Final Writing Sample (Revised)

Matias Ustares

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1 Introduction

Understanding the mechanisms that relate price adjustments to labor markets can help quantify the costs of recessions in the labor force, improve the design of fiscal and monetary policies, and provide a better understanding of how price rigidities affect price adjustments in economies. By exploiting administrative records of Argentina for the period 1994 to 2018 , we seek to bring li ght to the aforementioned channels. Assumptions about price rigidities are a core element in macro models. Although the evidence reinforces the assumptions, studies with salary data are not abundant, nor for a developing country like Argentina and with monthly frequency. In the study period, the country experienced periods with different inflation regimes, large devaluations of its currency, at least three major recessions, and multiple changes in labor market regulations. These reasons make the study of the Argentine economy relevant.

There is ample price setting literature documenting the distribution of wage changes for the U.S. and Europe (see Kahn, 1997; Dickens, Goette, Groshen, Holden, Messina, Schweitzer, Turunen, and Ward, 2007; Sigurdsson and Sigurdardottir, 2011; Le Bihan, Montornes and Heckel, 2012; Barattieri, Basu and Gottschalk, 2014; and Grigsby, Hurst and Yildirmaz, 2019). We find that the frequency of wage changes is asymmetric between positive and negative changes in Argentina for periods of low inflation (less than 10% p.a.). These results coincide with the studies for developed countries. However, for periods of high inflation (10% to 40% p.a.) we observe that the distribution of frequency of wage changes is symmetric around a mean close to the annual inflation.

Using Argentine administrative records, Blanco, Drenik and Zaratiegui (2020) study the distribution of labor income during large devaluations. They provide evidence about the role of labor mobility and income floors set by unions for heterogeneous recovery. The authors suggest that inequality could affect aggregate dynamics and the distributional impact of sudden stops could be the main aspect to consider for the design of macro policies. One of the main contributions of the authors is that they are the first to document evidence for these novel data set.

Although price rigidities are well documented, measurements of wage stickiness and data availability are still scarce. Previous studies follow different forms of measurement to capture the frequency of price (and wage) changes. Stevens (2019) applies a KolmogorovSmirnov statistical test by developing an algorithm where the breakthrough threshold is set and a minimum length is established without breaks in the frequency of salary changes. By eliminating the noise in the frequency of changes, the author establishes a criterion to measure wages. Blanco et al. (2020) remove prices preceded and followed by the same price. Nakamura and Steinsson (2008) identify the V-shapes across time and remove them. Finally, Kehoe and Midrigan construct a modal price. Following the literature, we construct a regular wage from which we get the main facts. The regular wage minimizes the typical measurement error of administrative data and avoids time aggregation bias. We reconcile the literature and take into account the significant variations in frequency and in their pattern across inflation regimes and workers in an economy like Argentina.

As Blanco et al. (2020) point out, these facts and evidence invite us to develop the basis for new macro models. Christiano, Eichenbaum and Evans (2005) claim that wage contracts are a

key element to explain the mechanism by which a monetary shock explains the dynamics in a New Keynesian model. In the same sense, Shimmer (2004) shows that wage rigidity explains the lack of propagation in the Mortensen-Pissarides search and matching model. By developing a small-open-economy model, Schmitt-Grohe and Uribe (2016) suggest that wage rigidity can explain the different dynamics of the labor markets between different exchange rates. We present a model with wage rigidities to explain the dynamics of the labor market. In addition, we calibrate the model for different inflationary regimes and evaluate monetary and fiscal shocks and policies for each scenario with our model.

2 Background

The period of study can be divided into two major stages: 1996-2001 and 2002-2015. The sub-period 1996-2001 was under a currency board that established a 1 to 1 relationship between the Argentine peso and the US dollar. At the beginning of the 90s, Argentina had stopped hyperinflation and implemented structural transformations of its economy. Regarding the external sector, the Argentine economy faced the Mexican peso crisis in 1995. Between 1998-1999 the devaluations of the East Asian countries, Russia and Brazil, led the country to the greatest crisis in its history. Between 1998 and 2002, real GDP fell 15%, and the unemployment rate reached 20%.

