The Dynamics of Chilean Income inequality from 1990 to 2015

Econ 452 Term Paper

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Part 1. Empirical Trends

The first part of this paper attempts to replicate the analysis from Heathcote, Perri and Violante (2010), using LIS data from the Chilean National Socio-Economic Characterization Survey (CASEN) collected from 1990 to 2015. Sample selection and data treatment is mostly in line with the HPV paper, but there are a few key exceptions worth noting throughout the presentation.

Figure 1 uses individual level data on annual earnings, hourly wages and annual hours. Where earnings are defined as employment income plus two thirds of self employment income, note that we only include positive earnings in our sample. Hourly wages are defined as yearly earnings divided by the number of hours worked that year, noting that annual hours must exceed 260. In order to understand the relative dynamics of earnings inequality, I compute the variance of log earnings for both men and women. The resulting statistic is mechanically equivalent to the variance of log wages plus the variance of log hours minus twice the correlation between hours and wages. Each component is graphed over the time period in order to analyse the dynamics of earnings inequality by sex. There doesn't seem to be any major difference between male and female wage inequality throughout the observed time frame. There may be, however, a slight negative trend in wage inequality for both sexes. As one would expect, the variance of annual hours worked is much higher for women than it is for men, since more women are culturally inclined to work fewer hours if they are raising children. For both Men and women, the correlation between log hours and log wages, although still negative, has been increasing since 1990. From all these trends, we gather that male earnings inequality has remained more or less constant from 1990 to 2015, whereas female earnings inequality has increased significantly, mostly as a result of the large increase in the 1990s.

FIGURE 1. inequality in labor supply and earnings of men and women (CASEN)
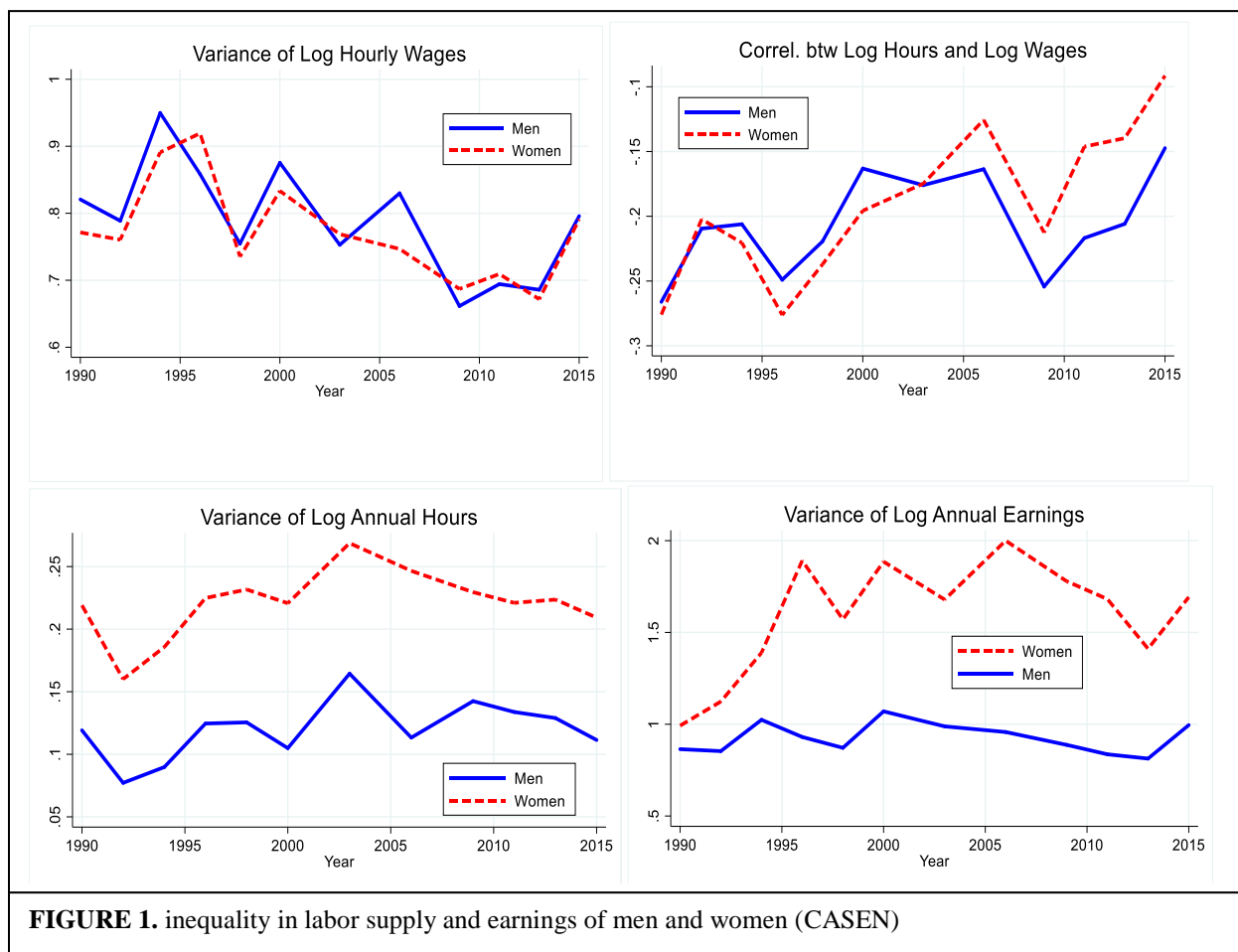
For figure 2, we use the same individual level data as before but now it is further decomposed into three subsamples: Men between the 0th and 10th, 45th and 55th, & 90th and 100th percentiles of the earnings distribution; representing low, middle, & high earners respectively. Mean real earnings, wages and hours are then computed for each subsample. The LIS has already controlled each variable for inflation using the Chilean CPI with 2011 as the base year. The top left panel shows that wages have increased spectacularly for all three cohorts since 1990, with the largest increase being for the middle earners and the smallest being for the top earners. In relation to wages, annual hours have diminished very slightly for each cohort over the period. Thus, we observe a large increase in earnings for each cohort. The large spike in unemployment

