EAP groups, it needs to be adjusted both for the earner/household ratios and intra-group dispersion. To the extent that poorer households generally have fewer income earners, the household Gini will be underestimated and indeed the dependency ratio in Latin America has changed considerably over the century. However, work on intra-group

dispersion in Latin America for recent decades shows that the intra-quartile Gini is much more stable than the inter-quartile value (Lopez & Servan, 2005).

3. Preliminary results

This section presents graphically the preliminary estimates for our earnings Gini series. For each country we depict the new series (Earn-Gma5) together with – except Venezuela - series estimated by FitzGerald (2008) adopting a similar procedure (Ftz-G) from 1900 to 2000, the Williamson measure (i.e., the ratio of GDP per capita to the real urban wage) from 1900 to 1940 (W-ratio). All series are five-year moving averages. We also include available household Ginis (HH-G) from Altimir (see Thorp, 1998, Statistical Appendix), Szekely data set and ECLAC. The comparison is completed with the inclusion of the 1920 Gini estimates from Bértola et al (2010) for Argentina, Brazil and Chile, and Rodríguez Weber series for Chile in the 1900-30 period.

Two aspects to highlight of the estimation procedure:

- Chile 1900-1930. We are adopting the estimates of Rodriguez Weber (2008) – RW. Our estimates fit very closely those of RW during 1916-1930, but show a divergence before 1916.
- Mexico 1911-1920. Because of the distortions caused by the hyperinflation during the revolution as well as data limitations we opted to estimate separately the earnings Gini for the 1900-1910 period using the data available on nominal wages and GDP from the "Estadísticas del Porfiriato" (see Annex 1). Then, we constructed Gini values from 1921 onwards by linking wage series to the benchmark PREALC series for the 1965-1980 period. This means that the levels pre-1910 may not be fully comparable with those after1920.

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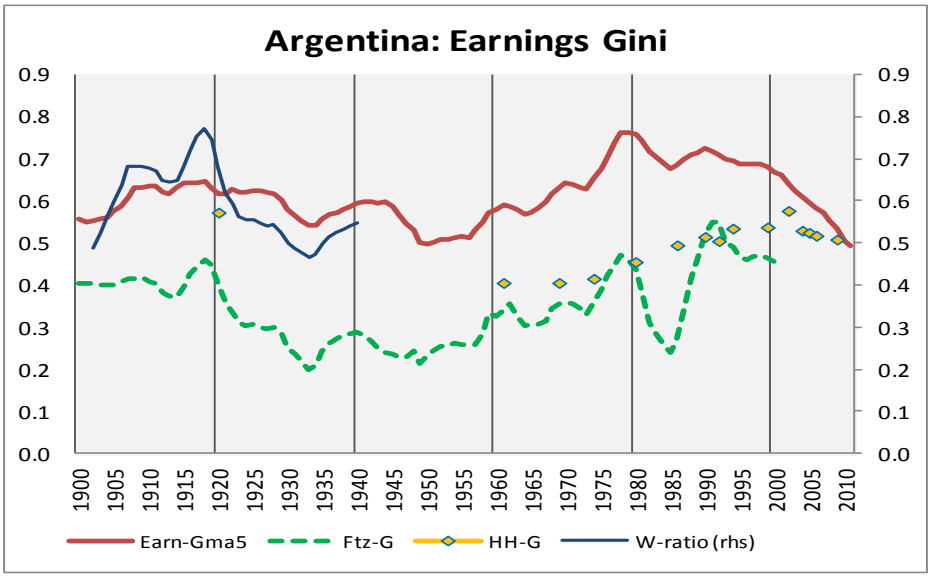
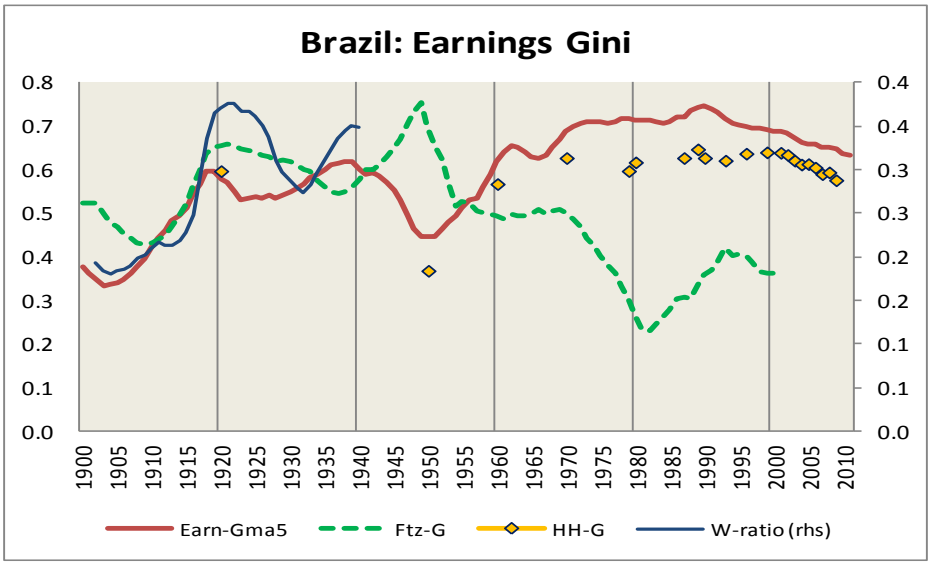
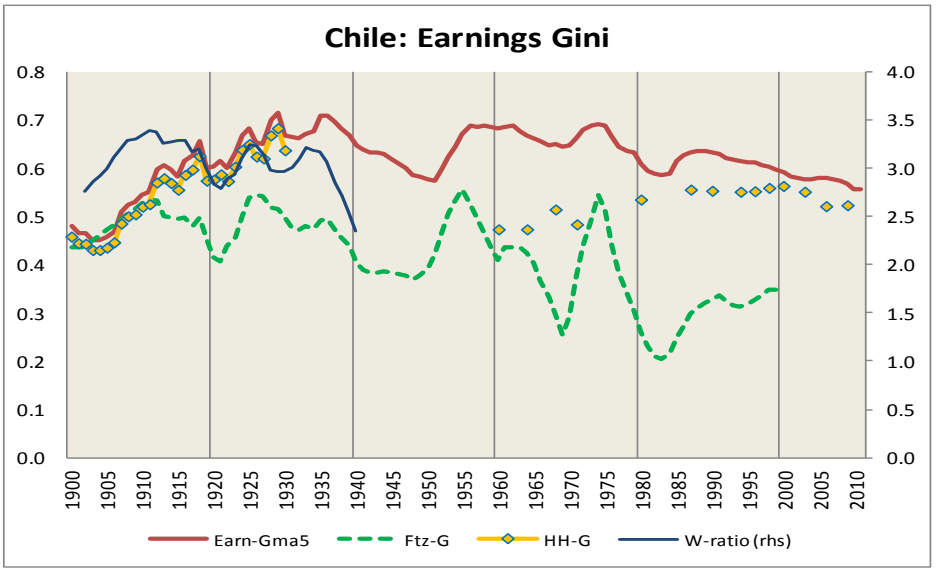
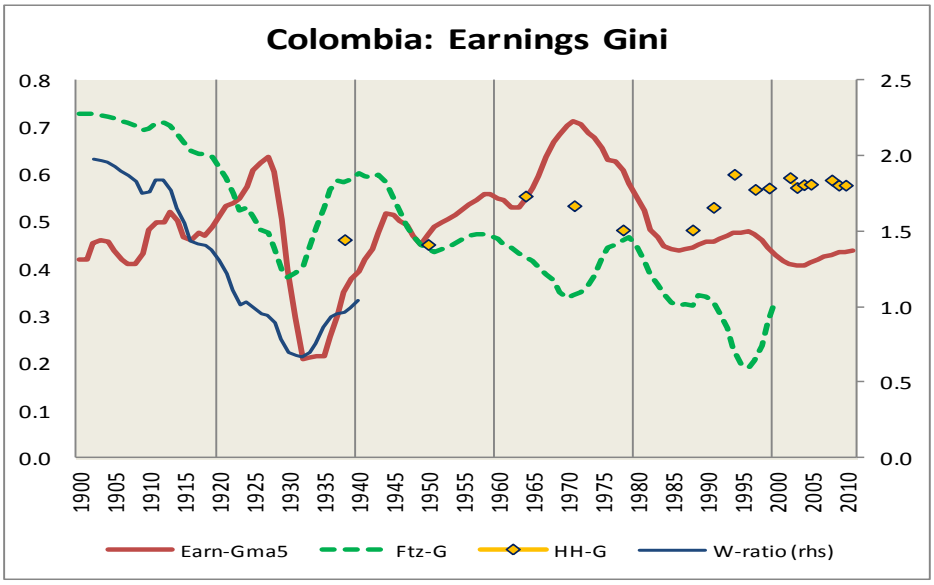
Charts 1a: New earnings Ginis series and comparisons

