Devaluations, Inflation, and Labor Income Dynamics[*]

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Abstract

We study labor income dynamics during large devaluations in Argentina, using a novel monthly administrative employer-employee matched dataset covering the universe of formal workers in the 1994-2019 period. After the 2002 devaluation, real labor income decreases due to a sluggish nominal income adjustment relative to a massive increase in inflation. In the recovery, inequality decreases due to a slower recovery of income at the top of the income distribution. Between-firm heterogeneity is the main contributor to the heterogeneous speed of recovery. Labor market mobility and unionization are the driving mechanisms for the heterogeneous recovery. Facts are robust across other devaluations.

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1 Introduction

Sudden and large real exchange rate (RER) devaluations are associated with significant and abrupt increases in inflation, together with collapses in output and changes in relative revenues of sectors with different trade exposure. Despite the importance of these episodes in business cycles across emerging economies, there is little–to–none evidence on their relationship with the labor market, and especially the heterogeneous effects across workers. The lack of empirical facts to guide economic theory motivates our research question: How does the distribution of labor income evolve during large devaluations?

We study labor income dynamics during large devaluations in Argentina. The average monthly labor income drops during the four devaluation episodes in our sample, with an average elasticity close to minus one third. We do not find this pattern in recessions without large devaluations. The most novel finding of this paper is the decrease in inequality during the recovery after the 2002 devaluation. The standard deviation of log real income drops by 14% due to heterogeneous recovery rates within workers: while workers in the 10th percentile of the pre-devaluation income distribution gain 43% on average after four years, the 90th experienced an average loss of 6%. We decompose the dynamics of income across income percentiles in a between-sector, between-firm, and within-firm components and find that the between-firm component is the primary driver of the differences in the speed of recovery. We find that labor market mobility and unionization explain the heterogeneous recovery across workers, while there is a limited role for trade exposure and changes in labor income risk.

The analysis of the dynamics of the labor income distribution during large devaluations requires the combination of two factors not commonly found together in the previous literature: the availability of rich micro-data around episodes of large and sudden devaluations. In this paper, we measure labor dynamics using a novel administrative employer-employee matched dataset during the 1994-2019 period in Argentina, which covers four large devaluations. Our main panel dataset contains information about nominal pre-tax labor compensation for workers employed in the formal private sector.

There are three advantages of using these data: frequency, quality, and coverage. The frequency of the data is monthly; thus, we can distinguish between income fluctuations coming from earnings or employment status and their interaction for labor income at a high frequency. The source of the data is employers' sworn statements used for tax purposes and to define workers' social security contributions; thus, the data contains little measurement error, which is a common problem with survey-based micro-data. Besides, there is no top-coding. The coverage of the data is the universe of formal workers, which allow us to follow the same worker or firm for up to 26 years.

Our first finding is that average labor income drops during the largest devaluation episodes our data covers: January of 2002, January of 2014, December 2015, and May of 2018. Across all of these devaluations, average income drops by 0.40% when the RER devalues by 1%. Importantly, this correlation between the change in average labor income and RER devaluation rates is not present during recession episodes without a devaluation. For example, output dropped by 17% from 1998 to 2001. Nevertheless, the average labor income almost did not change. This lack of correlation between the business cycle and average income holds during periods of low inflation, such as the 1998-2001 recession (with an average inflation rate of 0.5%), and periods of high inflation, for example, the 2008-2009 and 2011-2012 recessions (when output dropped by 12% and 6%, respectively). The strong correlation between the real exchange rate and mean labor income motivates the analysis of the distribution of labor income around large devaluations.

We then focus on the dynamics of employment around large devaluations. The weak correlation between labor income and output does not apply to employment, and entry and separation rates. Total employment and the entry rate are pro-cyclical, while the separation rate is counter-cyclical. More relevant to our research question, we find a significant on-impact drop in the separation rate after the 2002 devaluation. The separation rate was 4% in December 2001 and dropped to 2.8% three months after the devaluation. In contrast to employment dynamics in developed economies, the separation and entry rates drive aggregate employment dynamics in equal proportions. While the contribution of the separation rate is small before 2001, it becomes a significant driver after the 2002 devaluation.

The main fact regards the heterogeneous dynamics of the income *distribution* around devaluations. Focusing on the 2002 devaluation, we find: i) no movement of the distribution of income during the two years before the devaluation, ii) a homogeneous drop in income during the first two quarters after the devaluation, and iii) a heterogeneous recovery. While the 10th and 25th percentiles of the income distribution recover to their pre-devaluation levels 22 months after the devaluation, it takes 74 months to the 90th percentile to recover. This much slower recovery of high-income earners relative to low-income earners implies a drop in the degree of inequality of income. For example, the interquartile range decreases by almost 30% log-points two years after the devaluation. This fact also holds during the recovery of the 2015 devaluation, and we do not find this pattern in the 2014 and 2018 devaluations since there is not enough time for the economy to recover in our data.

While the dynamics of different percentiles of the distribution are informative of cross-sectional statistics, they do not reflect individual income dynamics of workers across the income distribution. We extend the analysis by ranking workers according to their pre-devaluation (2000-2001) income and analyzing their within-worker average income growth. We find an empirical pattern of "parallel drop and pivoting." More specifically, during the year before the devaluation, the average year-over-year income growth is close to zero across the distribution. In the year after the devaluation, there is a homogeneous average drop in income of 24%. However, in the following years, we find substantial between-worker heterogeneity: After four years, the average income growth of workers in the 10th percentile of this distribution had experienced an average cumulative income growth of 43% relative to the month preceding the devaluation, while the average cumulative growth of those in the 90th percentile was -6%. Such heterogeneous recovery is almost linear (with negative slope) in the worker's position in the distribution. This fact is robust to further splitting workers according to their characteristics before the devaluation (age group, 1-digit industry, gender, full-time status) and to the inclusion of workers with zero monthly income in the formal private sector.

We find that between-firm heterogeneity is the main contributor to the "pivoting" effect in the recovery. We decompose the dynamics of income across income percentiles in a between-sector, between-firm, and within-firm components. We find that the between-firm component is the primary driver of the linear relation between the speed of recovery and the pre-devaluation income. For the income levels below the 60th percentiles, the average sectoral income and workers' income relative to the average of the firm is almost constant. The heterogeneous recovery of firms' average labor income relative to the sector increases by 20% (resp. -8%) for workers in the 10th (resp. 90th) percentiles, and it is linear across the percentiles of the distribution. Thus, our data suggest that to study the heterogeneous labor income dynamics during large devaluations, economists should focus their attention on explaining the drivers of firms' average labor income relative to the sector.

While the facts described so far provide a statistical description of labor income dynamics during large devaluations, they do not explain the economic drivers behind them. For this reason, we provide suggesting evidence of four potential economic mechanisms. We study the role of labor mobility, unionization, trade exposure, and labor income risk.

Labor mobility is the primary mechanism to explain heterogeneous recovery across percentiles of the income distribution. We demonstrate the claim in three steps. First, we show that the cumulative probability of separations and job-to-job transitions are decreasing in income. Thus, labor mobility is more prevalent among low-income earners. Second, we show that average income growth across jobs after a separation is only positive for low-income earners, and it is positive and decreasing in pre-devaluation income after a job-to-job transition.

To evaluate the quantitative role of labor mobility, we construct several counterfactual income series. We construct cumulative labor income changes without considering income changes experienced after separations, after job-to-job transitions, or both. We show that workers in the 10th (resp. 90th) percentile of the income distribution experienced a 10% (resp. -5%) faster recovery in the data relative to the counterfactual series that exclude changes in income after separations and job-to-job transitions. The quantitative magnitude of the recovery in the counterfactual labor income series is one-half of the recovery in firms' average labor income. Thus, labor mobility allows workers to hedge against inflation.

Unionization is another important mechanism to explain the recovery of income, especially at the middle-to-top of the income distribution. Unions determine the minimum labor income for all workers covered at the sectoral level. For this reason, we study the income dynamics by unionization status for covered workers with incomes close to that minimum in five sectors with strong unions. We find that the income growth of unionized workers is 30% higher relative to non-unionizes workers in four industries. In those sectors, unions negotiated an increase in income between 30% to 60% above inflation. For the remaining sector, we find that the recovery of income does not vary with unionization status, since the union negotiated an increase similar to inflation. Across all industries, unionized workers are mainly middle-to-top income earners, and their income recovers 6% faster relative to non-unionized workers.

We find a limited role for trade and income risk in explaining our the central fact. To understand the role of trade, we study labor income in tradable and non-tradable sectors, and in more disaggregated industry classifications. We find that the RER and sectoral labor income are correlated, and their correlation is a function of trade exposure. For example, while labor income in the tradable sector was decreasing before the 2002 devaluation, it persistently increases by 10% relative to the non-tradable sectors. Nevertheless, we also find that workers' permanent income pre-devaluation and the recovery of sectoral labor income are not correlated as the between-sector income recovery suggested. Finally, we find that the dispersion of year-over-year income growth increases significantly (i.e., the interquartile range increase by 20%). Therefore, a decrease in income risk cannot explain the drop in inequality.