in ca. 2000, (likely due to the east Asia crisis of 1997/98) resulted in a slight dip in P0-P10 log earnings, but unemployment has had little to no effect on the overall earnings trend.

FIGURE 2. Understanding Male Earnings Inequality (CASEN). The LIS corrects all data for inflation: "all flow variables are deflated (or inflated) to mid-year equivalent values using the Consumer Price Index (CPI) indices available from official sources."
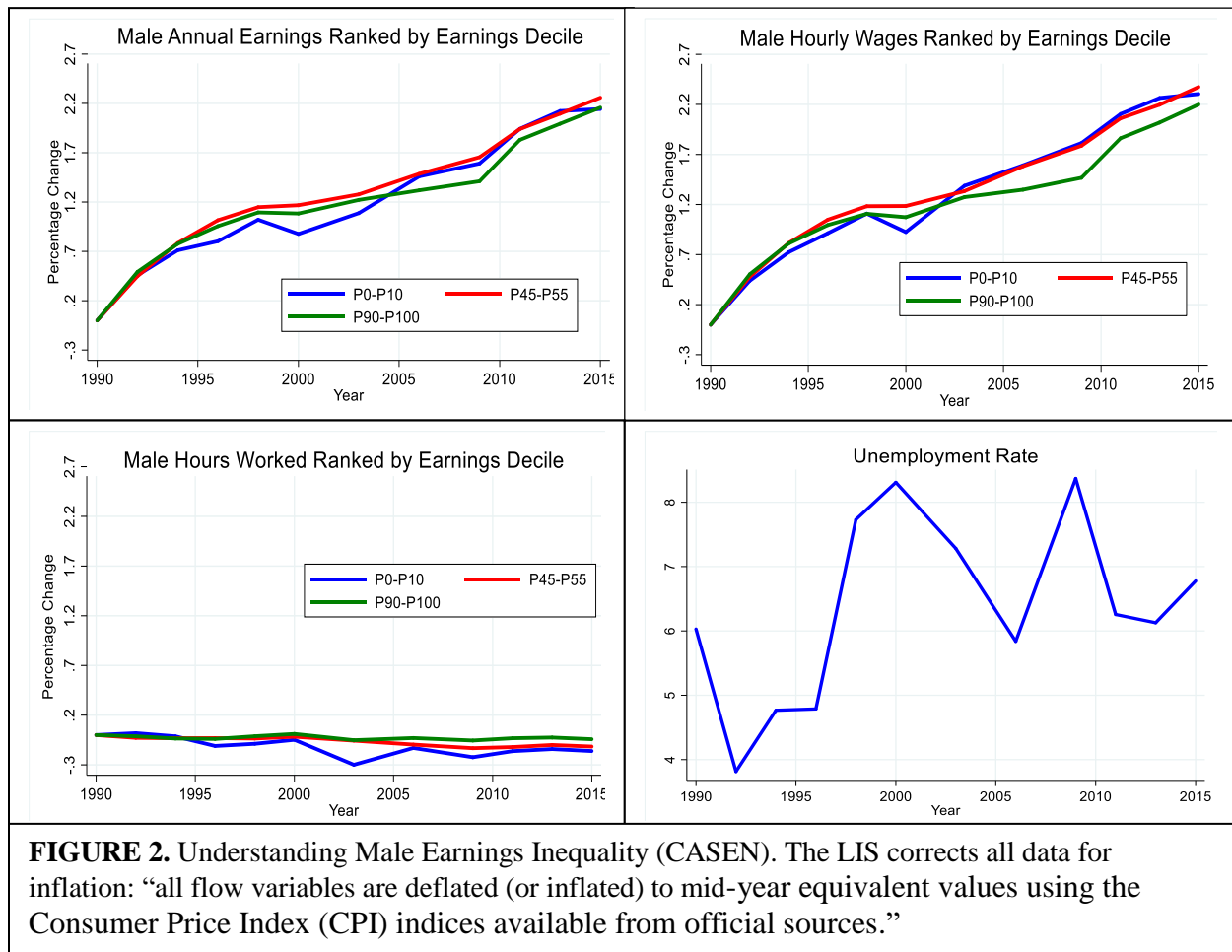
Figure 3 uses equivalized household level data. Unfortunately, the CASEN does not provide adequate data on the relations of household members, so instead of using the OECD equivalence scale households are weighted by the total household earnings divided by the square root of the number of household members as recommended by the LIS. Notice that the variance of log equiv. earnings looks almost identical to the P50-P10 ratio. This demonstrates how the variance of log tends to favour lower tail inequality in its measurement. Similarly, the Gini coefficient behaves like the P90-P50 ratio, thus it is favouring upper tail inequality since it is most sensitive to changes in the middle and top of the distribution. From these figures, it is