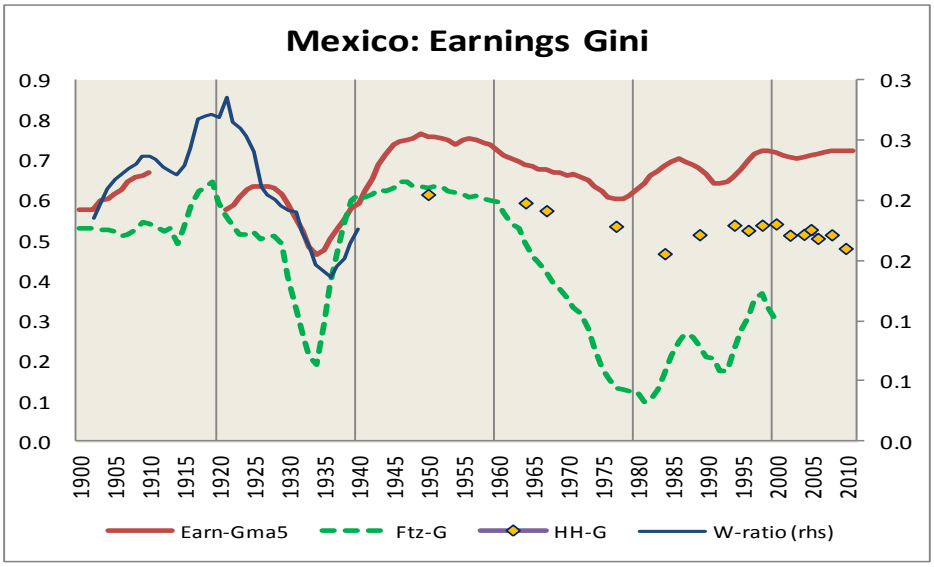


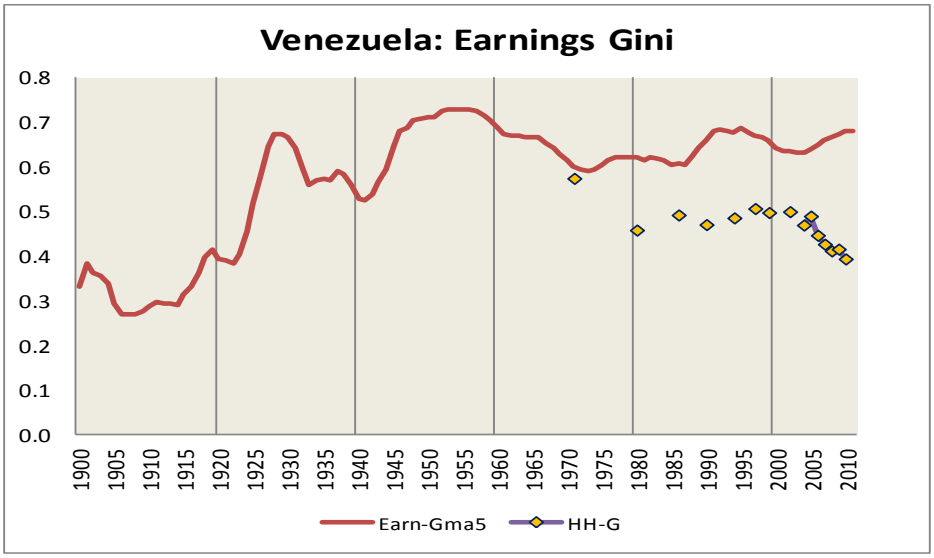




Charts 1b: New earnings Ginis series and comparisons







Comparisons among the inequality series:

- For the post 1950 years our series fits reasonably well the trends and fluctuations observed in the household Ginis available, especially in the case of Argentina, Brazil, Chile and Mexico. This gave us some reassurance that the early estimates can also be a good proxy for the "true" income inequality during the first half of the last century. Note that ours reflects inequality before net taxes and transfers, whereas the household Ginis are based on disposable income after net taxes and transfers. This means that our estimates tend to underestimate the observed narrowing in inequality in the last decade on the new century (e.g. in Venezuela).

- The comparison between our series and those calculated by FitzGerald show enough differences, both in terms of trends and fluctuation, to justify the construction of the new set of series with superior information (i.e., substituting real wages for sectoral labour productivity) but with the use of the same methodology. They also do a better job than FitzGerald´s series in matching developments in the household Ginis.

- With the exception of Colombia, the new series tend to be consistent with the Williamson ratio (1900-40), particularly by showing an increasing inequality trend to about 1920. This give additional support to claims that the First Globalisation brought about a significant worsening in inequality and that the colonial roots may have played a lesser role than that implied by the institutionalist approach in accounting for high inequality levels observed in the closing decades of the last century.

- Regarding the consistency with Bértola et al (2010) estimates for 1920, little can be said because there is no trend to compare with. The authors provide another data point circa 1870, but any interpolation between those two points can be largely misleading. However, there are two potential implications. First, according to our series for Brazil, 1920 appears as an outlier of an otherwise rising trend during the first three decades of the last century or so. This would suggest that 1920 is not a typical year to measure prevailing inequality levels in the country at the time (Bértola et al report a high Gini of 0.597). Secondly, if there is an upward bias in the 1920 estimate, their 1872 estimate for Brazil (0.548) would suggest that the First

Globalisation did little to worsen inequality in the country - or even that inequality could have been reduced during the period.[4]

Trends, peaks and fluctuations

- Our estimates indicate a significant inequality reduction during the Great Depression in Colombia and Mexico and, to a lesser extent, in Argentina and Chile. One possible explanation of this result is the combined action of nominal wage rigidity and deflation (all four countries experienced deflation in the early 1930s) boosting real wages at the expense of unemployment. Whereas, this effect tends not to be reflected in the GDP per worker series that in most cases shows a contraction. As a consequence, earnings of group 1 (employers, managers & professionals) – which is calculated as a residual – shrink considerably. But note that because we are using economically active persons rather than employment series to calculate the shares of each occupational group as well as to calculate GDP per worker, our earnings Ginis tend to overestimate a reduction in inequality at times of high unemployment such as during the Great Depression.

- The 1970s tend to be dominated by a high level of inequality with a peak in Argentina, Chile and Colombia. The decades of the 1930s, 1940s and the 1970s are sources of fluctuations in inequality. If the narrowing trend in the former can be associated with rigidities and multiple exchange rates (allowing for a currency overvaluation), the worsening trend during the latter period could have been influenced by hyperinflation in Argentina, Brazil and Chile hurting wages. In both cases, it could be argued that the fluctuations responded to unstable macroeconomic policy, and that the effects are not part of a secular trend in inequality.

For the calculation of overall inequality in the region we add the Bértola´s series for Uruguay. This allows us to produce averages - simple and population weighted - for seven Latin American countries (LA-7). We also calculate the average inequality curve for the Southern Cone. This separation is of interest because this group of countries industrialised relatively earlier and could display different inequality-growth dynamics.