Finally, we study the role of policy changes or additional dimensions of the labor market to understand the heterogeneous labor market dynamics during devaluations better. Since our dataset does not include information of hours of work, we make use of labor force surveys and data on workers with full-time labor contracts in our main dataset. The decrease in inequality is also observed for full-time workers only and in the distribution of hourly wages. Therefore, the drop in inequality is driven by a compression of hourly wages, and not by the dynamics of hours. Since our analysis is based on real labor income constructed with the aggregate CPI, we also reproduce our central fact with real income constructed with income-specific CPIs. The pivoting of the real income recovery decreases slightly, but since pivoting in nominal real income is five times the income-specific CPI, the pivoting in real income is almost unaffected. Finally, we analyze the role played by two policy interventions after the 2002 devaluation: changes in the minimum wage and in the severance payment.

Neither of them can explain the decrease in inequality and the drop in the separation rate after the 2002 devaluation.

Implication for economic theory. Although our results might not quantitatively apply in contexts with different labor market institutions, they point towards mechanisms on how economies adjust after sudden and large devaluations.

Since the original work of Bils and Klenow (2004), and despite the importance of wage rigidities in macroeconomic fluctuations (see Christiano, Eichenbaum and Evans, 2005), there has an impressive development of theories for pricing behavior relative to wages. The argument behind the differential development is the availability of high-quality pricing data, which is absent for wages. First, we show that real labor income decreases during large devaluations due to faster adjustment in prices than wages. Second, we show that the slow recovery of wages is heterogeneous across the income distribution. This fact connects the dynamics of wages to inequality at a business cycle frequency. Therefore, canonical models of sudden stops (see, e.g., Mendoza, 2010) should incorporate fluctuations in inequality during large devaluations as a propagation mechanism (e.g., the role of inequality to explain the impressive Argentinean recovery), and as a primary consideration for the development of optimal policies.

Canonical models in international macroeconomics rely on the assumption that labor markets in the tradable and non-tradable sectors are integrated (see, e.g., Balassa, 1964, Samuelson, 1964). Thus, in light of positive shocks to revenue per work in the tradable sector, one should expected an increase in the relative labor demand in the tradable sector. With integrated labor markets, equilibrium employment in the tradable sector and market-wide wages are higher. In this paper, we find that in response to a large and persistent positive shock to revenue per worker in the tradable sector, relative tradable employment experiences a small and temporary increase, while the tradable wage premium increases permanently. Al tough one would need a model to quantify the departure from the assumption of integrated labor markets, our evidence shows that models based on frictional labor markets would provide a more realistic depiction of the response of an economy to a large devaluation.

Relatedly, the typical calibration of the standard model with frictional labor markets (DMP) assumes a constant separation rate based on the fact that separations contribute little to employment dynamics in developed economies (see, e.g., Shimer, 2005). In this paper, we show that in an emerging economy that experiences a large decrease in real wages, the separation rate becomes a relevant driver of aggregate employment. Explaining this fact would require extending a model with endogenous separations (see, e.g., Mortensen and Pissarides, 1994) by including nominal frictions. This is the next step in our agenda.

Literature review. We highlight three contributions with previous work: the analysis of (i) the macroeconomic consequences of large devaluations, (ii) real labor income dynamics after a significant increase in inflation, and (iii) business cycle dynamics of labor income in developed vs. developing economies.

Several papers study the economic consequences of large devaluations. The price dynamics after large devaluations is analyzed in Burstein, Eichenbaum and Rebelo (2005). They find that on average, 38% of the total nominal exchange rate depreciation is incorporated into CPI prices within 24 months. Thus, large devaluations tend to be following by large spikes in aggregate inflation. The distributional consequences of large devaluation are analyzed in Cravino and Levchenko (2017), Drenik, Pereira and Perez (2018), and Hausman, Rhode and Wieland (2019) across different dimensions. The first paper focuses on household-level inflation, the second paper focuses on the capital gains with foreign assets holdings, and the third paper focuses on redistribution between farmers and non-farmers. From a more aggregate perspective, the interaction between the labor market and devaluations is analyzed in Eichengreen and Sachs (1985) and Schmitt-Grohé and Uribe (2016). They argue that a devaluation, and its upward pressure on prices, can overcome downward nominal wage rigidities and stimulate output. In this paper, we extend the previous analysis by focusing on the dynamics of the *distribution* of labor income and employment after large devaluations using administrative micro-data from an emerging economy.

Another strand of the literature analyzes the joint dynamics of the real exchange rate and the labor market in the US (see Campa and Goldberg, 2001, Goldberg and Tracy, 2001, Gourinchas, 1998, among others).[1] Campa and Goldberg (2001) and Gourinchas (1998) focus on the US manufacturing sector and find small to null correlations of real exchange rates with employment. The former finds an elasticity of 0.04 of labor income with respect to a real exchange rate depreciation, while the latter finds substantial effects on the destruction and creation rates of tradable jobs and no effects in non-tradable industries. Goldberg and Tracy (2001) show that a more significant association of real exchange rates and labor income is concentrated among workers who change jobs. In contrast to these papers, in a developing economy such as Argentina, we find that shortly after a devaluation real wages across *all* sectors fall, but in the medium/long-run tradable wages become persistently higher than in the non-tradable sector.[2] Also, we find small reallocation effects of employment towards the tradable sector even though the analysis focuses on large devaluations.

[1] Further evidence from the U.S., France and Italy can be found in Gourinchas (1999), Klein, Schuh and Triest (2003), and Nucci and Pozzolo (2010).

[2] The previous literature has documented short-run increases in the wage premium of the tradable and exporting sector during the Mexican crisis in 1994 (Cugat, 2019, Frías, Kaplan and Verhoogen, 2009). Instead, we document that such increases are observed up to 15 years after a devaluation. This result is supported by evidence in Dix-Carneiro and Kovak (2017), who analyzed the long-lasting effect of changes in tariff.

This paper documents the evolution of the distribution of real labor income after an increase in inflation of 35%. This event, combined with the availability of a monthly panel, allows us to provide novel evidence about the adjustment process of the distribution of nominal labor income in the short- and medium- run. The main known facts about wage stickiness in environments with low and stable inflation are: (i) the share of workers experiencing wage changes within a quarter is between 0.21 and 0.35, (ii) the hazard rate of adjustment has an inverted U-shape with a peak at one year, (iii) the share of workers experiencing a wage cut is 2.4% for job stayers and 18.5% for job switchers.[3] These facts are reported in the US and Europe by Kahn (1997), Dickens et al. (2007), Sigurdsson and Sigurdardottir (2011), Le Bihan, Montornès and Heckel (2012), Barattieri, Basu and Gottschalk (2014), and more recently by Jo (2019) and Grigsby, Hurst and Yildirmaz (2019). Here, we provide novel evidence about the different speed of real adjustment across the income distribution after a significant increase in inflation. We find that high-income earners take four more years to revert to their pre-inflationary shock level than low-income earners. That is, the recovery of real income is heterogeneous, can be predicted by workers' characteristics, and has large effects on inequality.

Our paper is closely related to previous work on the dynamics of the distribution of labor income. While the measurement and analysis of the distribution of labor income in developed countries is a prominent research area, much less is known about developing countries. Storesletten, Telmer and Yaron (2004) use an innovative technique to estimate business cycle fluctuations of the innovation of the persistent component of labor income risk using the age profile of the cross-sectional dispersion. Closely related to this paper, Guvenen, Ozkan and Song (2014) study the business cycle fluctuations of higher order moments of the distribution of income growth in the US using data with information about the universe of workers.[4] They find no variation in the dispersion and a significant variation in the skewness of income growth. Using similar data covering the universe of formal workers, but with a higher frequency, we continue to find similar average statistics and variations in the skewness of annual labor income risk as in Guvenen *et al.* (2014). However, we do find significant volatility of the dispersion of the level and growth rate of labor income during large devaluations. To the best of our knowledge, this is the first paper that documents that nominal shocks in developing countries do affect idiosyncratic labor income risk.

Finally, we contribute to the literature that empirically documents the main drivers of aggregate employment. The driver of employment dynamics in developed economies is studied by Hall (2005), Ridder and van den Berg (2003), Jolivet, Postel-Vinay and Robin (2006) and

[3] In some European countries, the literature also reports a large level of synchronization around an specific date.

[4] See Hoffmann and Malacrino (2019) and Busch, Domeij, Guvenen and Madera (2018) for a similar analysis in Italy and Germany, respectively.

Hobijn and ahin (2009), and Shimer (2012). Across different developed countries, databases, and periods, they document a similar fact: employment fluctuations are mainly driven by movements in the job finding rate, and not in the separation rate. In another context, we find that movements in the separation rate are an important driver of aggregate employment around devaluation episodes, during which we observe a large decrease in real labor income. These results can be interpreted as evidence of the fact that wages of incumbent workers are indeed allocative. In addition, the joint collapse of real wages and separation rates is consistent with the prevalence of non-Coasean separations as documented by Jäger, Schoefer and Zweimüller (2019).

Layout. The paper is organized as follows. Section 2 describes the data and Section 3 presents aggregate business cycle fact with emphasis in large devaluations. Section 4 presents our two new facts. Section 5 presents evidence on the mechanisms behind these facts. Sector 6 shows the robustness of our finding. The last section concludes.

2 Data

This section describes the novel dataset that we leverage to study the dynamics of the income distribution after large devaluations. Interested readers should refer to Online Appendix Section A for a deeper discussion of variables in SIPA, sample construction, and cross-validation of SIPA results.