difficult to discern if there has been any underlying trend in lower tail household earnings inequality over the past three decades, since this measure appears to be very sensitive to transitory shocks in unemployment. As for middle/upper trail inequality, from 1990 to 2000 there was no trend, then from 2000 there was a clear downward trend until ca. 2009. Now, we are observing an upward trend starting in ca. 2009. Given the scarcity of these data is difficult to say whether any of these shifts represent structural breaks or whether these trends are simply stochastic or transitory.

**FIGURE 3.** Various measures of household earnings inequality (CASEN)

Figures 4 through 6 track inequality from individual head of household earnings to household disposable income. For the lower tail of the earnings distribution the gap between main earner inequality and household inequality has widened since 1990. This could indicate that there are fewer single earner households than there were thirty years ago. Notice that since the

two graphs never overlap, there are very few single households at the lower tail of the distribution. The reason for the variance being lower for households with more than one worker follows quite mechanically from the definition of variance. Compare this with the Gini coefficient, which depicts upper tail inequality and we see that the trend is nearly identical. This means that the household composition is quite uniform throughout the entire distribution[3]. When private transfers are added to household earnings, lower tail inequality reduces, likely as a result of households with older members receiving private pensions. It is important to note that, given the nature of our sample selection, we will be excluding many households who do not have members within the working age population, so the effects of private transfers on inequality are reduced. When asset income is included, there is no effect on lower tail inequality, since lower income households tend not to own capital. But upper tail inequality shifts up slightly due to the unequal distribution of capital income at the top of the distribution. When we include Government benefits to receive pre-tax income, we notice that lower tail inequality is reduced drastically, while upper tail inequality is also significantly reduced. This shows that public benefits in Chile help those at the bottom most of all and effectively redistribute wealth. However, when looking at income net of taxes, we notice that the effective tax rate for the top of the distribution is not so progressive and does little to reduce income inequality. There is an element of progressivity for the lower and middle part of the distribution however, resulting in an even lower variance of log disposable income than pre-tax income. One main point to draw from these figures is how disposable income inequality is driven almost entirely by earnings inequality and, even more particularly, wage inequality. The determining factors of wage inequality will be elaborated upon in part II.
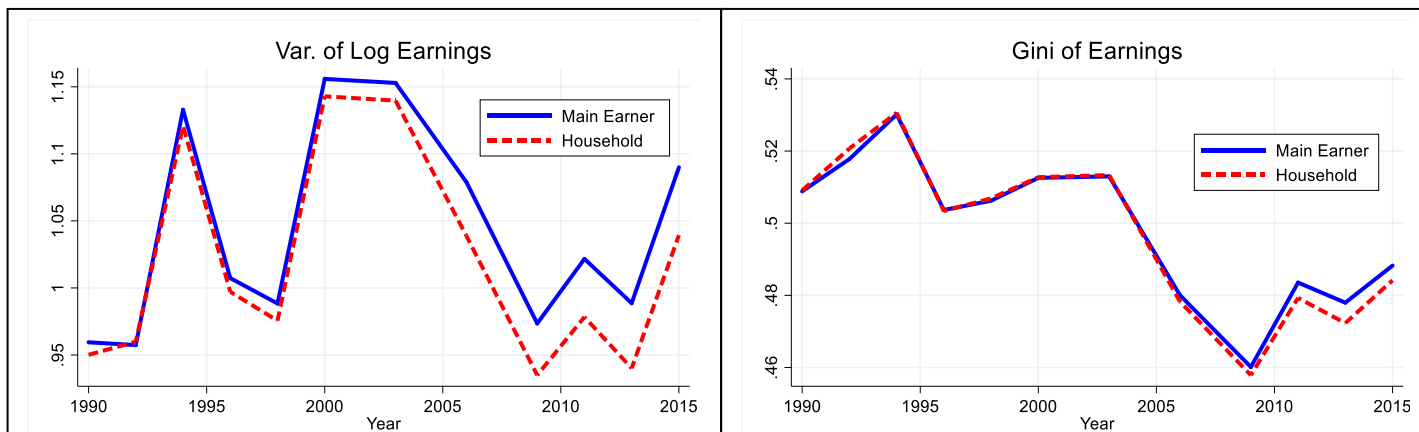
FIGURE 4. Understanding the Role of the Family for Earnings Inequality (CASEN)
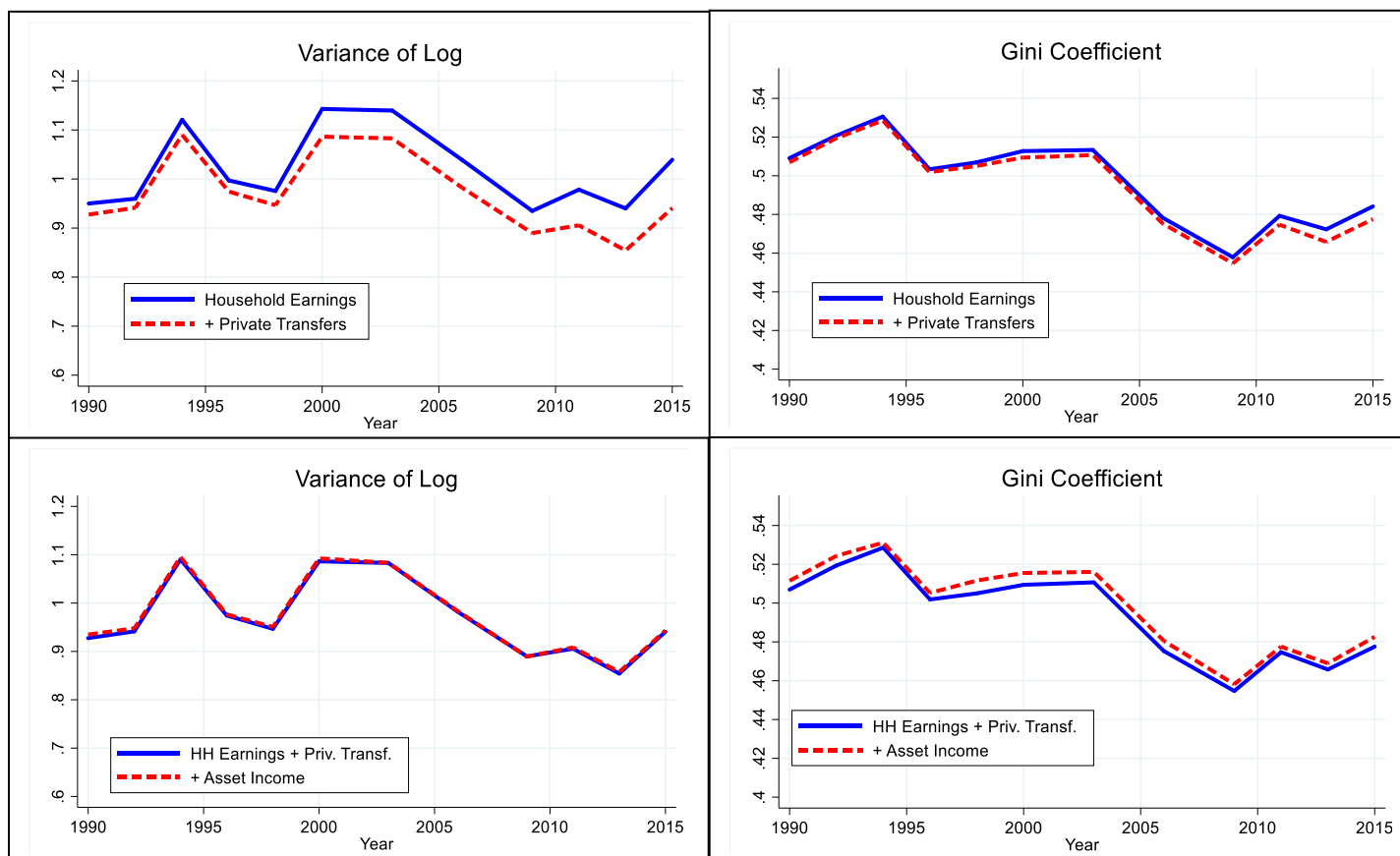
FIGURE 5. From Household Earnings to Pre-Government Income (CASEN)