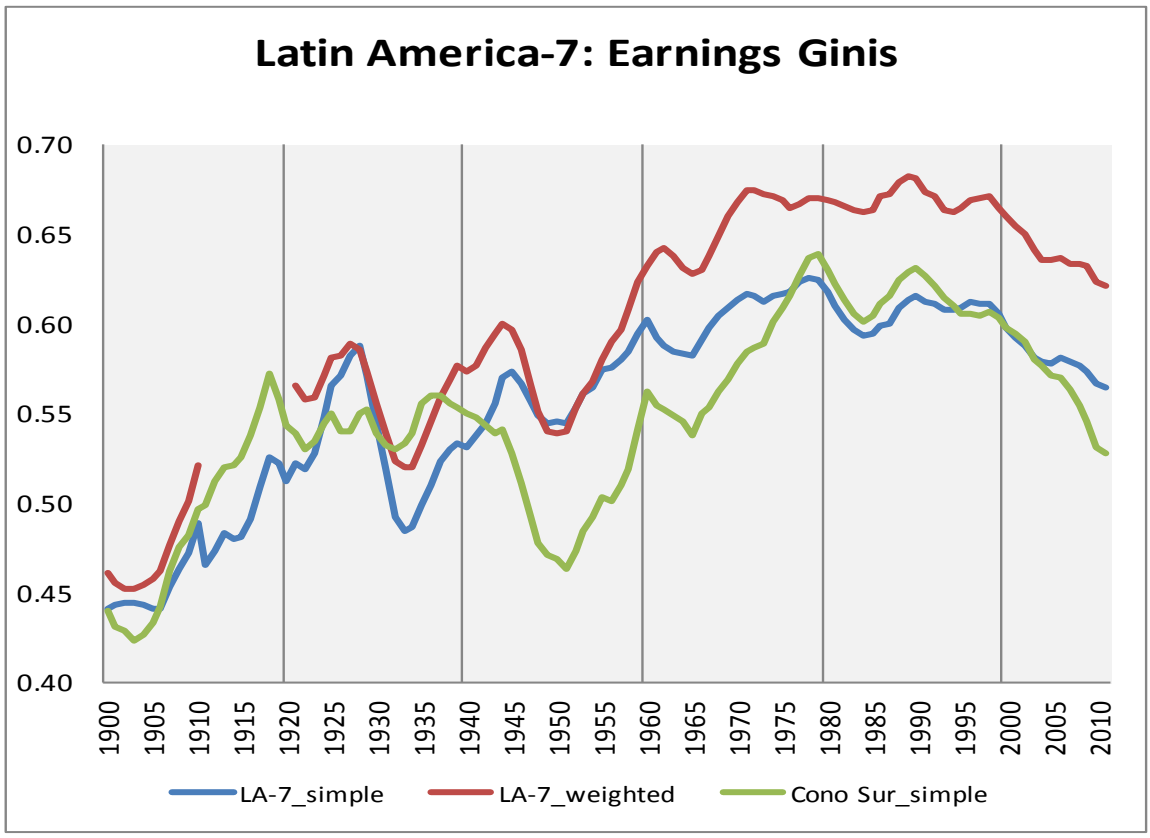
[4] However, this apparent paradox may not arise with the original 1872 Gini of 0.366 as reported in Bértola et al, 2008, which would indicate a worsening in inequality in 1920 relative to 1872 - even after adjusting for a potential upward bias in their 1920 estimate.

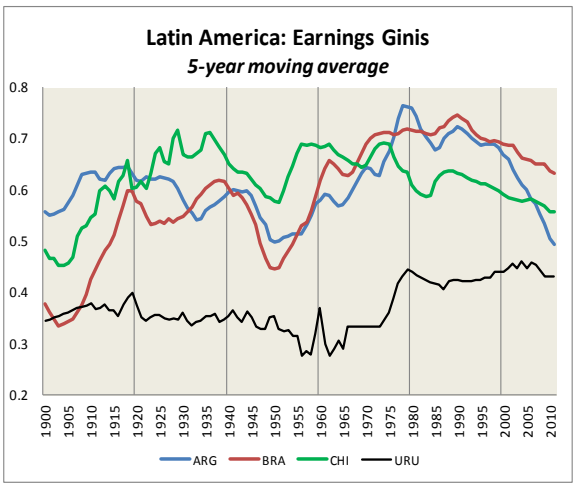
The following chart includes three regional averages for the LA-7: simple average and population weighted for the LA-7, and a simple average for the Southern Cone (all series are 5-year moving averages). We also include the summary of our earnings Gini series by country plus Uruguay.

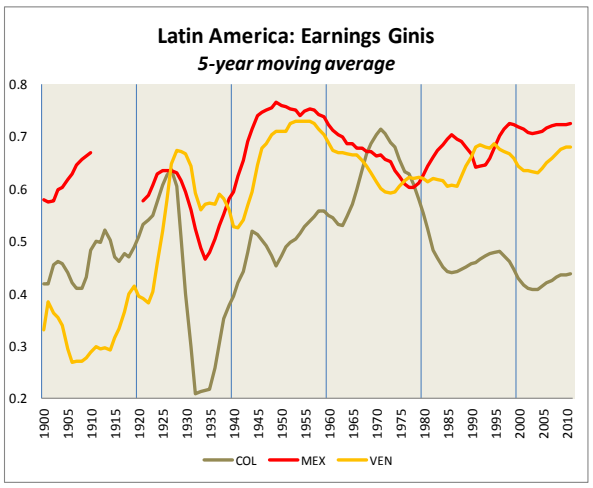
- The LA-7 aggregates seem to confirm the presence of an "N" shaped curve for the period 1900-2000 as argued by FitzGerald, with turning points circa 1930 and 1960. So increasing inequality during the earlier decades can equally be attributed to the First Globalisation, the industrialisation process (particularly in the Southern Cone and Mexico) and the dominance of an adverse macroeconomic environment (bust). Then the improvement of inequality that follows could be explained in terms of protectionist policies favouring urban workers, the start of a declining trend of the Kuznets process, or an expansionary macroeconomic environment.

- However, the period of narrowing inequality is relatively short-lived, as by the early 1960s the countries tended to return to the early peak in inequality during the 1920s. Indeed, the explanations behind an "N" shape point to a second turning point around mid 1970, not 1960. Then inequality levels reached a plateau circa the debt crisis that lasted about two decades before beginning to decline with the turn of the new century. When considering the extended period to 2010, the curve turns into an "M" shape. These shapes are more pronounced in the case of the Southern Cone countries, indicating that the overall pattern in the LA-7 is driven by that group of countries.

Charts 2: Aggregate inequality series







4. Final remarks

We have presented an improved and expanded set of earnings Ginis for the period 1900-2010. The calculation of this inequality indicator required assembling a consistent set of real wage series for agriculture, manufacturing and the urban sector for our six Latin American countries. This basic data is still preliminary. Though we believe that we are already taking into account most of the data available, there is still room for improvement in some countries and periods (e.g. manufacturing wages in Mexico in the years around 1930, and overall better data for urban wages in the last two decades or so). We may also need to fine tune some of the assumptions made to complete the series when data was lacking (e.g., in Brazil during late 1920s and early 1930s and in Venezuela in early decades). However, these potential changes are unlikely to result in a radical alteration to the results presented here.

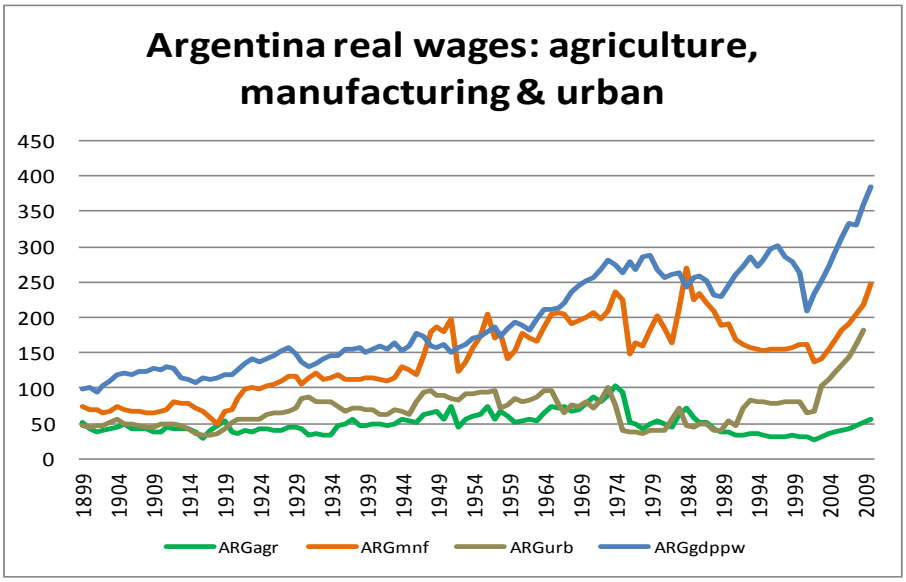
The next step is to use the inequality series, together with newly constructed indicators of resource dependency, to test their growth impact in a 5-year panel data regression based on a two-equation estimating framework. For the period 1900-2010 this would mean 138 observations (23*6). However, to allow comparability with previous outcomes, we may also offer results only for the XX^{th} century (126 observations). We will adopt a similar estimation strategy as in Barro (2000) – though using a different specification. The departure point is a general framework to test for the main determinants of economic growth. Then this framework is modified or augmented to make room for additional effects operating via the new variables of interest.