Data description. We use administrative employer-employee matched monthly panel data from Argentina. The data starts in July 1994 and ends in June 2019. Our data source is the Argentina's National Social Security System ("Sistema Integrado Previsional Argentino", SIPA from hereon). Following the 1993 social security reform, SIPA started collecting employer and employee administrative records to calculate tax liabilities and social security contributions. By law, all employers in the formal sector must present sworn statements providing relevant worker compensation information to SIPA every month.

SIPA tracks each worker's total monthly labor income in the formal sector without measurement error or top-coding, including all forms of payment that could trigger tax liabilities or social security contributions (e.g., base wage, bonuses, overtime compensation, etc.). The dataset also includes relevant demographic information on each worker and their jobs, as well as some characteristics of the firm, such as 4-digit industry and state. Importantly, SIPA also provides firm and worker identifiers that are consistent across the entire period, allowing us to analyze income dynamics for individual workers and firms on a monthly frequency for up to 26 years.

Coverage. The dataset covers the universe of formal workers employed in all regions, private industries, types of contracts (internships, temporary workers, full-time employees, and others), and in the public sector. One of the benefits of analyzing the Argentine labor market is that, relative to other Latin American economies, the informality rate is not as high—e.g., Gasparini and Tornarolli (2009) report a formality rate in Mexico of 45%. Figure E.14-Panel B shows the time series of the share of formal employment in the private sector for male salaried workers aged between 25 to 65 in Argentina. At the beginning of the sample, the formal employment share starts near 70%, with a minimum of 61% in 2002, and then stabilizes at 72% after 2009. We conclude that our data covers a large share of the overall population.

Sample selection and object of analysis. We present facts about the (log) real pre-tax total labor compensation of male workers aged between 25 and 65 in the private sector.[5] We restrict our sample to male workers aged between 25 and 65 years to avoid issues related to labor force participation and retirement. Finally, we drop observations coming from job spells involving workers employed in the public sector, since their wages might not be market-determined and subject to other non-market forces.

We apply some filters to monthly real labor income in our analysis. We eliminate outliers and winsorize top observations. We define outliers as workers who earn less than half of the monthly minimum wage. Because the minimum wage in Argentina has changed over time, we use the 1996 value in real terms (i.e., 200$ dollars per month) and adjust it by the average growth rate of real wages in the entire sample (i.e., 2% annual growth). We winsorize observations above the 99.999th percentile. Finally, we also omit the first and last wage of each job spell due to time aggregation concerns, since we do not know the day a spell starts/ends, or if the last wage includes severance payment. Although we do not consider these monthly salaries in the analysis of labor income, we use these observations to analyze employment flows. The final dataset with our sample selection and filters contains more than 700 million worker-month observations.

Finally, we purge the monthly labor income of the 13th salary paid in June and December to avoid spurious seasonality. This extra salary is by law and equals one half of the highest wage paid over the semester. Unfortunately, we only observe total income before 2008, so we use the formula established by law to calculate each worker's 13th salary.

Additional data. We complement the SIPA database with the information contained in Collective Bargaining Agreements (CBAs, from hereon) negotiated by trade unions at the

[5] Due to the intervention of inflation statistics in Argentina in 2007, we use consumer price indices provided by national statistics before 2007 and PriceStats from 2007 onward to construct real labor income.

sectoral level. In Argentina, a single union has monopoly power to represent workers at the sectoral level. That union signs a contract covering all employed workers in the sector independently of their membership status. We digitize these contracts at the sectoral level for several of the most important unions. We also use data from the Permanent Household Survey ("Encuesta Permanente de Hogares", EPH from hereon), which is the main household survey in Argentina.

Cross validation of SIPA data. Since this is one of the few papers using the SIPA dataset, a further discussion of the quality of the data is merited.

First, almost all labor statistics in national accounts in Argentina use the SIPA dataset (e.g., wages, updates of the labor value added at the sectoral level from the National Census, employment statistics, among others). Moreover, we qualitatively reproduce the main facts in Sections 3 and 4 for formal workers whenever is possible using EPH with some caveats. Additionally, we compute summary statistics applying the same data filters as in Guvenen *et al.* (2014) to benchmark them with U.S. statistics. We find similar statistics on average annual income across the sample, and the cyclicality of income growth skewness with output. Overall, we are confident that the SIPA dataset is a high-quality source of information on Argentina's formal market.

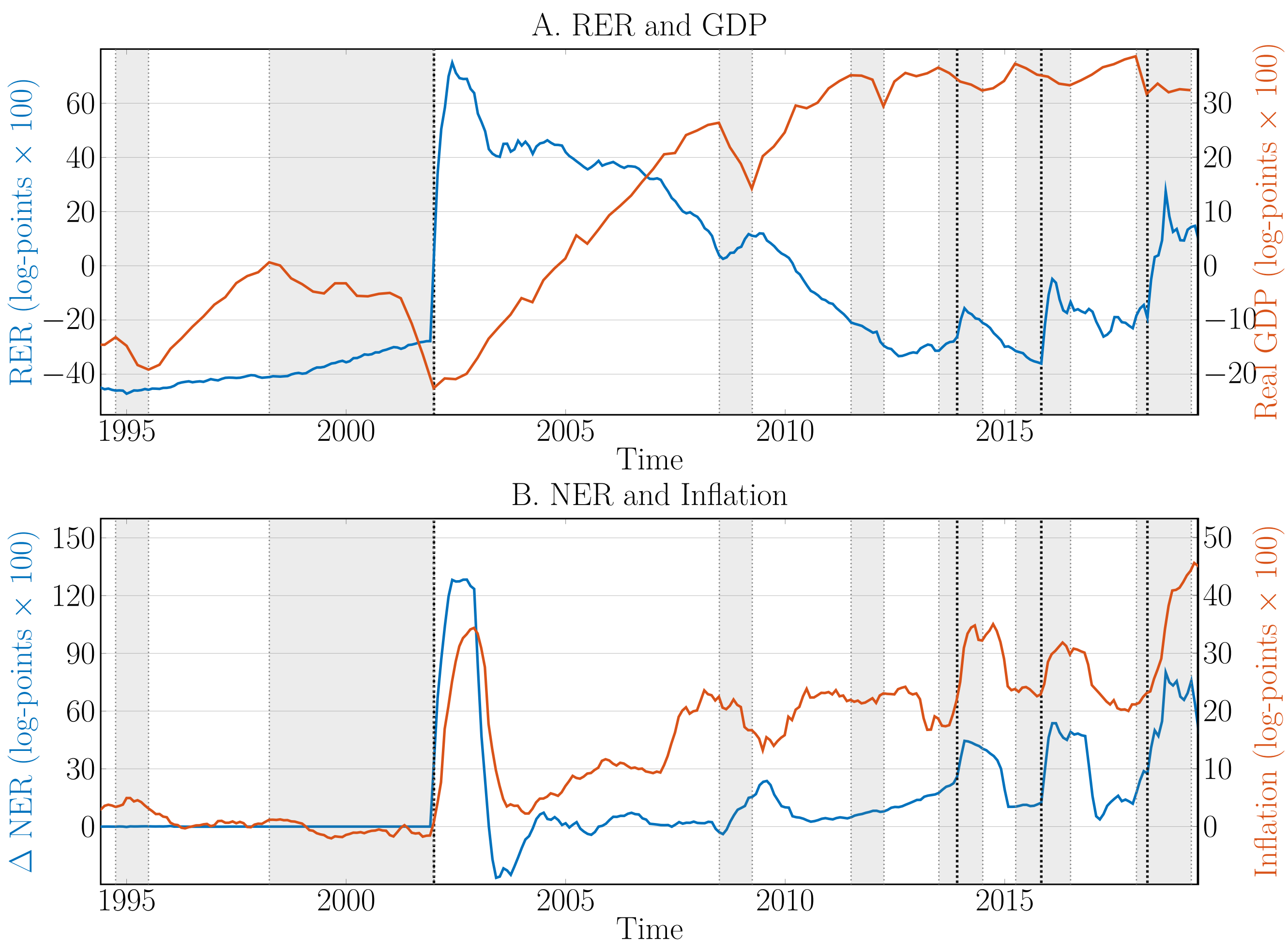
Seasonally adjustment. We seasonally adjust all-time series using the X-13ARIMA-SEATS Seasonal Adjustment program developed and used by the U.S. Bureau of the Census.

3 Aggregate Facts after RER Devaluations

This section describes business cycle facts for a number of macroeconomic and labor market variables. We analyze the RER, real gross domestic product (GDP), and inflation for macroeconomic variables. For the labor market, we focus on the real labor income, stock of employment, and flows between employment and non-employment in the formal private sector (from hereon we refer to this state as simply non-employment). We show a strong comovement between real labor income and flows of employment status with the RER during large devaluations. We do not observe a similar strong comovement of real labor income with output. These business cycle facts motivate the emphasis on studying the dynamics of the labor income distribution after the most significant devaluation in our sample.

Macroeconomic Business Cycle Facts. We first describe the macroeconomic environment during the period of analysis to contextualize our measurement exercise. Figure 1-Panel A shows the (log) RER between Argentina and the United States and (log) real output for the period of our data. We mark recession periods in gray and any monthly devaluation rate larger than 10% with black dotted vertical lines. We define a recession period as a sequence of quarters in which the quarterly growth rate of real GDP is negative. Figure 1-Panel B plots yearly inflation and nominal exchange rate (NER, from hereon) growth.