**FIGURE 6.**   From Pre-Government to Disposable Income (CASEN)
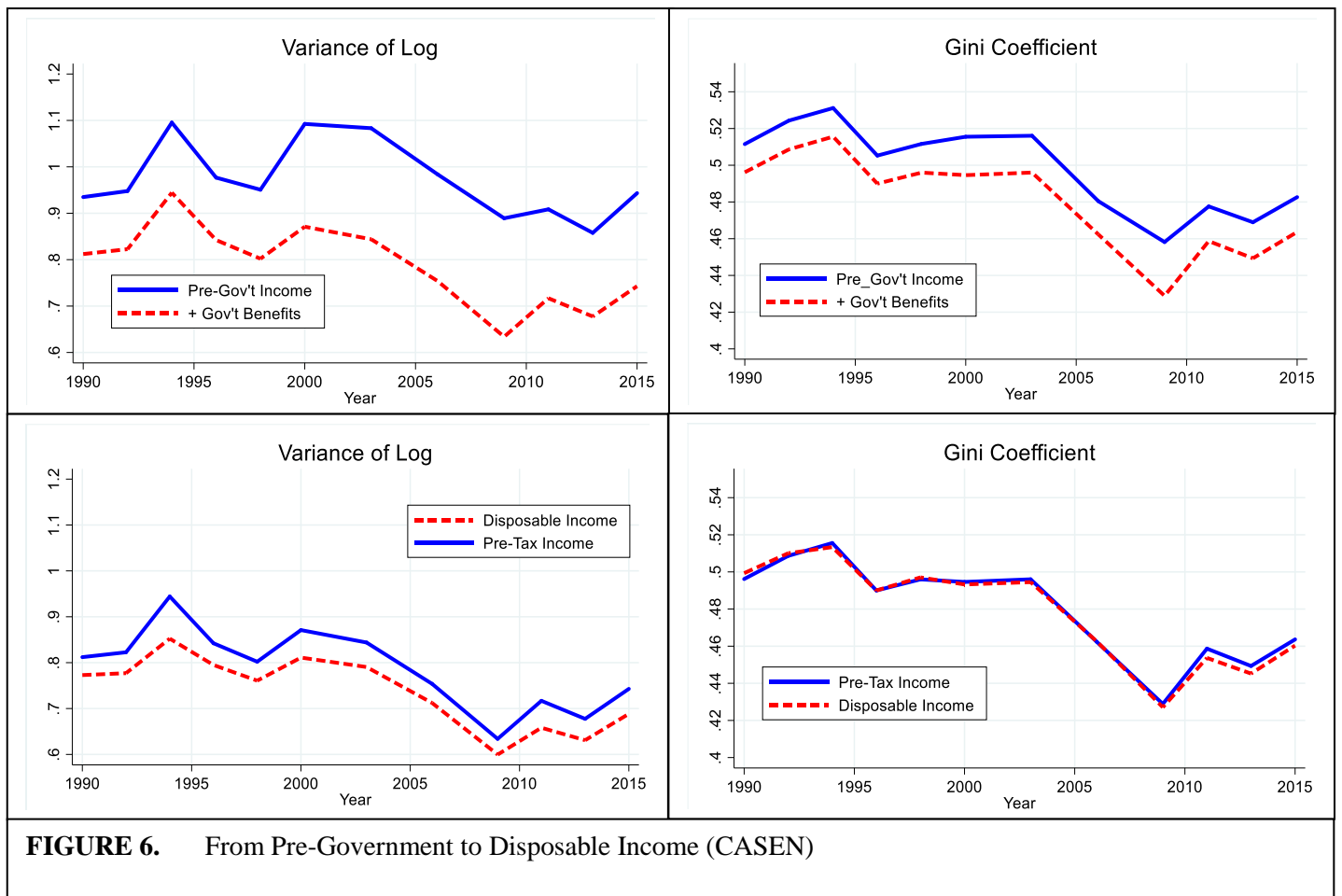
In summary, while earnings and wages have increased secularly since 1990, it is difficult to conclude whether this growth has had a positive effect on earnings and income inequality. If there is a true downward trend in the Gini coefficient, this could be the result of a growing middle class evidenced by the fact that median earnings and wages increased the most out of any cohort throughout this timeframe. Furthermore, lower tail earnings inequality may be slightly more sensitive to unemployment shocks and transitory institutional effects, but there does also appear to be a slight downward trend in lower tail inequality as well.