The start of the second sub-period occurs with the abandonment of the exchange rate. The Argentine peso-US dollar relationship suffered a nominal change of more than 200%. The devaluation meant an increase in inflation of 40% in one year, poverty greater than 50%, and a fall in real wages of more than 20%. The years after the crisis had economic growth rates higher than 7%. The employment and unemployment rate reached the 1998 level only in 2006. After more than a decade, due to the increase in public spending financed with monetary issuance, growing demand, and nominal devaluations, inflation was again present in the Argentine economy. Average inflation for the 2008-2015 period was 25%, and growth stagnated.

Regarding the Argentine labor market, one factor that stands out that it has an informal sector that represents more than a third of all employees. The formal sector has two institutions that regulate and influence wage dynamics: the minimum wage and the unions. In Argentina, the minimum wage is determined by the Council of Employment, Productivity and Minimum Wage (CEPM), which brings together workers, employers and the government. In the first sub-period, the minimum wage was fixed at $ 200 (Argentine pesos) and the CEPM was not working. Since the 2001 crisis, and on an annual basis, the CEPM meets to discuss the minimum wage and the wage bases of the collective bargaining negotiations that take place between workers and the different unions. Between 2004 and 2015, the minimum wage increased by around $1,225\%$ nominally and 56% in real terms.

The second major institution in the Argentine labor market is the collective bargaining agreements (CAB). Unions and workers define collective agreements with the force of law that apply to all labor relations in the formal labor market. During the first subperiod, the unions had almost no participation in the labor market. The few stipulated conditions were related to making labor contracts more flexible. Given price stability and rising unemployment, the unions were not demanding wage increases. In the second subperiod, the CABs were gaining prominence. Following the 2001 crisis, the government established a sequence of non-taxable lump sum increases for private-sector wage earners. Starting in 2004, collective bargaining between companies and unions began to spread to all sectors of the economy. As the economy recovered and grew, more workers entered the job market. At the same time, due to rising inflation, the need to protect the purchasing power of workers made CABs relevant in this subperiod.

3 Income Dynamics

3.1 Inequality

Figures 1 and 2 present the evolution of the percentiles of the income distribution of men and women. Leaving aside the 2001 crisis, incomes increased for both genders. The increase in income is not homogeneous in the distribution, but it is observed that the increase decreases monotonically in percentiles. For example, for men, we observed that while the 10th percentile of the male distribution increased by 69 log points, the 90th percentile increased by 23 log points. The same pattern is observed for women. However, the dynamics for p90 - p99.99 are different. We observe that the real income alternates periods of loss and other periods of gains. In both directions, the variations are small. The conclusion is the same for men and women.