Figure 1 – Macroeconomic Business Cycle Facts in Argentina 1994-2019



Notes: The figure plots four macroeconomic time series in Argentina for the period between 1994-third quarter to 2019-second quarter. Panel A describes the RER (blue) and real GDP (red), and Panel B describes NER and inflation. All variables are expressed in log-points × 100. RER is computed at a monthly frequency, and it is normalized by the historical median from 1965 to 2019. GPD is computed at a quarterly frequency, seasonally adjusted and normalized to zero in the third quarter of 1998. Recessions periods are in grey, and monthly devaluations larger than 10% are marked with black dotted lines.

Argentina is characterized by significant variations in the economic environment. Between 1994 and 2019, there were two exchange rate regimes: a fixed exchange rate from January of 1994 to December of 2001, in which the national currency was pegged one-to-one to the US Dollar, and a floating exchange rate from January of 2002 to the present. The average inflation in the two regimes was remarkably different. While in the first regime, the average annualized inflation was close to 0.5%, in the second regime the average inflation was 20%.

Our sample includes seven recessions with different comovement with the RER, which allow us to distinguish labor market dynamics during recessions with and without devaluations. Recession preceded or followed by large devaluations are 1998-2002, 2014, 2016, and 2018 recessions. The 1998-2002 recession featured a cumulative output drop of -21%, with a weak depreciation of the real exchange rate due to a lower inflation rate relative to the US. The end of the recession was associated with the most significant devaluations in our sample. The other recessions in this group have qualitatively similar dynamics, but with a smaller magnitude. Recessions without large devaluations are the 1995, 2008, and 2011 recessions. All these recessions were substantials—i.e., 6%, 12%, and 6% output drop in chronological order.

The period of analysis covers four large and sudden devaluations with a saw-toothed profile: January of 2002, January of 2014, December of 2015, and May of 2018. In the first month of 2002, Argentina abandoned its one-to-one peg to the US Dollar. The resulting depreciation rate was of 100% (in log points), ending a period of slow RER depreciation. The second sudden devaluation of 11% is mainly associated with a decision of the Argentinian Central Bank to stop intervening in the foreign exchange market by selling foreign reserves. The devaluation in December of 2015 occurred after a change of government. The new authorities removed all the restrictions on the operation of the exchange rate markets, with a subsequent devaluation of 31% in the next three months. The last devaluation in May 2018 followed the government's lack of capacity to rollover short-maturity debt and the approval of the largest rescue plan by the IMF in its entire history.

The devaluation episodes in our sample are large and induce a significant increase in aggregate prices. The order of magnitude of these devaluations are significant even in comparison to emerging economies. Following a standard classification of emerging economies in the literature, the 99th percentile of the RER growth rate distribution for this group of countries is 25%, respectively. Thus, our sample covers three tail events in terms of RER fluctuations. Finally, each devaluation is associated with a large pass-through into domestic consumer prices (see Figure 1-Panel B) consistent with international evidence. Burstein *et al.* (2005) documented an average elasticity of annual inflation to a large nominal devaluation of one-third across emerging economies. The average ratio of yearly changes of inflation over yearly change of the NER is 0.34 across devaluations (i.e., 0.29, 0.28, 0.13, 0.97 for each devaluation in chronological order).

This paper focuses mainly on the 2002 devaluation that has three additional features, apart from its size and variation in inflation. First, it is associated with a persistent fluctuation of the RER: it took five years to revert to the historical median and ten years to reach pre-devaluation levels. Second, its size took market participants by surprise, while the other devaluations were partially predicted. Third, we find that after the devaluation there is a recovery in real GDP and output per worker, key determinants for the recovery of labor income. Thus, its size, suddenness, persistence, unpredictability and subsequence recovery, makes the 2002 devaluation particularly desirable to analyze.[6]

Labor Market Business Cycle Facts. What are the cyclical properties of aggregate labor income and employment? As we explained above, the prevalence of sudden increases in inflation during large devaluations is an empirical regularity across emerging markets. Nevertheless, changes in real labor income depend on the relative flexibility of nominal labor income vis–a–vis prices, together with changes in the marginal product of labor. While Burstein *et al.* (2005) provide evidence on the empirical properties of prices after devaluations, there is scarce evidence about the dynamics of labor income after significant changes in inflation. On the one hand, we have considerable micro-data evidence of labor income or wages adjustment facts in low and stable inflation countries, where they respond mainly to idiosyncratic motives. On the other hand, we have macro–estimates (see for example Christiano, Eichenbaum and Evans, 2005) based on structural models that favor a dominant role of wage rigidities to explain aggregate times series.[7]

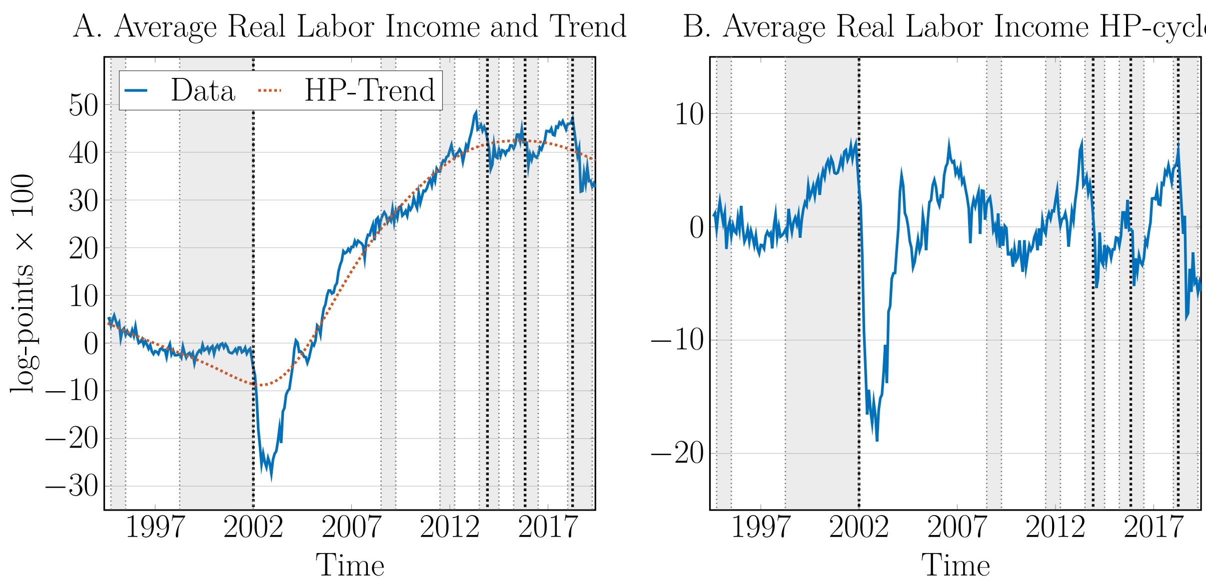
The average monthly labor income drops significantly during the four devaluation episodes described above. We do not find this pattern in recessions without large devaluations. Figure 2-Panel A plots the log average real income relative to the average income in 1996. Figure 2-Panel B plots the cyclical component of average real labor income after applying a Hodrick-Prescott filter (HP filter from hereon). As the figure shows, in the first six months after the 2002 devaluation, there was a drop in log average labor income of 26%. After this significant drop, it took two years for average income to revert to its pre-devaluation level. The elasticity of labor income to the RER in this devaluation episode is -0.21, much larger than previous estimates (see for example Campa and Goldberg, 2001). This elasticity takes values of -0.64, -0.25, and -0.5 in 2014, 2015, and 2018 devaluations, respectively. A smaller recovery is only observed in the third large devaluation in the sample.

We do not find a significant correlation between average labor income and output during recessions that are not associated with sudden changes in the RER. This property holds in periods with low and high inflation rates (i.e., before and after 2001). This lack of correlation

[6] In Appendix B.1, we present data on exchange rate expectations from a survey of professional forecasters provided by Consensus Economics. In December 2001, agents were expecting a devaluation of 7% within the following 12 months, so clearly, a devaluation rate of more than 100% had a sizable unexpected component. In Appendix B.2, we plot the dynamics of output per worker as a simple measure of labor productivity.

[7] Here we use "wage" to refer to labor income under the implicit assumption that the intensive margin of labor supply is constant. We analyze the robustness of this assumption in Section 6 with additional information on part– and full–time workers and weekly hours of work.

Figure 2 – Business Cycles of Average Real Labor Income



Notes: The figure shows monthly business cycles fluctuations of average (log) real income from 1994 third quarter to 2019 second quarter. Panel A shows the average real labor income and its trend with HP filter. Panel B shows the detrended average real labor income with HP filter. We use an smoothing parameters in the HP filter of 129600 to remove the trend component. Recessions periods are in grey and monthly devaluation larger than 10% are in black dotted lines.

is surprising, given the magnitudes of the recessions. The two recession during the fixed exchange rate regime (i.e., 1995 and 2008-2001 recessions) have cumulative output drops of 6% and 21%, respectively. Despite the significant output drop and the negative effect it had on employment (see below), there are no noticeable fluctuations in average labor income. Similar patterns hold during recessions within the floating exchange rate regime.