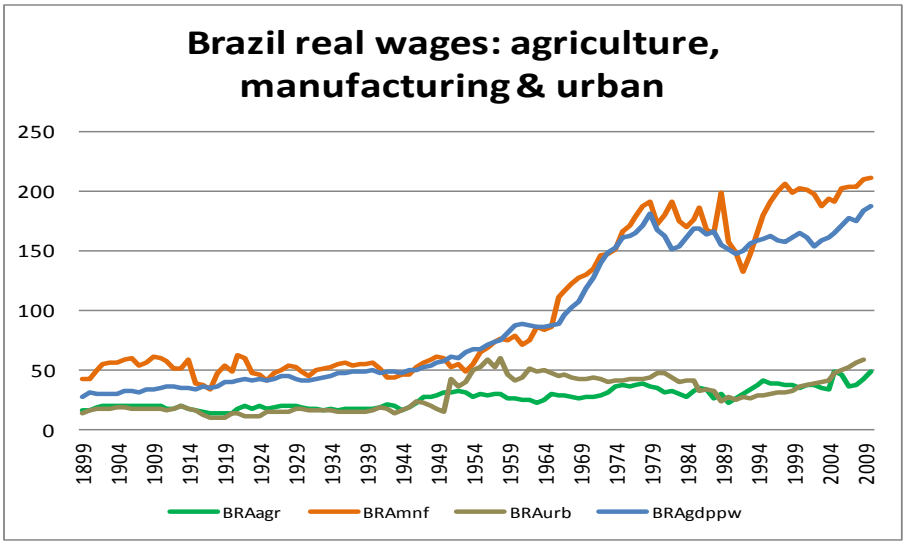
Annex 1: Real Wage Series by Sectors

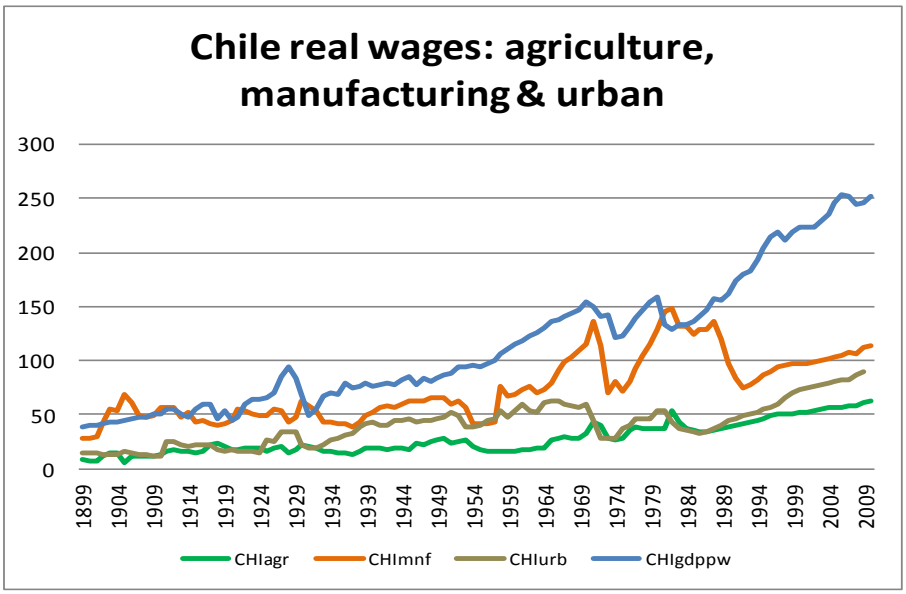
The core values for the wage series are provided by PREALC (1983).
This offers comparable data on nominal and real wages by sectors (agriculture, manufacturing and construction) as well as minimum urban wages for18 Latin American countries including our LA-6. The period covered by PRELAC ranges in most cases from 1965 to 1980. Real values are at 1970 prices in local currencies. To complete our wage series for the whole 1900-2011 period, we splice wage series from other sources to the core PREALC values by applying rate of growth backwards from circa 1965 and forward from circa 1980. In order to make the levels of the series comparable across countries we calculate PPP$ values using the PPP exchange rates available for 1970 (ECLA).

The monthly GDP per worker series are calculated as follows. First we calculate an average monthly wage from our series in 1970. Second, we use information on the wage share on total income in that year in order to calculate a GDP per worker value in 1970 consistent with our estimated average wage level. The wage rates are assumed to be 40% in Argentina, Chile, and Mexico. For Brazil we use 35% which is the average value reported for circa 1990 (IBGE), 45% for Colombia (average share of salary income on total household income during the period 1950-1970, from DNP) and for Venezuela 47% from Baptista (1997). Then we use the growth rate of the original GDP per worker (at 1970 prices) to go back to 1900 and forward to 2011. Next we present the charts by country, showing four series: real wages in agriculture, manufacturing and urban sector, as well as the series of GDP per worker. This is followed by detailed information by country on methodology and sources.

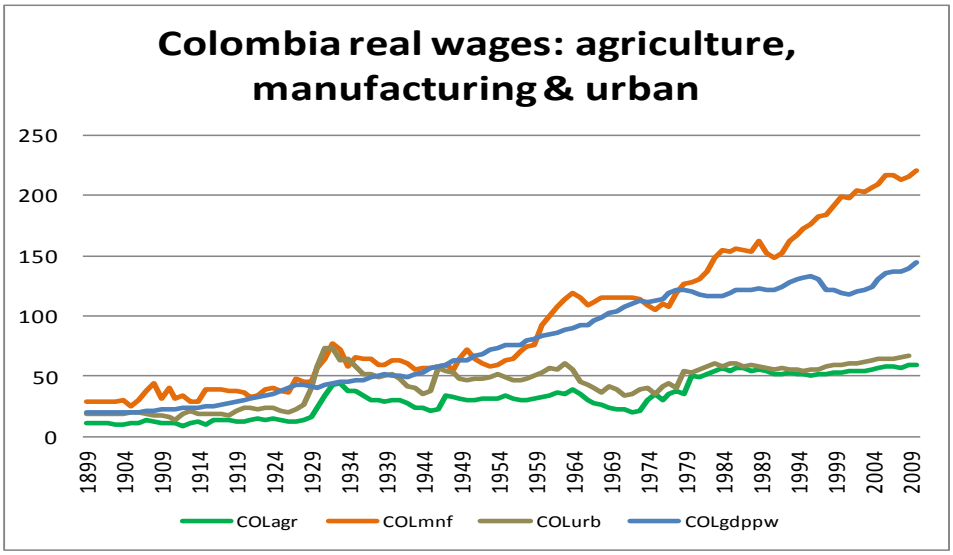
Charts 3a: real wage by sectors and GDP per worker for the LA-6