II. Decomposition of Wage Inequality

This section seeks to explore the underlying factors determining wage inequality. In a similar manner to Autor, Katz, & Kearney (2008) and using the same data as in part I, I attempt to track the evolution of wage inequality in relation characteristics of the labour market from 1990 to 2015. An emphasis is placed on the education premium in order to access whether the dynamics of Chilean wage inequality can be explained by skill biased technical change. Although the conclusions I draw are not entirely inline with Autor et al. due to the structural differences of Chilean and American earnings inequality, I do attempt to replicate their analysis and sample treatment.
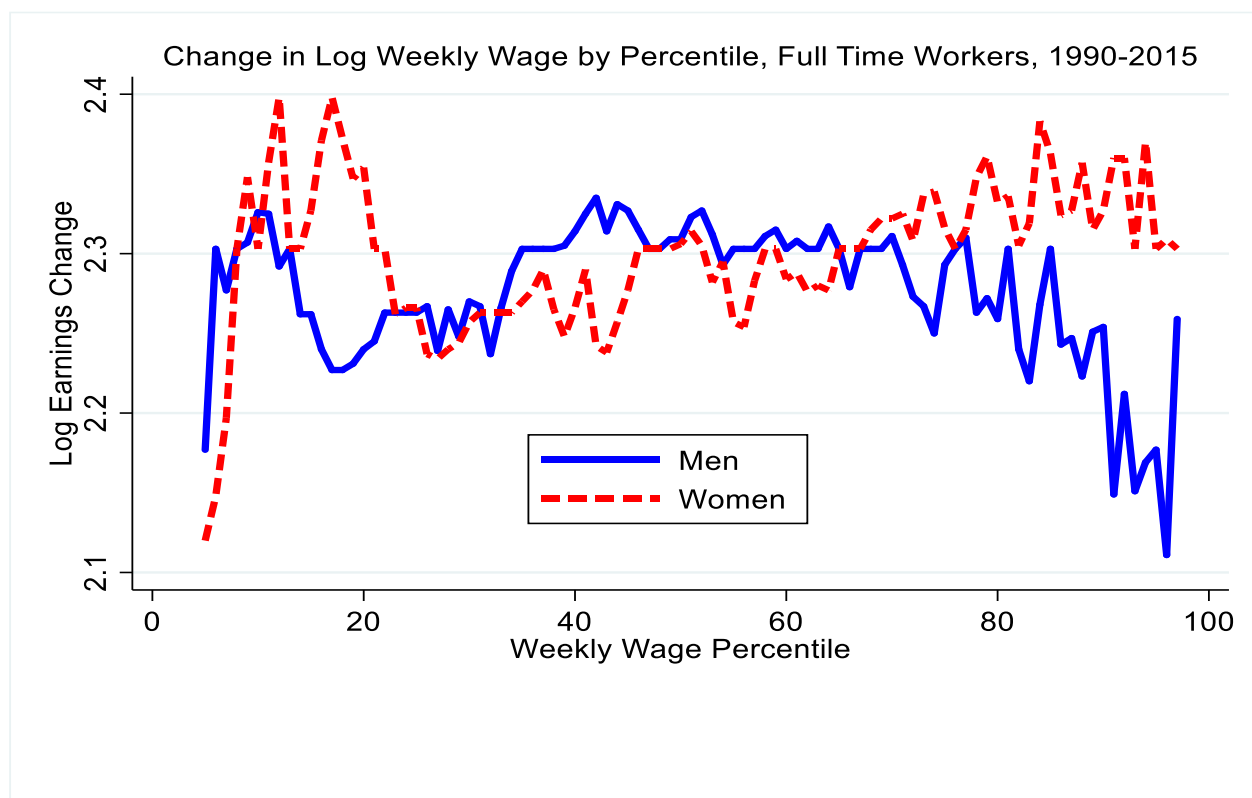
FIGURE 7. From LIS data collected from the CASEN in Chile using data on full year employees who work at least 35 hours per week between the ages of 16 and 64. Composition adjusted using standardized weights for each year. Due to top and bottom coding, we go from the 3rd to 97th percentiles.