Do changes in real income correlate with labor market flows? While employment is strongly pro-cyclical, its drivers—the job finding and separation rates—may vary over the business cycle. Studying these drivers informs us about which frictions we need to study to explain fluctuations in the labor market. For example, if fluctuations in the job-finding rate mainly drive unemployment, then wages of *new hires*—and theories that explain them—are essential to understand employment dynamics (Pissarides, 2009). This result breaks if the separation rate is the primary driver of employment dynamics. In that case, wages of *incumbent* workers are allocative and matter for business cycle dynamics.

Quantitatively, the job-finding rate is the main driver of unemployment fluctuations across developed countries. Shimer (2012) shows that fluctuations in the job-finding rate account for almost 80% of unemployment fluctuations during the 1948 to 2007 period (this number increases to 95% since 1985). This fact is robust across countries and to alternative methods for the computation of the job finding and separations rates.[8] While the findings of these papers have guided the development of theories to study business cycles in developed economies, their sample does not include episodes of sudden stops in emerging economies with large drops in real labor income. For this reason, we revisit their analysis in our data.

We analyze the stock of employment and the flows between employment and non-employment within the following accounting framework. This framework is motivated by the fact that we do not need to make assumptions about whether a worker is unemployed or working elsewhere (e.g., in the informal or public sectors) if we do not observe her in the sample—see also Davis and Haltiwanger (1992) for a similar approach. Let N_t be the stock of employed workers in our sample in period t. We write the law of motion of N_t making use of the entry (N_t^{entry}) and exit flows (N_t^{exit}):

$$N_t = N_{t-1} - \underbrace{N_t^{exit}}_{s_t N_{t-1}} + \underbrace{N_t^{entry}}_{e_t N_{t-1}} = N_{t-1}(1 + e_t - s_t), \tag{1}$$

where e_t and s_t denote the entry and separation rates in period t, respectively.

Business cycle fluctuations of the separation rate are quantitatively significant. The most significant fluctuation of the separation rate is after the 2002 devaluation, where it falls from a pre-devaluation level of 4% to 2.8%. Figure 3-Panel A and Panel B plot the evolution of employment, entry rates, and separation rates. As the figure shows, employment and entry rates are pro-cyclical, separation rates are counter-cyclical, and there is a negative trend in the entry and separation rates.[9] A natural question is: how much of the observed dynamics of aggregate employment is due to fluctuations in separation and entry rates?

Separation and entry rates drive aggregate employment dynamics in almost equal proportions. We show this property in the following way. First, we calculate $\overline{s}$ and $\overline{e}$ to be the average separation and entry rates during the sample. Then, we re-compute the time series of aggregate employment with the counterfactual separation or entry rates:

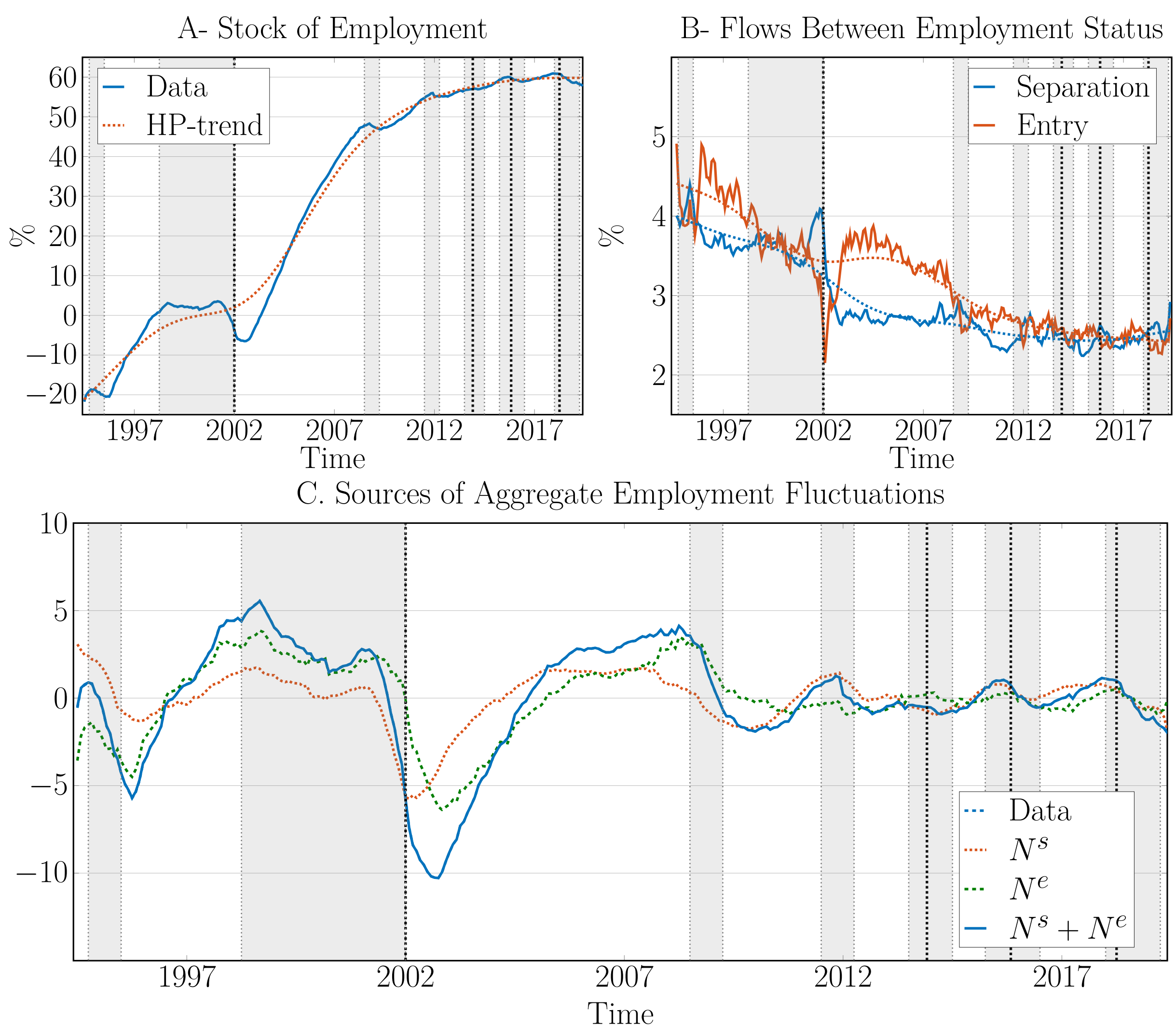
$$N_t^s = N_{t-1}^s(1 - s_t + \overline{e}) \quad \text{and} \quad N_t^e = N_{t-1}^e(1 - \overline{s} + e_t), \tag{2}$$

with $N_0^e = N_0^s = N_0$, where N_0 is the observed employment in the first month of the sample. Figure (3)-Panel C shows the cyclical component of N_t, N_t^e, N_t^s, together with their sum. Note that the observed dynamics of N_t are close to $N_t^e + N_t^s$. The most significant fluctuation of N_t^s is during the 2002 devaluation where it generates a considerable dynamics of total employment.

[8]See Hall (2005), Ridder and van den Berg (2003), Jolivet *et al.* (2006) and Hobijn and ahin (2009) for similar results across developed countries, datasets and time periods.

[9]The trend in entry and separations rates are consistent with empirical patterns across countries (see for example Shimer, 2005).

Figure 3 – Business Cycle Dynamics of Aggregate Employment



Notes: The panels A and B plot (in the following order) the total employment and entry and separation rates. The Panel C shows (log) aggregate employment, N_t^e, N_t^s, and $N_t^e + N_t^s$ with HP filter. N_t^e and N_t^s are defined in equation (2). We use HP filter to decompose each variable in trend and cycle with an smoothing parameters of 129600. Recessions periods are in grey and monthly devaluation larger than 10% are in black dotted lines.

Discussion of aggregate facts. We find that the significant changes in real income interact with labor flows between employment and non-employment. This fact matters for the development of labor market models that study sudden stops. The magnitude of this interaction during the 2002 devaluation suggests the importance of endogenous separations to explain aggregate employment dynamics. Nevertheless, there are two extreme cases for models of endogenous separations: The Coasean case—in which separations are efficient—or the non-Coasean case—in which separations are inefficient (see Jäger, Schoefer and Zweimüller, 2019).

To explain each case, define the bargaining set of a match between a worker and a firm as the interval of wages between the opportunity costs of the firm and worker. As long as this bargaining set is not empty for a given firm-worker pair, there exists a wage such that the pair will exploit the gains from the match through employment. The Coasean version of the model rationalizes the 2002 drop in separation rate with a large fraction of bargaining sets becoming empty during the significant recession before the devaluation. In this case, there exist no wages that can sustain a significant fraction of matches, and the efficient outcome is their dissolution. In the non-Coasean case, the large separation before the devaluation is due to a decrease of firm's opportunity cost below the real wage. In this case, a lower real wage across a large fraction of matches after a devaluation decreases the level of separations in the economy. The non-Coasean case restore efficiency after the devaluation since the firm-worker pair are exploiting the gains of the match.