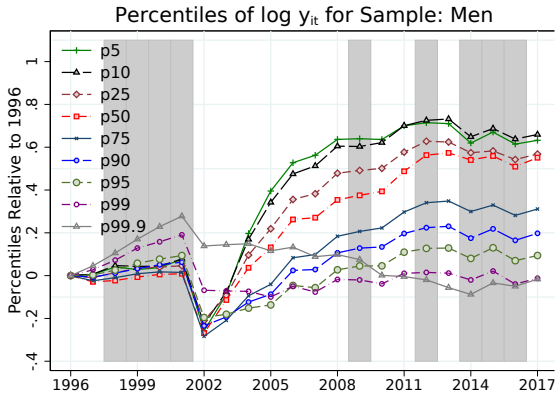

Figure 1: Men

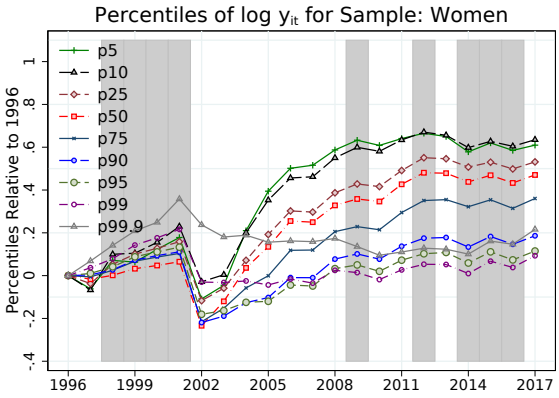

Figure 2: Women

From the previous figures, we also observe the business cycle is connected to the fluctuations of the percentiles. The 2001-2002 crisis and the steep drop in income by more than 20 log points in the percentiles are clear examples. Women experience a greater increase in real income throughout the entire distribution except above the 75th percentile. To illustrate, the 99.9% percentile is the one with the greatest rigidity for the business cycle. On the other hand, the recovery is heterogeneous throughout the lower income distribution. Still, we note that the lowest percentiles recovered the income level before the 2001-2002 crisis more quickly.

The rapid growth of the lowest percentiles explains the fall in inequality in Argentina since the crisis. Figures 3 and 4 show the difference between the 90th and 10th percentiles and the standard deviation, scaled by a factor of 2.56, which corresponds to the P90-P10 differential for a Gaussian distribution. It is observed that the income distribution for women has been less unequal relative to men. For the period 2002-2008, we observe that the P90-P10 differential decreased from 2.90 to 2.40 for men and from 2.75 to 2.30 for women. For the rest of the period, inequality reversed slightly but steadily.

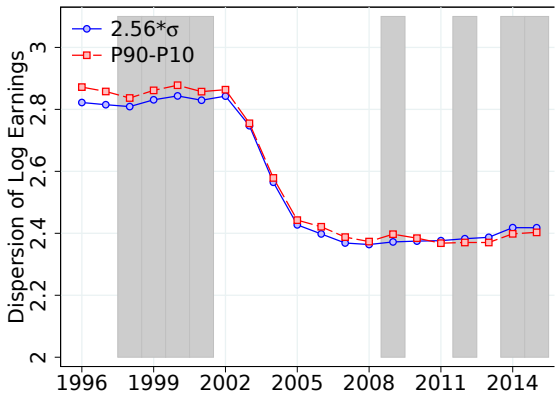

Figure 3: Men

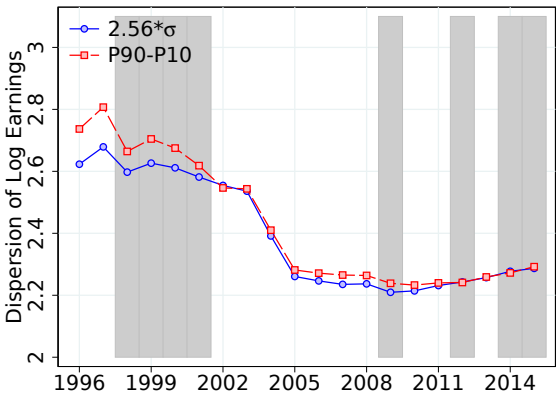

Figure 4: Women

Figures 5 and 6 show the contribution of upper and lower inequality measured by the P90-P50 and P50-P10 differences, respectively, to the aggregate dynamics of inequality. There was a similar decrease in upper and lower inequality of 28 and 23 log points for men, respectively, between 2002 and 2008, when inequality decreased. On the contrary, for women, the main factor contributing to the decrease in inequality during the same period was maximum inequality, which decreased by 26 log points. While the highest inequality since 2008 has remained stable or even decreased, the lowest inequality has risen steadily, especially for men.