The first figure examines the difference in log weekly earnings from 1990 to 2015 for men and women by percentile. The measure uses fixed standardized weights to control for sample composition differences over time. It is evident from this picture that earnings growth has been high for all parts of the distribution. For men, growth was largest for the middle of the distribution and tapered off towards the tails. For women, growth has been more uniform, although the top of the distribution has displayed an advantage.

FIGURE 8.   From LIS data collected from the CASEN in Chile using data on full year employees who work at least 35 hours per week between the ages of 16 and 64.
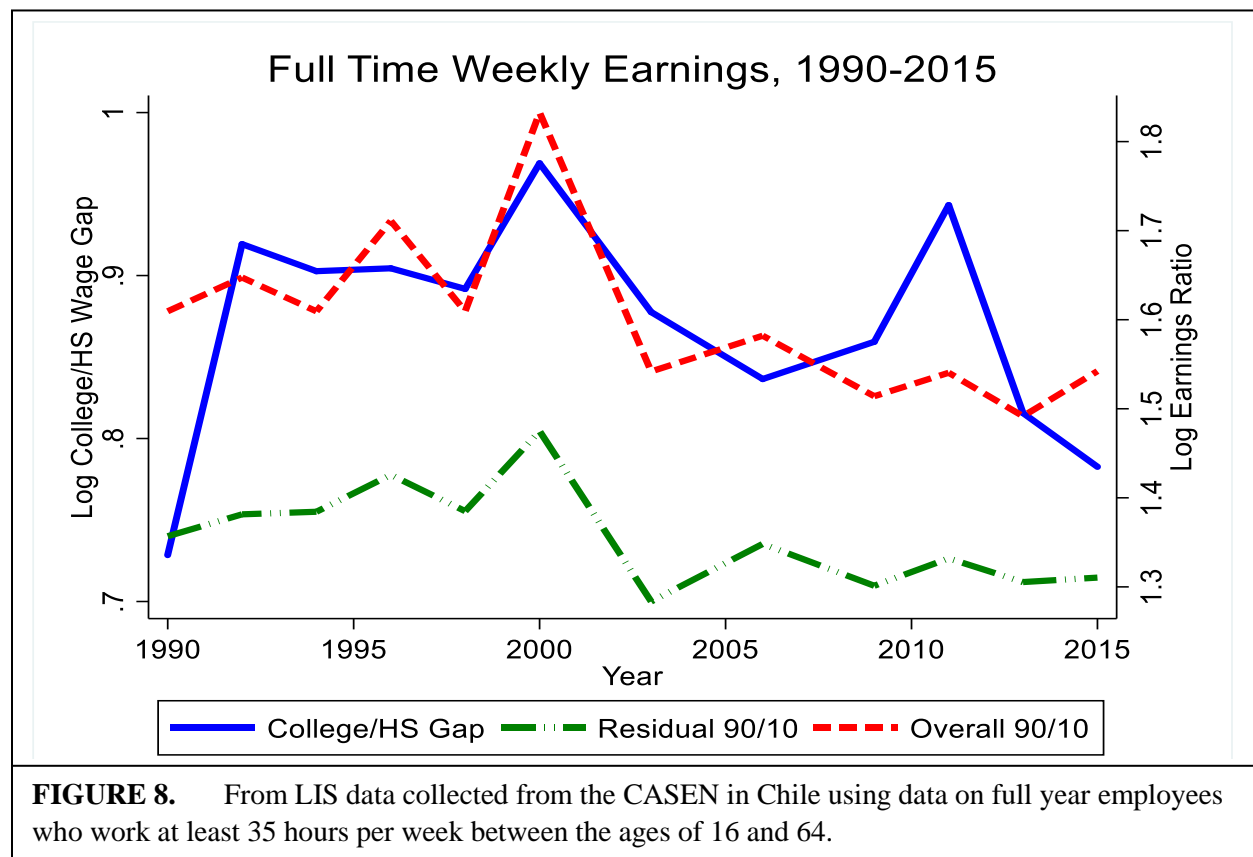
Figure two decomposes wage inequality by examining overall 90/10 inequality and residual inequality in relation to what Autor et al. consider to be the most important determining factor of earnings inequality, the education premium. In terms of metrics, the education premium