Our data points to the non-Coasean case as the driving mechanism behind the drop in separations. First, the combination of rigid wages before the devaluation (see Figure 2), and an aggregate output drop of -21% likely made the upper bound of the bargaining set of some firms hit their workers' wages, leading to inefficient separations. Second, there were no changes in unemployment benefits in Argentina during this period. Thus, we do not find evidence in favor of any theory that explains the drop in separations based on an increase in the workers' opportunity cost. Third, the evidence we provide below further support the role unions played in (not) renegotiating wages before the devaluation.

4 Distributional Facts after RER Devaluations

In this section, we focus on the dynamics of the *distribution* of labor income after large devaluations. In the previous section, we documented a large aggregate drop in real income after the 2002 devaluation and the subsequent recovery. Here, we analyze the heterogeneous effects of the 2002 devaluation on workers located across the income distribution. We present similar analysis for the other devaluation episodes in the Appendix.

4.1 Heterogeneous Dynamics across the Income Distribution

Given the significant fall and the subsequent recovery of mean income after the 2002 devaluation, two natural questions arise. Was this fall experienced homogeneously across the income distribution? What were the distributional dynamics of labor income during the recovery period? Figure 4 plots moments of the income distribution—normalized percentiles, the interquartile range, and the standard deviation—during two years before and five years after the devaluation. The first important observation is that, as we can see in the figure, there is no significant fluctuation across percentiles of the income distribution before the 2002 devaluation despite the severity of the recession. This lack of fluctuations is also reflected in the evolution of the interquartile range and the standard deviation. Second, there is an *homogeneous* drop of 26% across the distribution of real income during the first two quarters after the devaluation. This drop is the result of the rapid increase in inflation and a lack of nominal adjustment of wages.

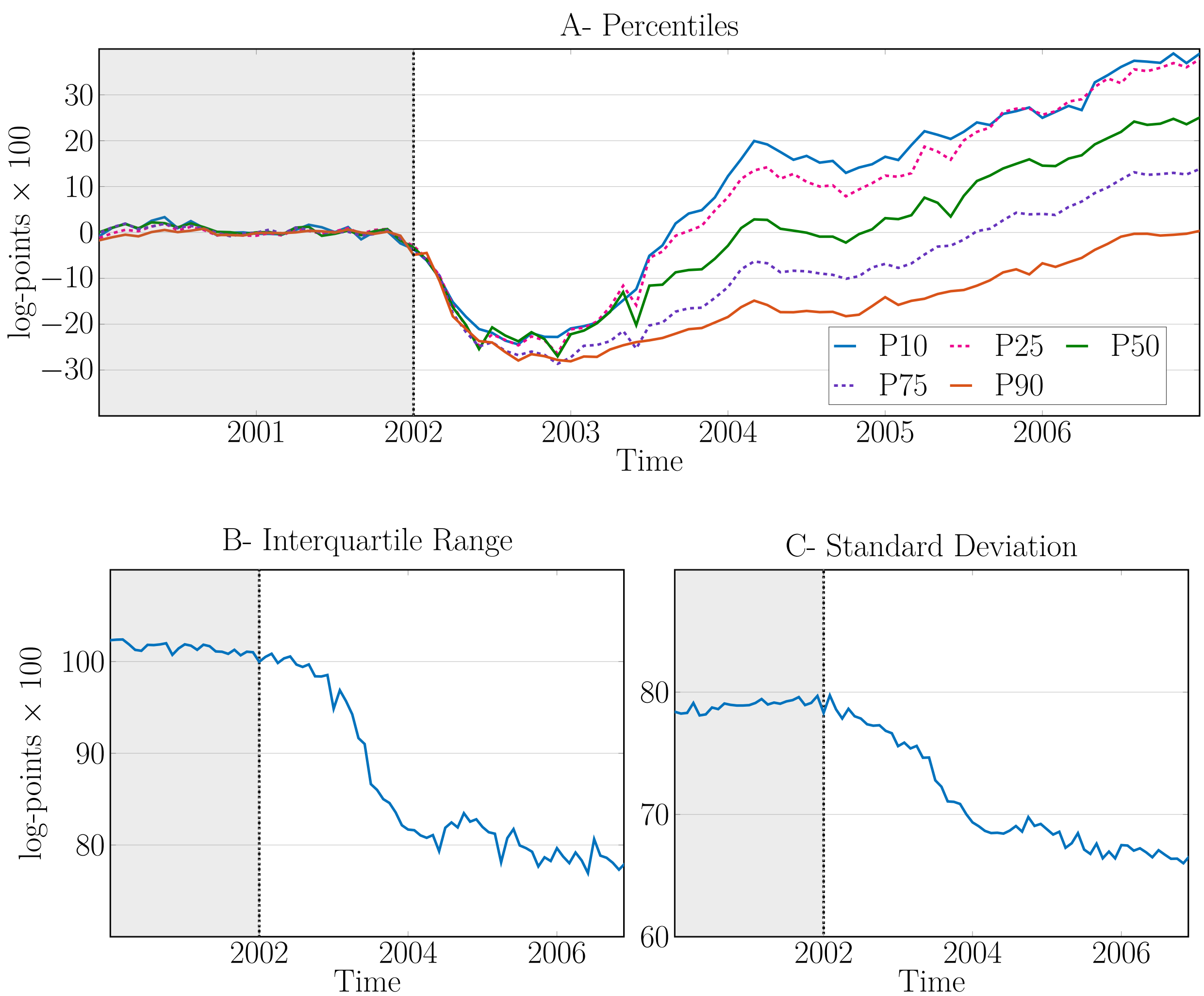
Despite this homogeneous fall, Figure 4 shows that there is significant *heterogeneity* in the speed of recovery of real income across different parts of the distribution. While percentiles below the median start recovering after the third quarter, percentiles above the median continue falling for two additional quarters. Alternatively, note that the 10th percentile of the income distribution recovers to its pre-devaluation level in 21 months, while it takes 61 months for the 90th percentile to recover. This faster recovery of the bottom of the income distribution implies that the distribution became less unequal after the devaluation.

The compression in the distribution during the recovery is reflected in the evolution of the inter-quartile range and the standard deviation. The interquartile range drops from close to 100% to 80%, and the standard deviation drops from 79% to 68%. This recovery can be more easily seen in Figure 5, which compares the real income distributions in 2001 and 2006. Four years after the devaluation, there is a substantial shift upwards in the bottom of the real income distribution and compression of real wages from the top.

While the previous analysis is informative of cross-sectional statistics, it does not reflect income dynamics of individual workers across the income distribution during and after the devaluation. This is simply because the identities of the workers behind each percentile can change drastically over time. We address this issue by studying workers' income growth conditional on their pre-devaluation level of income.

To do this, we rank workers according to their permanent real monthly income during the pre-devaluation period and group them in percentiles according to this ranking. However, the presence of an age profile in income will render this ranking more favorable towards older workers, thus confounding income and age differences. We address this issue following Guvenen *et al.* (2014). We first run a pooled regression with all the data in the sample of log

Figure 4 – Moments of the Distribution of Labor Income



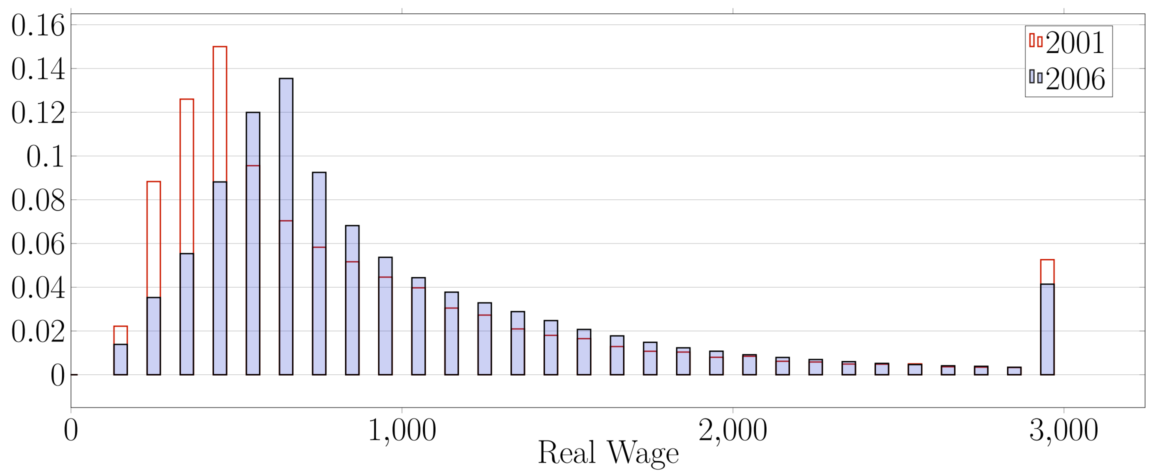
Notes: The figure plots moments of the distribution of monthly real income from January of 2000 to December of 2006. Panel A plots the percentiles of the log income distribution (× 100) normalized by their average during 2001. We use Px to denote the x-th percentile of the distribution. Panels B and C plot the interquartile range ($P75 - P25$) and the standard deviation for the same period.

labor income on a set of age and year dummies. Then, we rank workers according to their average log income net of the life cycle profile during the two years before the devaluation. We drop workers with less than six months of employment during the period 2000-2001 since we cannot capture precisely their average income over the period. Figure 6 shows the mean year-over-year growth of real income (net of the life cycle profile) from December of 2001 onwards in the y-axis and the percentiles of the permanent income (net of the life the cycle profile) in the x-axis.[10]

[10] Formally, we define the permanent component of income net of the life cycle profile for agent i as

$$\bar{Y}^i_t \equiv \sum_{m=0}^{23} e^{\tilde{y}^i_{t-m}} \times \mathbb{1}\{N^i_{t-m}=1\} / \left[\sum_{m=0}^{23} e^{d_{a-m}} \times \mathbb{1}\{N^i_{t-m}=1\}\right],$$

Figure 5 – Income Distribution in 2001 and 2006



Note: The figure plots the income distribution in 2001 and 2006. Distributions are Winsorized using the 95th percentile of distribution as the upper bound.