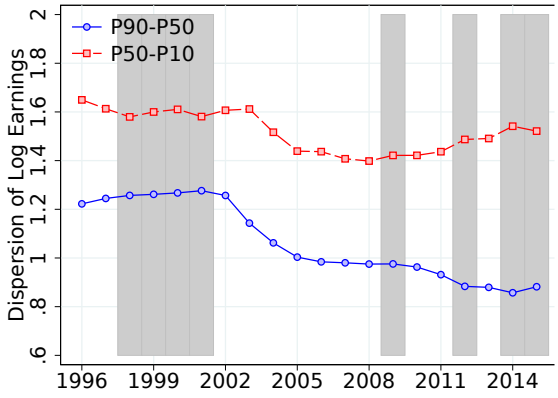

Figure 5: Men

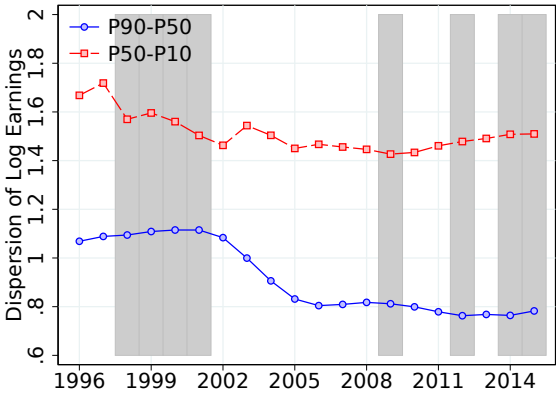

Figure 6: Women

Cruces and Gasparini (2009) propose possible reasons for the fall in inequality. First, they claim that the labor market's recovery pushed up wages and increased the employment rate, thus lowering the unemployment rate. Also, the authors argue that changes in relative prices favored labor-intensive industries that were protected with tariffs from the government. Third, they suggest a slowdown in adopting new technologies, promoting a lower substitution rate for unskilled labor. Finally, through non-taxable lump-sum increases, the government contributed to the fall in inequality.

3.2 The Top 1%

Figures 7 and 8 show the logarithmic complementary cumulative distribution function of the income distribution against the logarithmic earnings of workers within the top 1% of the income

distributions in 1996 versus 2015. The relationship suggests that the distribution of Pareto closely approximates the right tail of the income distribution in Argentina. Furthermore, a well-defined pattern is observed: the income distribution for men has a thicker tail than the distribution for women, as captured by the parameter in a lower form in 1996 and 2015.

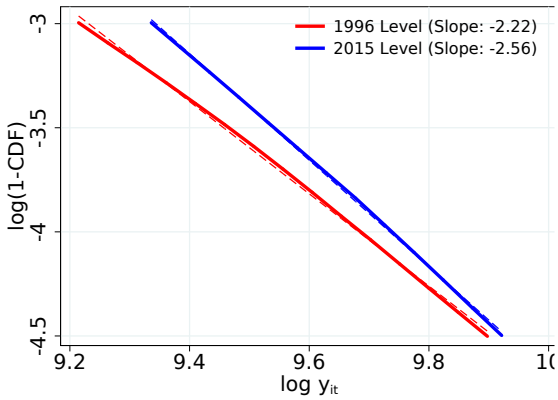

Figure 7: Men

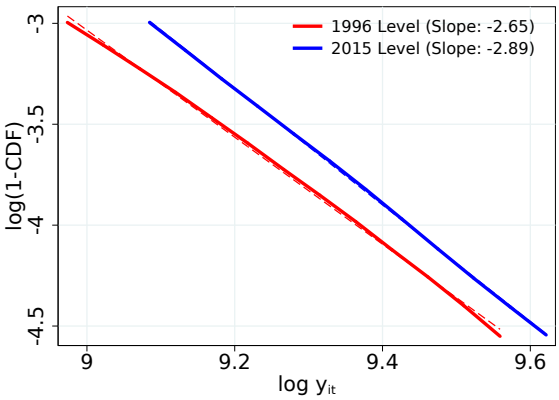

Figure 8: Women

The top 1 % shows strong heterogeneities. The first four quintiles increased their income throughout the period at the expense of a fall in the last quintile (Figure 9). Besides, the profit share received by the top 10% experienced a similar decline, the change in income shares received by those at the top was markedly different. For example, the earnings share received by the top 1% was reduced by only 2.5%, and the profit share of those above 0.1% and 0.01% higher was stable throughout the period (Figure 10).