is the difference in log weekly earnings between college graduates and high school graduates. This measure is supposed to represent a skill premium, thus its evolution over time ought to reflect skill biased technological change. Meanwhile, the 90/10 ratio (measured by taking the log between the 90th and 10th percentiles of the weekly earnings distribution) is meant to reflect the trends in overall inequality; while the residual 90/10 ratio, (constructed using the residual of a regression on experience/age, sex, and education) measures the inequality within groups. The education premium exhibits its largest increase in the early 1990s, after that It appears to follow a slight downward trend. Similarly, both the overall 90/10 ratio and the residual 90/10 follow a slight downward trend throughout the time period. It is important to note that the rapid increase in the education premium at the beginning of the reference period was not followed by a subsequent increase in earnings inequality. In fact, after 1992, all these statistics seem to exhibit slight downward trends, despite spikes which could be the result of exogenous shocks which leave many of the poorer/less educated people unemployed, thus increasing every displayed measure. Moreover, skill biased technological change, does not appear to be the main driver of earnings inequality in Chile. There are likely other structural determinants of wage inequality which outweigh the effects of skill biased technological change in the opposite direction.

Log Weekly Wages	1990	1992	1994	1996	1998	2000
exp	0.0407	0.0384	0.0381	0.0399	0.0373	0.0356
exp2	-0.0007	-0.0006	-0.0006	-0.0006	-0.0006	-0.0005
female	-0.2124	-0.2007	-0.2158	-0.2041	-0.2465	-0.2491
HS	0.4311	0.4861	0.4601	0.5319	0.5181	0.5199
College	1.1220	1.3510	1.3248	1.3784	1.3482	1.4468
Female & HS	-0.1006	-0.1149	-0.0474	-0.0929	-0.0486	-0.0354
Female & College	-0.2987	-0.4202	-0.3963	-0.3982	-0.2604	-0.2488
Constant	12.4810	12.9565	13.3354	13.4407	13.6418	13.7351
Log Weekly Wages	**2003**	**2006**	**2009**	**2011**	**2013**	**2015**
exp	0.0355	0.0305	0.0285	0.0322	0.0348	0.0353
exp2	-0.0005	-0.0005	-0.0004	-0.0005	-0.0006	-0.0006
female	-0.2148	-0.2392	-0.2545	-0.2652	-0.2692	-0.2564
HS	0.4243	0.4099	0.3929	0.3835	0.3800	0.3257
College	1.2509	1.1995	1.2305	1.3164	1.1815	1.0833
Female & HS	-0.0535	-0.0463	-0.0078	-0.0101	-0.0332	-0.0174
Female & College	-0.1926	-0.1115	-0.1455	-0.1481	-0.0125	-0.0257
Constant	13.8420	14.0240	14.2037	14.2902	14.4638	14.6035

TABLE 1.   From LIS data collected from the CASEN in Chile using data on full year employees who work at least 35 hours per week between the ages of 16 and 64. Composition adjusted using standardized weights for each year.