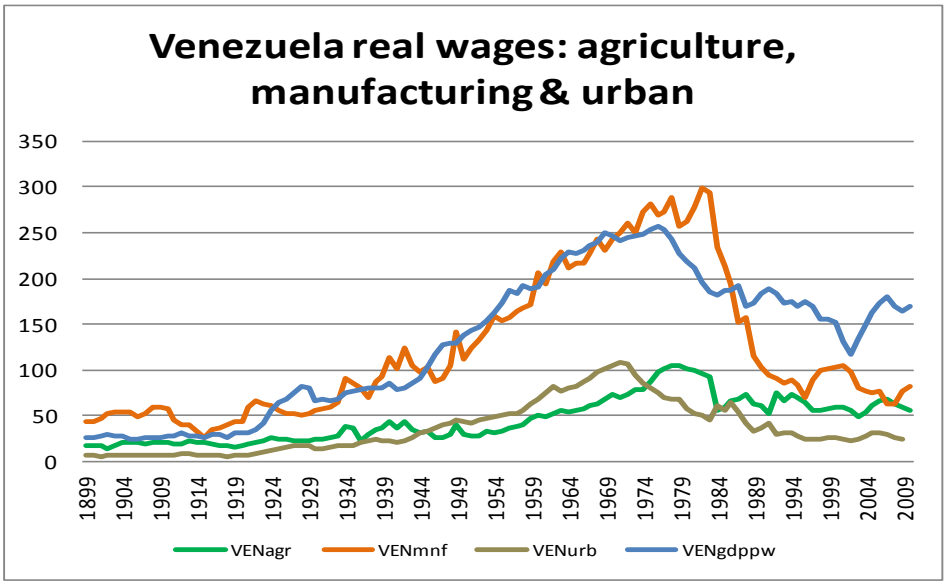




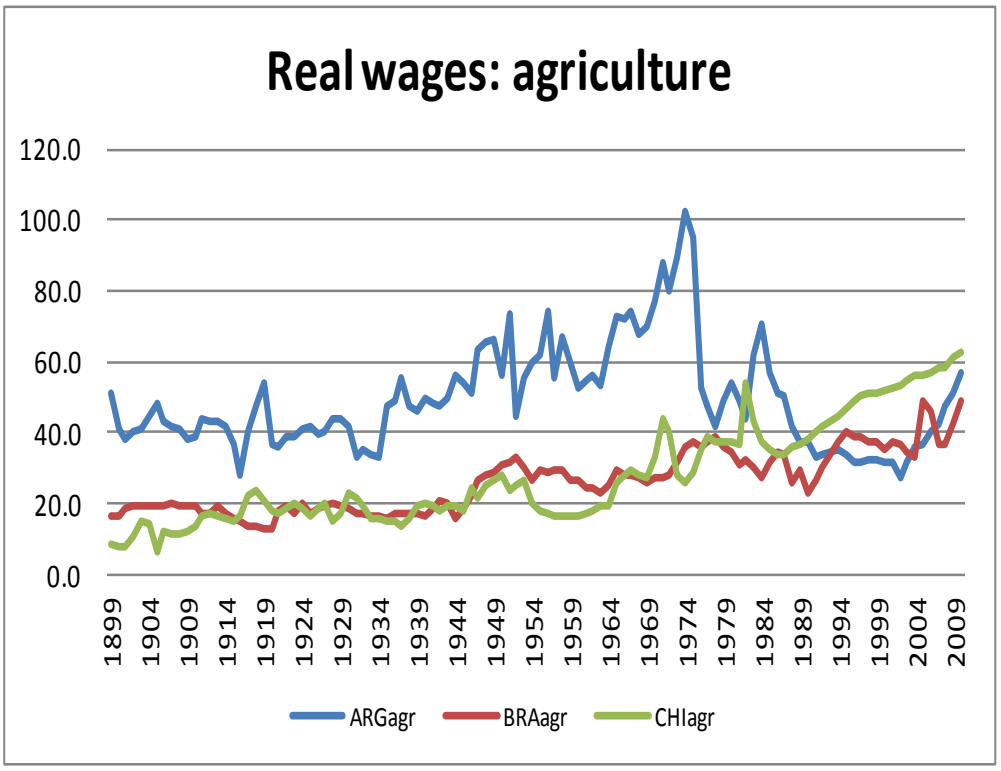


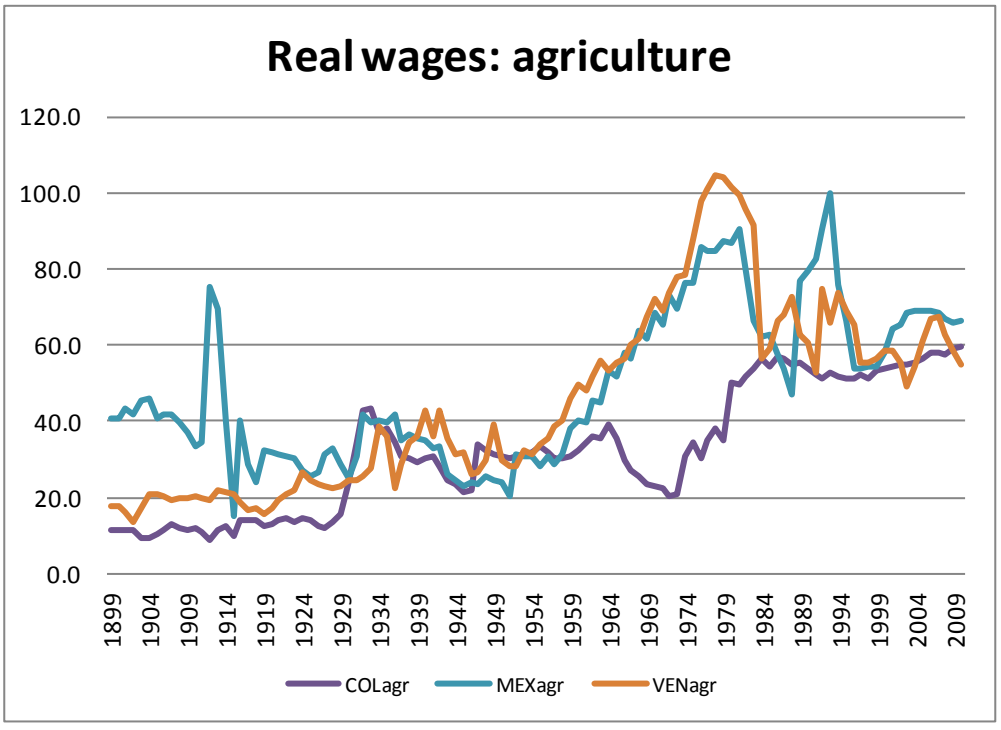
Charts 3b: real wage by sectors and GDP per worker for the LA-6