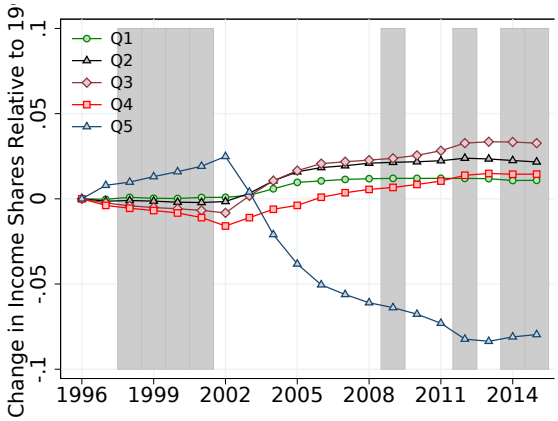

Figure 9: Quintiles

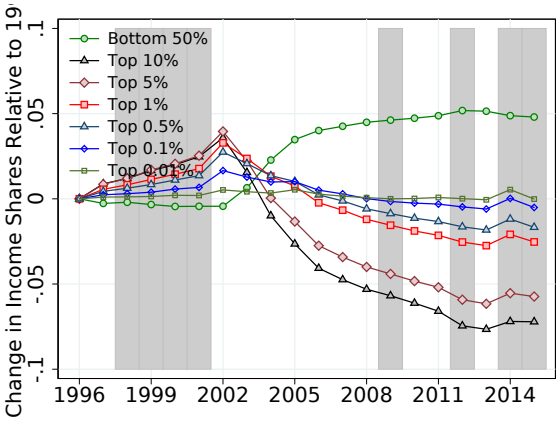

Figure 10: Selected income shares

Alvaredo (2010) estimates that the income shares, excluding capital gains, which accumulates in the top 0.1% increased from 4.3% in 1997 to 7% in 2004, and the 0.01% almost doubled from 1.4% to 2.5% during the same period. Using personal income tax returns, the author suggests that the increase in the employment of high-income people is associated with export-oriented sectors because they benefited from the real depreciation of the Argentine peso after the devaluation of the Argentine peso currency in 2002.

4 Results

In this section we present the main findings on the dynamics of the frequency of wage changes for the entire period by characterizing the differences between periods of low and high inflation. Finally, we disaggregate workers by different types of heterogeneities: deciles, gender and age. For practical purposes, we define the period 1997 to 2001, as the period of low inflation (-0.3% on average) and the period from 2007 to 2015, as that of high annual inflation (24.3% on average). In this way, we manage to set aside the transition period 2002 - 2006 after the 2001-2002 crisis, where relative prices were being corrected.

4.1 Frequency of wage changes in low and high inflation

Figure 11 shows the distribution of changes in wages. As Dickens et al. (2007), Sigurdsson and Sigurdardottir (2011) and Le Bihan et. al. (2012), we find that the frequency of wage changes is asymmetric between positive and negative changes for periods of low inflation. For the period 1997-2001, the distribution concentrates 24% of the observations between the range -25% to 0%. For the period 2007-2015, the 48% of the observations fell in the 0% to 25% range. We also find that the average wage change coincides with the average inflation for the period. This is observed for both periods. Also, at higher levels of inflation, the distribution becomes symmetric. The mass of workers in the range $[0\%, 25\%)$ and those in $(25\%, 50\%]$ have only a difference of 4 percentage points (pp). This fact contrasts with the period of low inflation, where the difference is 24 pp. Intuitively, we observe that periods of high inflation lead to larger falls in real wages of workers.