Table 1 displays the coefficients of Mincer wage equations for each year in the sample. By measuring the interaction between sex and education we notice some remarkable trends. For instance, in 1990 college educated women were only making approximately 19 percent more than high school educated men, whereas in 2015 we would expect them to make 81 percent more. Similarly, when compared to college educated men, women with comparable levels of education would earn 50 percent less on average than men in 1990, but in 2015 that gap has

narrowed to 27 percent less. For High school graduates, the gender wage gap reduced marginally from 31 percent to 26 percent. The same cannot be said of women with less than a high school education, however. Throughout the entire period we would expect them to be making between 20 and 26 percent less than men with the same level of education. In fact, the gap increased for them between 1990 and 2015 by 4 percent.

III. Structural Factors

The first year of this dataset is 1990, a very significant year in Chilean history. This year marked the end of a 17-year military dictatorship led by Augusto Pinochet. Throughout the Pinochet regime, Chile experienced large scale market liberalization and tight fiscal and monetary policy. The dictatorship also cracked down on trade unions and political opponents who were key players in the conflict of income distribution. Furthermore, political instability and interest rate hikes resulted in a lack of domestic investment as well as two recessions in ca. 1975 and 1982 (Rodríguez Weber, 2015). It was under these preceding circumstances that Chile established itself as one of the most unequal countries in the world. It is in relation to the (Ffrench-Davis, 2002)structural break in 1990 and the democratization of Chile that we should analyze the facts and figures presented in parts I and II.

First and foremost, the growth in wages across the distribution displayed in figure 1 is likely the result of a restored optimism in the domestic economy that followed from the end of the dictatorship. Moreover, although wage and GDP growth was still positive under general Pinochet, the economy was still operating well below its potential capacity (Ffrench-Davis, 2002). Thus, the large growth in real wages starting in ca. 1990 likely result from the economy recovering to its potential. It is also important to note that the cohort with the largest real wage

growth was in the middle of the distribution; the same fact can also be seen in figure 7 from part II.

The dynamics of earnings inequality indicate that upper tail inequality has diminished over the reference period while lower tail inequality remains ambiguous. Due to the bottom coding of our data, we do not receive a completely accurate depiction of the evolution of poverty rates in Chile, so our measures for lower tail inequality may not be the most accurate depiction. For instance, from 1990 to 2000 poverty rates decreased by 18 percentage points (Ffrench-Davis, 2002). Figure 8 displays the dynamics of Chilean earnings inequality most clearly. By analyzing residual inequality over the time period, we get some sense for how the unobserved features of democratization help reduce 90/10 inequality. By investigating the trend in residual inequality, we notice that overall inequality has a very similar shape and follows a nearly identical trend. Despite the large increase in the education premium in the early 1990s, the trend in overall inequality has remained negative. From this, I gather that the residual is a far more important determinant of earnings inequality in Chile than factors such as skill biased technological change.

The residual inequality does represent more than just institutional factors in which democratization would have its largest impact. It could also measure unobserved natural skill levels, family wealth and social privileges &c... Although the regression from which the residual was generated did not control for any of these unobserved factors, I argue that democratization is still the most important unobserved feature. To justify this claim, I consider democratization to be a pervasive feature which influences almost all potentially explanatory variables. For instance, the decline in the College/HS wage gap after 1992 could result from the localization of the Chilean economy from 1992 to 2015. What I mean by this is that, as the Chilean economy

moved away from international trade and started focusing on domestic growth, the demand for highly educated, English speaking contractors and managers fell. At the same time, the economy became more inclusive of less educated local workers and small enterprises. These factors culminate in a diminution of the education premium. Additionally, as public institutions began to favor lower income workers by raising minimum wages and wages for public employees, in conjunction with the recommissioning of trade unions; wages grew for middle and low skill workers, thus reducing the education premium further. This can be observed in the data by noticing how the constant in the Mincer wage equations rose from 12.4 to 14.6 over the whole period.

The political and economic transformation that took place in 1990 has had such a pervasive and palpable influence on earnings inequality that it becomes almost impossible to analyses its effects in isolation. If more variables were available, one could try to construct a democratization index, this would likely reduce the residual in our model. Nevertheless, I would still have doubts as to whether the index could truly capture such a ubiquitous feature. For this reason, It is important to understand that we cannot get the whole story from data alone, since it would be impossible to understand Chilean earnings inequality without first understanding the historical context in which this data was generated.

Works Cited

Autor, David H., Lawrence F. Katz, and Melissa S. Kearney. (2008). Trends in US wage inequality: Revising the revisionists. *The Review of economics and statistics 90.2*.

Ffrench-Davis, R. (2002). *"Economic reforms in Chile." From Dictatorship to Democracy.*

Heathcote, Jonathan., Perri, Fabrizio., Violante, Giovanni L. (2010). Unequal we stand: An empirical analysis of economic inequalityin the United States, 1967–2006. *Review of Economic Dynamics*.

Rodríguez Weber, J. (2015). Income inequality in Chile since 1850. *DOL (Documentos On-line)/FCS-UM*, 24-27.

Data Source

Luxembourg Income Study (LIS) Database, http://www.lisdatacenter.org (Chile; 1990-2015).

Luxembourg: LIS.