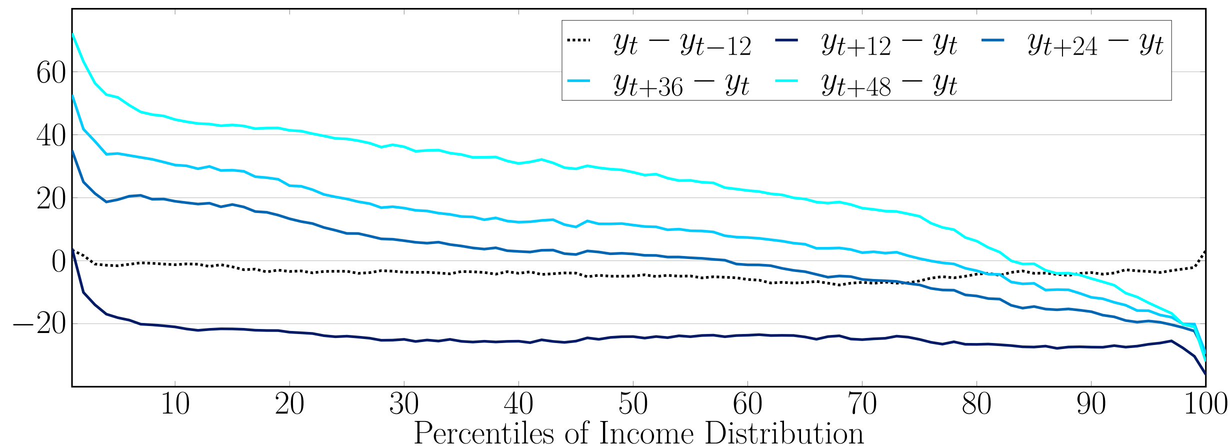
The first fact is that, during the year before the devaluation, the average year-over-year income growth ($y_t - y_{t-12}$) is close to zero for all percentiles. This homogeneous average growth disappears after the devaluation and the pattern that emerges across the income distribution is one of a "parallel drop and pivot". That is, in the year after the devaluation, there is a parallel average drop in income ($y_{t+12} - y_t$) of 24% across percentiles, followed by a pivoting of the cumulative mean income growth centered around the income growth of the highest-income workers. The gap is quantitatively significant. After four years ($y_{t+48} - y_t$), the average income growth of workers in the 10th percentile of the pre-devaluation distribution had experienced an average cumulative income growth of 43% relative to the month preceding the devaluation, while the average cumulative growth of those in the 90th percentile was -6%.

We extract two conclusions from this analysis. First, income dynamics monotonically depend on the worker's position in the pre-devaluation income distribution. Second, the asymmetric recovery and the compression of the income distribution is the result of the larger *within-worker* average growth rates for workers at the bottom of the distribution.

Discussion of relevance of main fact. Figure 6 is surprising and the goal of the rest of this paper is to explore the economic mechanisms behind it. It is surprising since it states that the main source of income for a large majority of the population, i.e. labor income,

where t corresponds to the month of the devaluation, $\tilde{y}_t^i$ is the log real labor income, d_a are the coefficients of the age dummies in the pooled regression, and N_{t-m}^i is an indicator of employment in period $t - m$. We scale the age dummies so that the fixed effect of a 25 year old worker matches the average labor income of a 25 year old worker in the regression sample.

Figure 6 – Average income growth conditional on average income in 2000-2001



Notes: The figure describes average income growth conditional on the percentile of the distribution of average monthly real income during 2000-2001. The sample is restricted to workers that had at least 6 months of employment during the 2000-2001 period.

recovers faster for low income workers.

The previous literature has measured the distributional effects of monetary and exchange rate policy originated from different channels. Doepke and Schneider (2006) and Verner and Gyongyosi (2018) have studied the distributional impact resulting from the revaluation of nominal debt. Previous research focusing on redistributional impact of large devaluations have found that low-income workers are the ones that are more negatively affected. They experience larger increases in household-specific inflation (e.g., Cravino and Levchenko (2017)), and a larger negative revaluation of their nominal assets since they tend to save in local currency assets (e.g., Drenik *et al.* (2018)).

In this paper, we document that monetary policy, through its exchange rate policy, also has distributional consequences due to the dynamics of nominal labor income. The first distributional consequence involves redistribution between workers and firms. As we show in Figure B.2 in the Appendix, after the 2002 devaluation, there is a decrease in the annual labor share from 40% to 31% due to the rapid increase in the inflation rate and the lack of similarly rapid adjustment of nominal wages. The second step in the redistributive process involves the heterogeneous rates of recovery of real income of workers across the income distribution.

The distribution of labor income—and expectations of it—matters for aggregate demand whenever markets are incomplete. There is a large literature showing this channel in macroeconomics, for example Kaplan, Moll and Violante (2018) and Auclert and Rognlie (2018). The generalization and importance of this channel for understanding labor dynamics in other countries is an interesting venue for future research. Second, if the distribution of labor income affects the distribution of welfare, then the study of optimal policy vis-as-vis actual policies seems to be a promising research area.

Robustness. To investigate the robustness of the results behind Figure 6, we performed similar analysis with different subsamples of the data. In each case, we have found that the main finding on the heterogeneous recovery of real income after the 2002 devaluation still holds. Results are presented in Web Appendix Section C.

First, we explore the possibility that a subgroup of workers is driving the main aggregate result. To address this, we perform additional splits of the data. Given the large change in relative price across sectors brought about by the devaluation, the observed pattern could be the result of a compositional effect. Although we will explore this further below, we reproduce the main finding by splitting the sample according to the 1-digit sector of employment of each worker in December 2001. Figure C.1 shows that the qualitative pattern is present in each of the broad sectors. Similar compositional effects might arise due to differences in the growth rates of income by age. Figure C.2 reproduces the main figure by groups of working according to their age in December 2001 (25-29, 30-34, etc.) and shows similar patterns in each subgroup of workers. We also reproduce the figure using data of women (see Figure C.3) and find similar results. Finally, we verify that our finding is not driven by the way we construct the measure of permanent income. Thus, following Guvenen *et al.* (2014), we compute the measure of permanent income as the average monthly income in the 5 years prior to the devaluations (as opposed to 2 years as in the baseline analysis). Figure C.4 shows the results, which are quite similar to those found in the baseline analysis.

One potential concern would be that the fact is driven by changes in the intensive margin (the number of hours of work) or the extensive margin (the employment status of a worker). To address the first concern, we exploit information on the full-time/part-time status of the worker's job. Figure C.5 reproduces the main fact using data on full-time jobs only and shows a similar pattern as in the baseline analysis. To address the second concern, we extend the sample to include the "zeros": If a worker is not employed in the private formal sector in any given month, we replace his income by zero. This generates a balanced panel for each worker employed in December 2001. Figure C.6 shows that the main finding is robust.[11]

Another potential concern of this analysis is that the observed "pivoting" might be the result of mean reversion of labor income. While this concern is qualitatively valid, it is not valid quantitatively for the observed persistence of labor income. We verify this statement replicating Figure 6 starting in 1997, when aggregate labor income was stagnant, to isolate

[11] To deal with the log and the zeros, we follow the literature (see for example Guvenen, Ozkan and Song, 2014) and replace $\mathbb{E}(\Delta \log y_t)$ with $\Delta \log \mathbb{E}(y_t)$. By computing the same statistics in our original sample without the zeros we conclude that the differences at the bottom of the distribution between Figure 6 and Figure C.6 are mostly due to Jensen-inequality effects.

the effect of mean reversion (see Figure E.17 in the Web Appendix). The patterns between both figures are clearly different: in the analysis starting in 1997 average income growth is muted and there is no "pivoting" effect across the income distribution. From this analysis, we conclude that income dynamics after the devaluation are not an artifact of mean reversion and depend on the worker's position in the pre-devaluation income distribution.