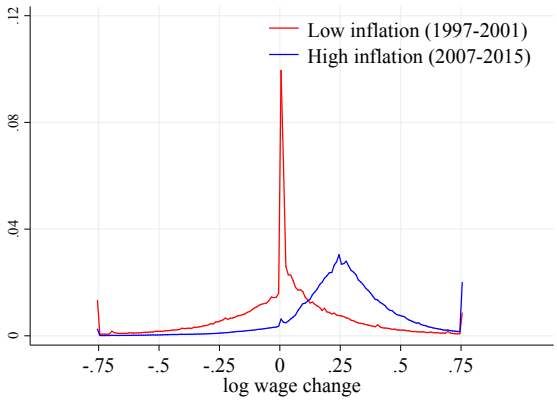

Figure 11: Distribution of wage changes across Inflation Regimes

In accordance with the literature, we observe that the frequency of upward wage changes increases significantly with inflation, from an average of 0.44 in low inflation period to 0.90 during the high inflation period (Figure 12). Similiarly, the frequency of downward wages falls from 0.20 to 0.05 (Figure 13). In other words, during periods of high inflation, wage increases are more common than in periods of low inflation. Another finding is that the aforementioned facts are linked to the business cycle. In 1998 the Argentine economy slowed down, giving rise to the greatest crisis in its history in the years 2001-2002, where we observe that the frequency of wage increases fall from almost 0.50 to 0.36 in April 2002. Thus, the frequency of wage decreases goes from 0.17 to 0.29 for the same period.

Figure 12: Upward Wage Changes

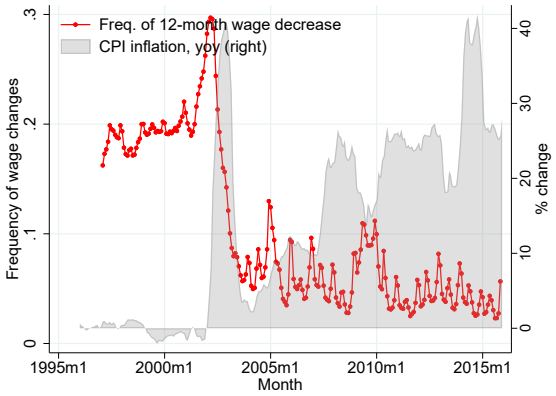

Figure 13: Downward Wage Changes

4.2 Heterogeneities in the frequency of wage changes

Figure 14 displays the frequency of wage changes for four groups of workers who are 26, 35, 45, and 55. The main finding is that the frequency of wage changes decreases over the years regardless of whether inflation is low or high. Additionally, we find that average wage increases decrease with age. In periods of low inflation, the regular average wage increases for these four groups of workers were: 15.6%, 14%, 12.5%, and 11.7%. This pattern is not identifiable in periods of high inflation.

Figure 15 presents the frequency wage change by income. In particular, we show the dynamics for the deciles 1, 5 and 10. We observe that the average annual frequency of regular wage changes for workers in the first decile is 0.85 and 0.81 for the last one. This pattern is constant throughout the period. Workers with higher wages have stiffer wages and have wage increases at a lower rate. Additionally, we observe that in periods of low inflation the average size of wage changes have an inverted U shape for average wage increases. The same is observed for the decrease in wages, although with less definition.

When studying the differences by gender, we observe that the probability of an increase conditional on a wage change is 0.74 for women and 0.67 for men, in the period of low inflation (Figure 16). Furthermore, the frequency of wage changes for men correlates better with inflation than that of women (0.53 and -0.12, respectively). However, the average frequency and size of wage changes are practically the same for both genders.

The last characteristic we study is the type of sector, which represents one of the main sources of heterogeneity. It is probably associated with the role of the unions or the multiple regulations of the labor market. In particular, we describe the frequency of wage changes for: agriculture, manufacturing, construction, commerce, and education. These sectors represent 57% of formal employment in Argentina. Figure 17 shows that the most important differences are observed in the period of low inflation. Agriculture, the most flexible sector, is 23 pp more flexible than the commerce sector. These heterogeneities are diminished when the economy goes through periods of high inflation. Additionally, the conditional probability of a wage increase shows similar differences between sectors: while 79% of wage changes in the agricultural sector were positive between 1997 and 2001, only 58% were positive in construction. Finally, we consider that sectoral heterogeneity goes beyond differences in levels during periods of low and high inflation.