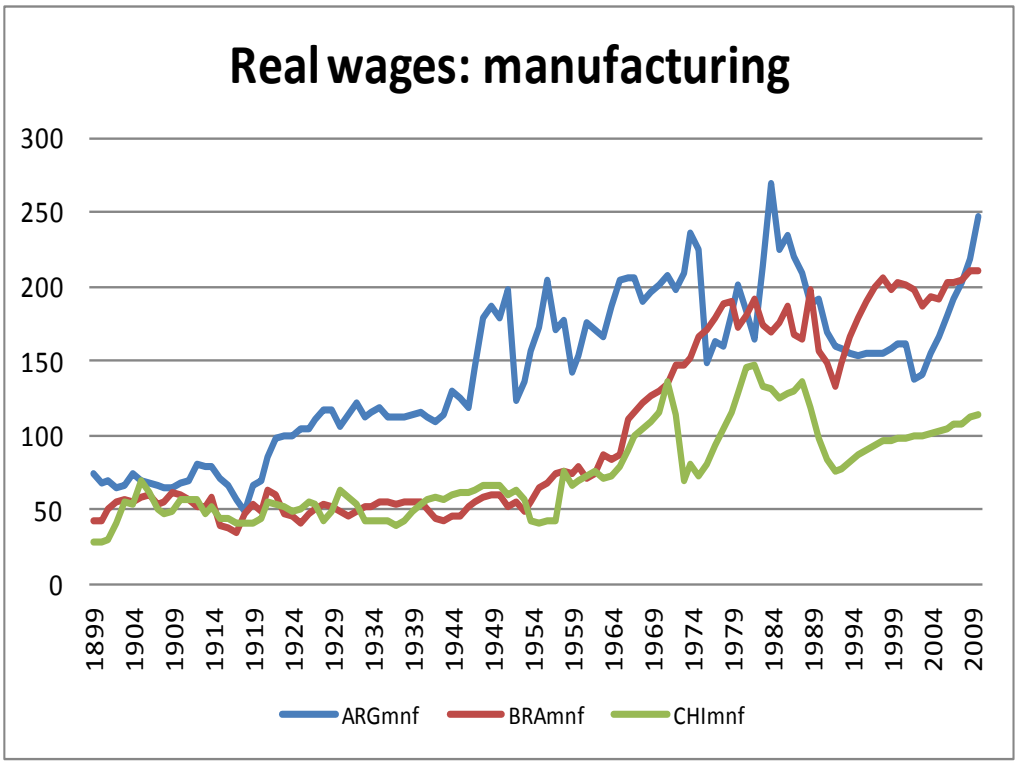


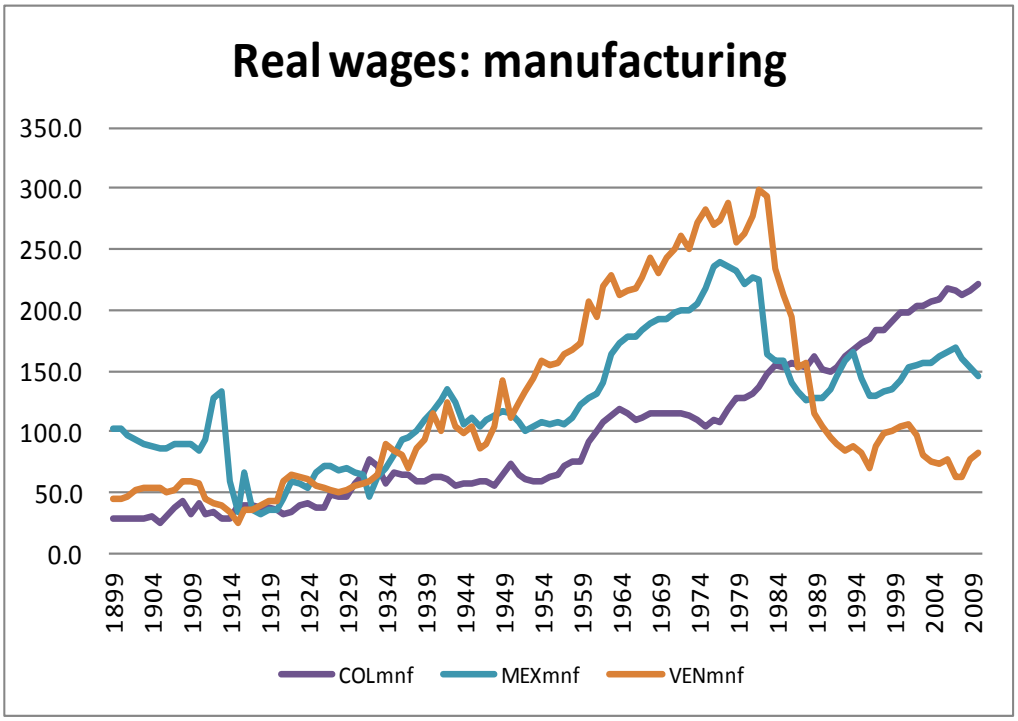
Charts 4a: real wage in agriculture in the LA-6





Charts 4b: real wage in manufacturing in the LA-6





Argentina

Agriculture/rural:

1900-1913: real rural salaries from Cortes-Conde (1979).

1913-1965: average wage in agriculture from IEERAL(1986). *This series is also available to 1984.*

1965-1980: real wage for the unskilled worker in agriculture (national level) at pesos of 1970 from PREALC.

1980-92: real wages in agriculture, australes at 1984 prices from OECD data set.

1992-1995: we could not find specific wage data for agriculture so for these three years we are using the rate of growth of nominal industrial salaries (see below for sources).

1995-2011: nominal monthly earnings in agriculture from *Ministerio del Trabajo* website.

Manufacturing:

1900-1940: average monthly industrial salary in pesos at 2004 prices from Ferreres (2005). *This series is also available to 2004.*

1940-1970: real monthly wage in manufacturing (australes at 1984 prices) from OECD data set. *This series is also available to 1992.*

1970-1979: real average wage (paid) in manufacturing (national level) at pesos of 1970 from PREALC.

1979-1992: real monthly wage in manufacturing (australes at 1984 prices) from OECD data set.

1992-1995: ECLAC index of industrial monthly wages (blue collar worker) at constant prices.

1995-2011: nominal monthly earnings in manufacturing from *Ministerio del Trabajo* website.

Minimum urban:

1900-1913: uses the rate of growth on the rural wage (see above).

1913-1965: real average wage (australes at 1960 prices) excluding agriculture and government from IEERAL. *Series also available to 1984.*

1965-1980: urban minimum real wage (pesos of 1970) from PREALC.

1980-1986: minimum real wage index (2000=100) from ECLAC.

1986-1990: real average real wage index (2000=100) from ECLAC.
1990-2004: minimum urban real wage index (1990=100) from ECLAC.
2004-2011: real average wage index (2000=100) from ECLAC.

Deflators. In those cases when the original wage data are in nominal terms we use a deflator from the following sources:
1900-1980: uses CPI sourced from OxLAD. 1980-2006 from INDEC.
2007-2011: use the implicit GDP deflator to correct for the underreporting in the official CPI inflation figures.

Brazil

Agriculture/rural:
1913-1919: minimum rural daily wage index in the Sao Paulo region from Cardim (1936). For 1911, 1921, 1924 and 1934-1939: uses the average of daily rural wages for "unskilled farm workers" (*trabalhador da enxada*) in milreis for five representative states, namely: Bahia, Minas Gerais, Pernambuco, Rio de Janeiro, and Sao Paulo (BR5). There is no data available for Rio de Janeiro in 1911 and 1920 and for Sao Paulo in 1911. In these cases we made estimates based on proportionality with data available for other regions. Also we are not including the data point for Sao Paulo in 1934 because is an outlier and distorts the media for the year.
Sources for 1911,1920 & 1921: Resumo de varias Estatisticas Economico-Financieras. 1924. Ministerio da Agricultura, Industria y Comercio. Rio de Janeiro. 1924. Sources for 1924, 1934-1939: IBGE Anuário estatístico do Brasil. Rio de Janeiro.

1940-1948: uses the rate of growth of minimum real wage series from Camargo (1984). An alternative is to use the series of minimum wages in rural areas for BR5 sourced from IBGE Evolução do Salário Mínimo Regional - 1940/1984. But the use of the latter series produces a level of real wage during the earlier decades of the century that are significantly above those of Argentina.
1948-1965: earnings from the unskilled worker in agriculture (remuneração do trabalho agrícola - diarista) from the Instituto de Economia Agrícola (IEA) – available at IPEAdata website.

1966-1978: average monthly real wage in agriculture (cruceiros of 1970), national level, from PREALC.
1978-2011: earnings from the unskilled worker in agriculture from IEA (based on Abril and November data for Sao Paulo region).

Assumptions and interpolations:
1900-1912: growth with series of nominal value added in agriculture per economically active worker. Al alternative is to use the series of nominal urban wage in Pernambuco from Williamson dataset, but this series for this period is largely based on interpolations. The figured for 1912 and 1913 are assumed to be equal to the data point of 1911. Then the series is spliced with the index provided by Cardim. Figures in 1920, 1922-23 are interpolated.

There is a data gap between 1924 and 1934. Clearly an interpolation here can be very misleading as it would ignore a very likely turning at the start of the Great Depression. We opted not to use the Williamson's salary series for two reasons. First, they are not likely to be a food proxy for the rural wage; and second, there are some inconsistencies in this period. They show a real increase of 50% between 1924 and 1930 in Rio de Janeiro (with a peak in 1930) but a 35% fall in Pernambuco in the same period (a peak in 1926).

Until better information for the period is available we are working with the hypothesis that there is a peak in 1928 and then a decline during the early years of the 1930s – a similar hypothesis is adopted for manufacturing real wages (see below). This pattern is consistent with the behavior of meat consumption per capita in Rio de Janeiro (IBGE) and beer production per capita – largely for internal consumption - for Brazil overall (Mitchell, 2003). We have no data for 1940 so its value is made equal to the 1939 one.

Manufacturing
1913-1919: index of minimum rural daily wage in the Sao Paula region from Cardim (1936). For 1920, 1928: average wage in industry from industrial censuses on those years.
1937 average manufacturing monthly salary for Brazil from IBGE Anuário Estatístico do Brasil (AEB).

For 1942-54: wages of blue collar workers in industry (salário dos operários) - from IBGE AEB 1941/1945-1954. Rio de Janeiro: IBGE, v. 6-15, 1946-1954.
1946-76: average hourly earnings in manufacturing from Mitchell (2003)
1968-1979: average monthly real wage in manufacturing (cruceiros of 1970), national level, from PREALC.
1979-2010: calculated based on the annual rate of growth of the average nominal wage in manufacturing, São Paulo region. Sourced from Federação e Centro das Indústrias do Estado de São Paulo (available at Ipeadata). This source also offers annual rate of growth of real wages in manufacturing, but its use results in an exponential rise that looks unlikely.

Assumptions and interpolations:
1900-1912: the series for nominal wages growths in line with the nominal urban wage in Rio de Janeiro from Williamson dataset.
Interpolations: 1921-27; 1929-36; 1938-41. The value for 1920 is assumed to be equal to the data point of 1919. This assumption is necessary to be able to link the Cardim's series with the value from the 1920 industrial census.
We assumed that the real wage series peaks in 1928 (data point). Then we use the rate of growth of meat consumption per-capita in Rio de Janeiro (IBGE) to proxy the real wage from 1928 to 1939. The next data point available for industry is in 1942. In order to link both series we use the rate of growth of the minimum wage between 1940 and 1942 and assumed the value of 1939 equal to that of 1940.

Minimum urban:
1900-1937: real wage in Rio de Janeiro (index, 1913=100) from Williamson dataset.
1937-1940: average hourly earnings in manufacturing from Mitchell (2003).
1940-1947: minimum real wage from Camargo (1984).
1947-1960: nominal minimum wage in Rio de Janeiro
1960-1965: growth in line with the average hourly earnings in manufacturing from Mitchell (2003).
1965-1980: urban minimum monthly real wage (cruceiros of 1970) from PREALC.
1980-1990: minimum real wage index (2000=100) from ECLAC.
1990-2004: minimum urban real wage index (1990=100) from ECLAC.
2004-2011: real average wage index (2000=100) from ECLAC.

Deflators. In those cases when the original wage data are in nominal terms we use a deflator from the following sources:
1900-2000: for the sake of inter-temporal consistency we decided to use the implicit GDP deflator estimated by IBGE as our measure for the country's internal price index. The same choice was made by Fiorencio & Moreira (1997) in their study of the real exchange are during the period 1947-1995.
During the hyperinflation years of the late 1980s and mid 1990s, we noticed that the use of the "IPC ampliado" (IBGE) results in a discontinuity circa 1989. This problem is not present in the GDP implicit deflator.
2000-2011: uses CPI inflation from IBGE.

Chile

Agriculture/rural:
1900-26: Matus (2009, Anexo 9), daily real wage for unskilled worker (*jornal del peon rural real*) at 1913 prices.
1926-65: Mitchell (2003), minimum daily rates per adult male. Series runs up to 1986.
1965-80: minimum real wage in agriculture in pesos at 1970 prices from PREALC.
1980-1986: Mitchell (2003), minimum daily rates per adult male.
1986-93: INE nominal wages of non-specialised workers.
1993-2009: INE nominal wages for unskilled workers
2010: ECLAC real minimum wage.

Manufacturing
1900-28: Matus (2009, Anexo 9), daily average real wage in industry ((*jornal diaro industrial ponderado real*) in pesos of 1913.
1926-65: Mitchell (2003), average daily nominal earnings in manufacturing. Series runs up to 1998.
1965-80: average real wage in industry at national level in pesos of 1970 from PREALC.
1980-92: average daily nominal earnings in manufacturing from Mitchell (2003).
1992-2004: index of real average monthly wages in manufacturing from ECLAC.
2005-2010: INE index of hourly earnings in manufacturing.

Minimum urban:

1900-1927: average nominal wage for a selection of unskilled workers in the public sector (includes *portero, mayordomo and mensajero*) from Rojas (1982 – see in Díaz et al, 2003).

1927-55: index of nominal paid nominal wages for unskilled workers from Díaz et al (2003).

1955-1965: average nominal daily wages by insured employees (all activities) from Mamalakis (1980). Tabla 14.5 (taken from Díaz et al, 2003).

1965-1980: minimum urban wage in pesos of 1970 from PREALC.

1980-1990: minimum real wage index (2000=100) from ECLAC.

1990-2004: minimum urban real wage index (1990=100) from ECLAC.

2004-2011: real average wage index (2000=100) from ECLAC.

Deflators. In those cases when the original wage data are in nominal terms we use a deflator from the following sources:

1900-1927: Mamalakis (1983). Figures taken from OxLAD.

1928-2011: Chile's Instituto Nacional de Estadísticas (INE).

During the 1970-1977 period the original INE series was corrected using the information provided by Cortazar & Marshall (1980).

1971-1972: The rate of inflation in 1971 was calculated by applying the same adjustment used by Díaz et al (2003) in the estimation of the December-December series. For 1972 we assume a correction factor that reflects the lower acceleration in annual inflation relative to the year-end values.

Colombia

Agriculture/rural:

1900-02: grows in line with GDP per worker.

1902-18: daily nominal wage for unskilled worker (*chapolero*) in Hacienda Jonás - in Antioquia – from Palacios (1984).

1918-38: nominal wages for unskilled workers in the public sector from López Uribe (2008).

1938-48: average daily real wages in the coffee sector in the regions of Viejo Caldas, Valle del Cauca and Antioquia from Arango (1982).
1948-65: average daily rates per adult male in agriculture from Mitchell (2003).
1965-80: minimum daily real wage in agriculture in pesos of 1970 from PREALC.
1980-2010: overall real minimum wage index (2000=100) from ECLAC.

Manufacturing
1900-04: assumed equal to the 1905-07.
1905-10: average daily nominal wage (based on four occupations) in Fábrica Fenicia from Urrutia & Arrubla (1975)
1910-24: real wages for skilled workers in the public sector from López Uribe (2008).
1924-38: Average real wage in industry from Echavarría (XXXX).
1938-65: non-agricultural daily earnings to 1953; average hourly earnings in manufacturing to 1965 from Mitchell (2003).
1965-80: average real wage in manufacturing at national level from PREALC.
1980-90: average hourly earnings in manufacturing from Mitchell (2003).
1990-2011: index of average wages in manufacturing (including coffee processing) from DANE.

Minimum urban:
1900-05: grows in line with GDP per worker.
1905-50: average wage for unskilled workers in the public sector from López Uribe (2008).
1950-1965: uses the rate of growth of the average real wage in agriculture.
1965-80: minimum urban wage in pesos of 1970 from PREALC.
1980-1990: minimum real wage index (2000=100) from ECLAC.
1990-2004: minimum urban real wage index (1990=100) from ECLAC.
2004-2011: real average wage index (2000=100) from ECLAC.

Deflators. In those cases when the original wage data are in nominal terms we use a deflator from the following sources:
Uses GRECO after 1905. During the period 1900-1905, inflation estimates are from López Mejía (1990).

Mexico

Agriculture/rural:

1900-10: daily nominal minimum wage in agriculture from Estadísticas Económicas del Porfiriato.

1921-25: daily nominal minimum wage in agriculture from Estadísticas Económicas del Porfiriato.

1925-34: real wage series for Mexico from Williamson dataset. During this period Williamson uses Alzati series of minimum yearly agricultural wages in Oaxaca state.

1934-65: minimum nominal wage for regular day workers in agriculture from Mitchell (2003).

1965-80: minimum daily real wage in agriculture – national level - in pesos of 1970 from PREALC.

1980-88: minimum nominal wage for regular day workers in agriculture from Mitchell (2003).

1988-2004: nominal earnings per month in agriculture from ILO.

2004-2010: minimum real wage index (2000=100) from ECLAC.

Manufacturing

1900-10: daily nominal minimum wage in industry from Estadísticas Económicas del Porfiriato. We apply a factor 3:1 to estimate an average daily wage in industry.

1921-41: uses the rate of growth on nominal value added per economically active worker in manufacturing from OxLAD.

1941-65: weekly nominal earnings in manufacturing from Mitchell (2003).

1965-80: average nominal monthly paid wages to blue-collar workers in manufacturing at national level from PREALC.

1980-96: weekly nominal earnings in manufacturing from Mitchell (2003).

1996-2004: nominal earnings per month in manufacturing from ILO.

2004-2010: index (2000=100) of average real wages from ECLAC.

Minimum urban:

1900-10: daily nominal minimum wage for the economy as a whole from Estadísticas Económicas del Porfiriato.

1921-34: real wage series for Mexico from Williamson dataset.

1934-1965: uses the official minimum nominal wage from Wilkie (XXX).
1965-80: minimum urban wage in pesos of 1970 from PREALC.
1980-2000: uses the official minimum nominal wage from Wilkie (XXX).
2000-2004: minimum urban real wage index (1990=100) from ECLAC.
2004-2010: real average wage index (2000=100) from ECLAC.