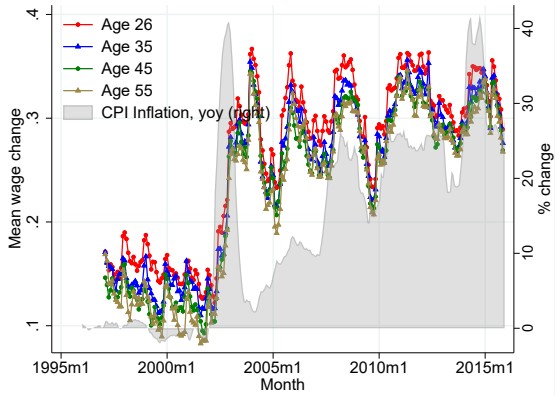

Figure 14: Age

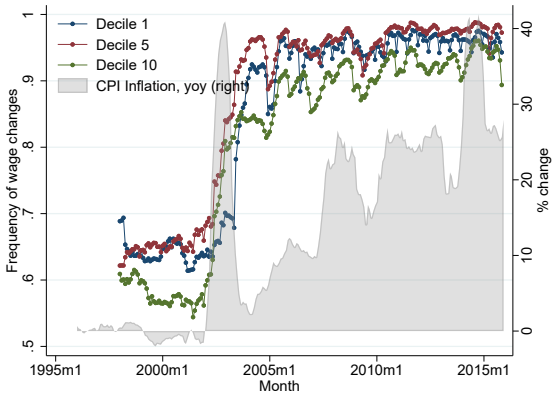

Figure 15: Income

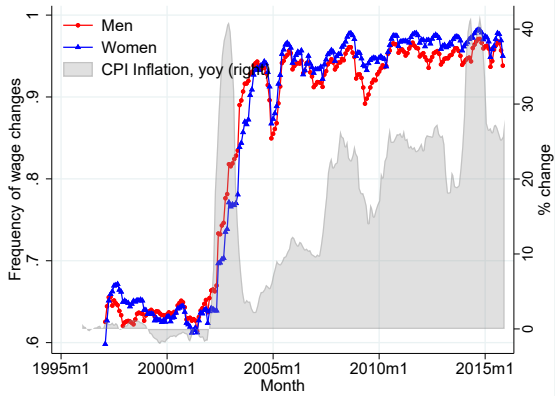

Figure 16: Gender

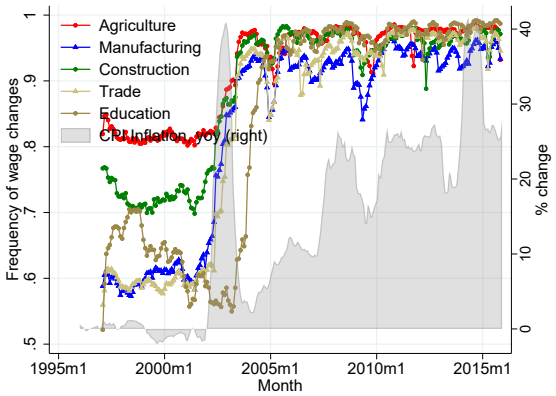

Figure 17: Sector

5 Conclusion

We find that the years 1996-2001 wages were constant until the crisis. In the 2001-2002 crisis there is a sharp drop in the level and dispersion of income, the first recovers as of 2003 and the second remains at low levels. Centralized mechanisms (e.g., minimum wage) dominate the dynamics of income inequality. We also document that during periods of high inflation, the frequency of wage changes increases significantly relative to periods of low inflation. However, the sources of heterogeneities are numerous, and future research is needed in this direction.