Deflators. In those cases when the original wage data are in nominal terms we use a deflator from the following sources:
1900-1913: wholesale price index in Mexico City from ITAM (2004).
During 1915-1917 inflation grows in line with currency devaluation (from Cardenas and Manns, 1987).
1918 onwards: uses OxLAD completed with CPI data from Banco de Mexico.

Venezuela

Agriculture/rural:
1900-24: grows in line with the monthly real earnings (at 1984 prices) of construction workers from Baptista (1997).
1924-50: for circa 1922, 1936 and 1950 there is information about typical wages in agriculture, manufacturing and the oil industry from McBeth (2012), as well as annual series of average wages in the oil industry for the period 1924-1950 (Valecillos, 1993). We calculate the ratio of agricultural wage relative to the oil wage for the three benchmark years and then use interpolation to complete a series of annual agriculture-oil wage ratios. Then those ratios are applied to the oil wage series to obtain an annual series of wages in agriculture.
1950-68: total nominal annual earnings in agriculture from Valecillos (1993) using official Banco Central de Venezuela (BCV) data. Annual remunerations per worker are calculated by dividing by the economically active population in agriculture taken from Aranda (1974).
1975-78: monthly rural real wage in bolívares of 1970 from PREALC.
1978-90: nominal annual earnings per worker in agriculture from Valecillos (1993) using official BCV data.
1990-2010: overall real minimum wage index (2000=100) from ECLAC.

Manufacturing

1900-22: grows in line with the monthly real earnings (at 1984 prices) of semi-skilled workers (e.g., mechanics and accountants) in the public sector from Carrillo Batalla (2002, 2003) – this data is available every five years from 1900 to 1935.

1922-61: for circa 1922, 1936 and 1950 there is information about typical wages in manufacturing and the oil industry from McBeth (2012), as well as annual series of average wages in the oil industry for the period 1924 to 1950. We calculate the wage ratio manufacturing to oil for the three benchmark years and then use interpolation to complete the manufacturing-oil annual wage ratios. Such ratios are then applied to the oil wage series to obtain an annual series of wages in manufacturing.

1961-65: total nominal annual earnings in manufacturing from Valecillos (1993) using official OCEI data and series of money wages in industry from Mitchell (2003).

1965-79: monthly real wage in manufacturing in bolívares of 1970 from PREALC.

1979-90: nominal annual earnings per worker in manufacturing as reported in OCEI industrial surveys (taken from Valecillos, 1993).

1990-97: index of real average monthly wages in manufacturing from BCV.

1997-2011: index (1997=100) of real wages in manufacturing (private sector) from BCV.

Minimum urban:

1900-74: monthly real earnings (at 1984 prices) of construction workers from Baptista (1997).

1974-80: minimum urban wage in bolívares of 1970 from PREALC.

1980-1990: minimum real wage index (2000=100) from ECLAC.

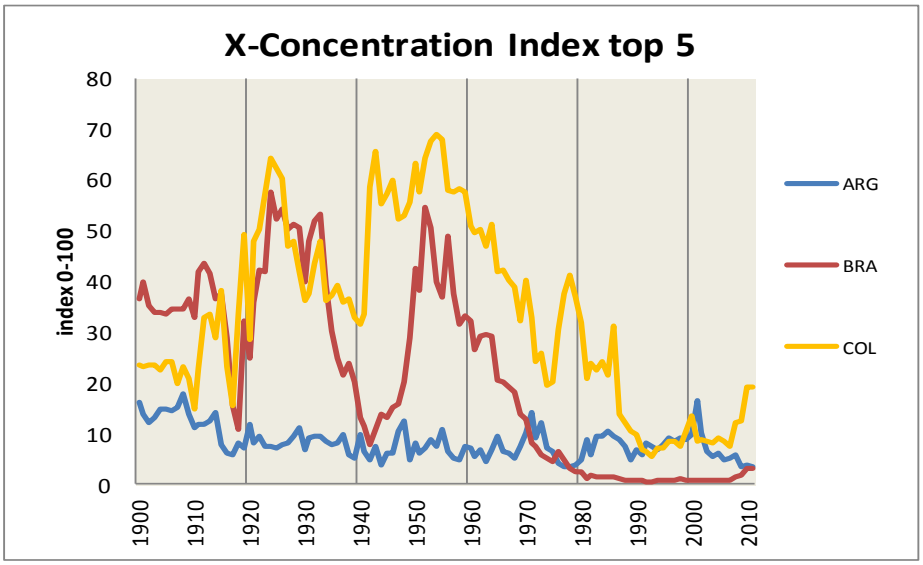
1990-2004: minimum urban real wage index (1990=100) from ECLAC.

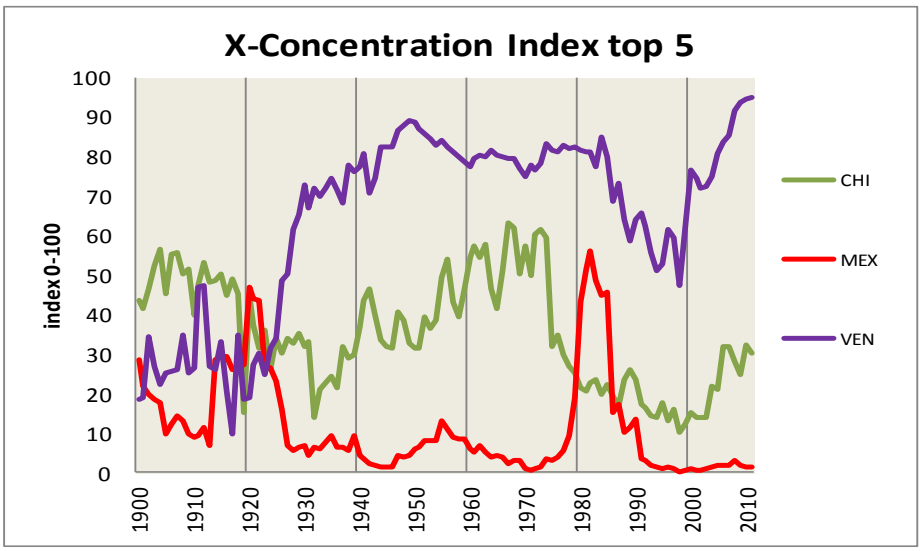
2004-2011: real average wage index (2000=100) from ECLAC.

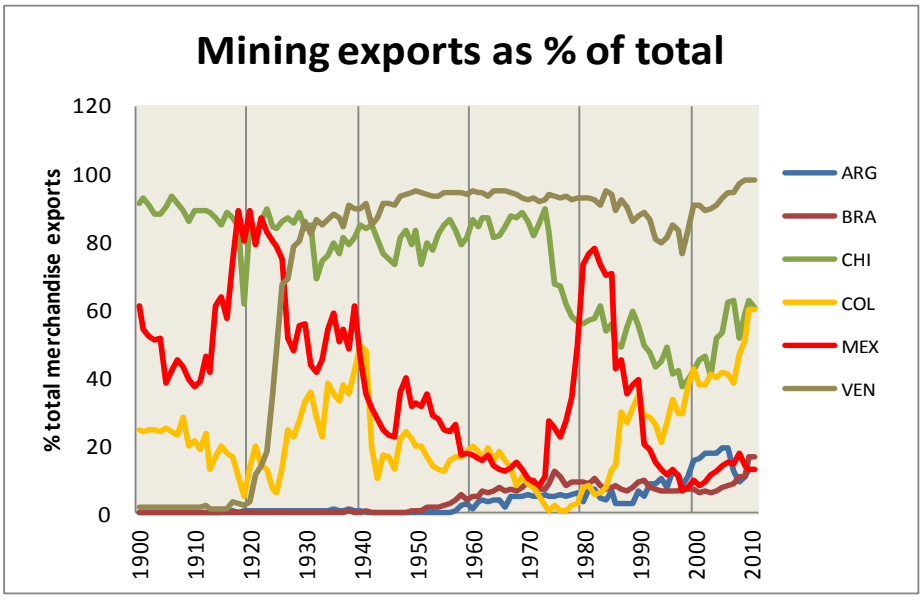
Deflators. In those cases when the original wage data are in nominal terms we use a deflator from the following sources:

1900-1944: general price index from Baptista (1997). After1945 uses CPI from Banco Central de Venezuela (BCV).

Annex 2: Commodity Concentration Indices







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