4.2 Anatomy of the Recovery: a Simple Variance Decomposition

Can the decrease in inequality be explained by between- or within-group dynamics? This is an important question since devaluations are associated with large changes in relative prices across sectors and firms, and thus could affect particular group of workers differently. We decompose the overall cross-sectional variance of log real income into between and within components across sectors and firms. Let y_{ijst} be the log real income of worker i, employed in firm j in 4-digit sector s in period t. This can be rewritten in the following way:

$$y_{ijst} \equiv \bar{y}_{st} + [\bar{y}_{jst} - \bar{y}_{st}] + [y_{ijst} - \bar{y}_{jst}],$$

where $\bar{y}_{st}$ is the average log real income in sector s, and $\bar{y}_{jst}$ is the average log real income in firm j in sector s. Then, the variance of y_{ijst} can be decomposed into three components:

$$\text{var}(y_{ijst}) \equiv \underbrace{\text{var}_s(\bar{y}_{st})}_{\text{Between-sector dispersion}} + \underbrace{\sum_s \omega_{st}\text{var}_j[\bar{y}_{jst}|j \in s]}_{\text{Between-firm dispersion}} + \underbrace{\sum_j \omega_{jt}\text{var}[y_{ijst}|i \in (j,s)]}_{\text{Within-firm dispersion}}, \quad (3)$$

where ω_{st} is the employment share of sector s in the sample, and ω_{jt} is the employment share of firm j. The first term captures the between-sector variance of sectoral mean log real income. The second term is the weighted average of the within-sector and between-firm variance of firm average log real income. The last term is the weighted average of the within-sector and within-firm variance of workers' log real income.

Figure 7, Panels A and B, plot the results of the decomposition for each month between January 2000 and December 2006. During this period, the cross-sectional variance of log real income decreased by 21.1 log points. Of this total decrease, a decrease of 7.1 log points was due to the between-sector component, a decrease of 7.2 log points was due to the between-firm component, and a decrease of 6.8 log points was due to the within-firm component. That is, each component almost equally accounts for 33% of the decline in labor income inequality.

A natural follow up question is: how important is the reallocation of workers to explain the between-sector component? To answer this question we compute a further decomposition of the change in the between-sector component in equation (3):

$$\Delta \text{var}_s \left(\bar{y}_{st}\right) = \underbrace{\sum_s \omega_{st} \left[\left(\bar{y}_{st} - \bar{y}_t\right)^2 - \left(\bar{y}_{st-1} - \bar{y}_{t-1}\right)^2\right]}_{\text{Fixed weights}} + \underbrace{\sum_s \left(\omega_{st} - \omega_{st-1}\right)\left(\bar{y}_{st-1} - \bar{y}_{t-1}\right)^2}_{\text{Fixed dispersion}}. \tag{4}$$

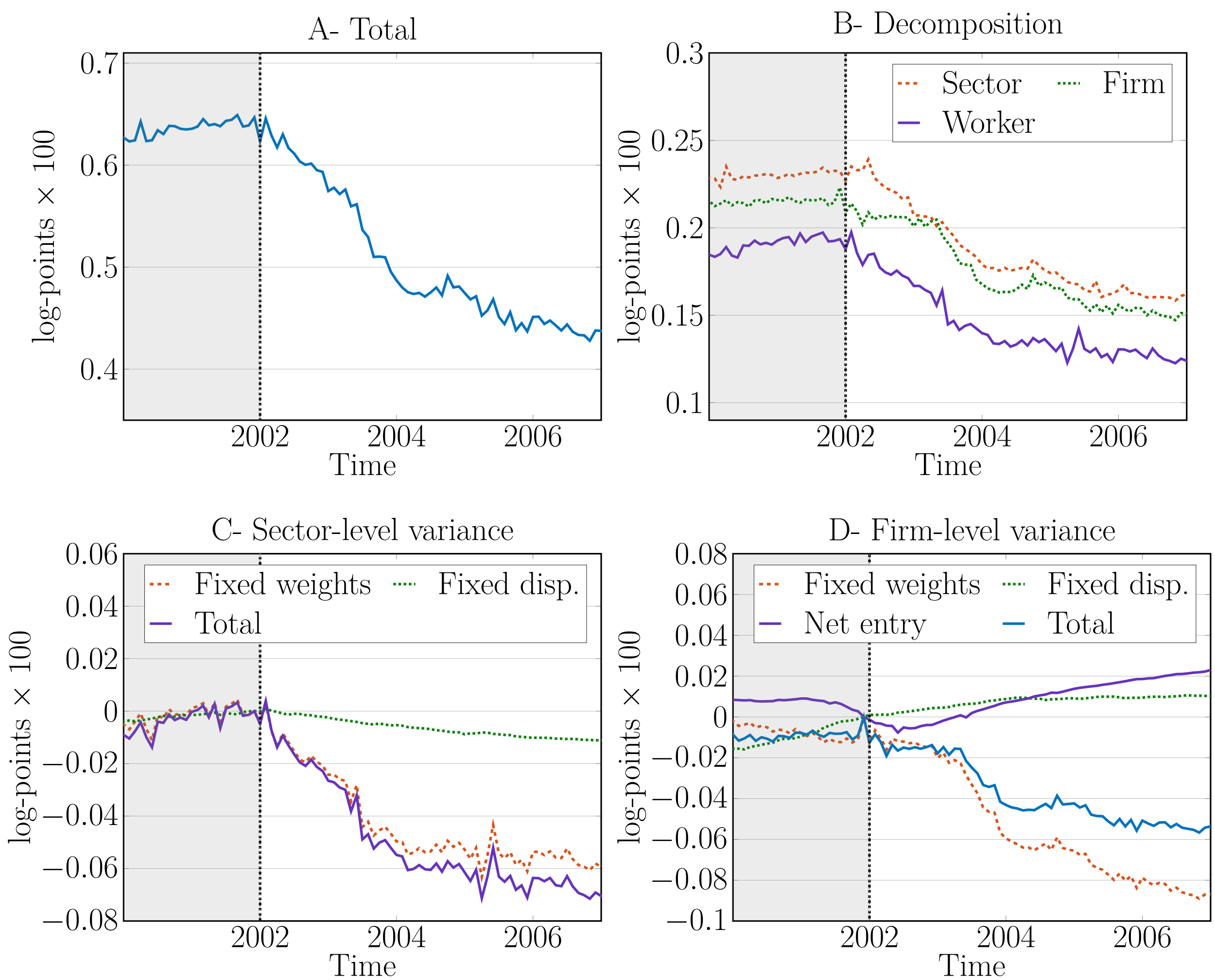
Here Δ denotes the difference operator, i.e., $\Delta y_t = y_t - y_{t-1}$. The first term captures changes in the between-sector component due to changes in sectoral squared deviations from the average labor income. The second term captures the contribution of changes in the weight of each sector. Figure 7-Panel C plots the results of this decomposition. From the overall decline in the between-sector component of 6.6 log points, 1.4 log points are accounted by the reallocation of workers across sectors and 5.2 log points by within sector changes in the deviations from the average labor income. Thus, only 21% of the decline in the between-sector component is due to the reallocation of workers across sectors.

We repeat a similar exercise for between-firms dispersion and find that the variance across firms' wages decreases despite the reallocation of workers. We decompose changes in between-firms dispersion in three terms according to the following identity:

$$\begin{aligned} \Delta \sum_s \omega_{st} \text{var}_j \left[\bar{y}_{jst} | j \in s\right] = & \underbrace{\sum_{s,j \in \mathcal{J}_{st} \& \mathcal{J}_{st-1}} \omega_{st}\omega_{jst} \left[\left(\bar{y}_{jst} - \bar{y}_{st}\right)^2 - \left(\bar{y}_{jst-1} - \bar{y}_{st-1}\right)^2\right]}_{\text{Fixed weights}} \\ & + \underbrace{\sum_{s,j \in \mathcal{J}_{st} \& \mathcal{J}_{st-1}} \left[\omega_{st}\omega_{jst} - \omega_{st-1}\omega_{jst-1}\right]\left(\bar{y}_{jst} - \bar{y}_{st}\right)^2}_{\text{Fixed dispersion}} \\ & + \underbrace{\sum_{s,j \in \mathcal{J}_{st} / \mathcal{J}_{st-1}} \omega_{st}\omega_{jst} \left(\bar{y}_{jst} - \bar{y}_{st}\right)^2 - \sum_{s,j \in \mathcal{J}_{st-1} / \mathcal{J}_{st}} \omega_{st}\omega_{jst} \left(\bar{y}_{jst} - \bar{y}_{st}\right)^2}_{\text{Net entry}}. \end{aligned} \tag{5}$$

Here $\mathcal{J}_{st}$ denotes the set of firms in sector s at time t. The first two terms have the same economic interpretation as in the decomposition of the between-sector component. The third term measures the change in the variance due to the entry and exit of firms. Figure 7-Panel D plots the decomposition in equation (5). The variance increases due to changes in the weights of each firm and net entry. The overall increment is of around 0.3 log points. The increase in the variance across firms' mean labor income due to the reallocation of worker between survival and new firms is overshadowed by the decline in the dispersion of mean labor income across firms. Therefore, the variance across firms' wages decreases despite the reallocation of workers between survival and new firms.

Figure 7 – Variance decomposition across sectors, firms, and workers



Notes: The figure plots the total variance and its decomposition according to (3) from January of 2000 to December of 2006. The sector component is $var_s[\bar{y}_{st}]$, where $\bar{y}_{st}$ is the average income at sector s defined at 4 digits-level CIIU. The firm component is $\sum_s \omega_{st} var_s[\bar{y}_{jst}]$, where $\bar{y}_{jst}$ is the average income at firm j in sector s and ω_{st} is its workers share. The worker component is $\sum_j \omega_{jt} var_j[\bar{y}_{ijst}]$, where $\bar{y}_{ijst}$ is the labor income of worker i at firm j in sector s and ω_{jt} is the firm's j workers share .

4.3 The Role of Sectors and Firms across the Distribution

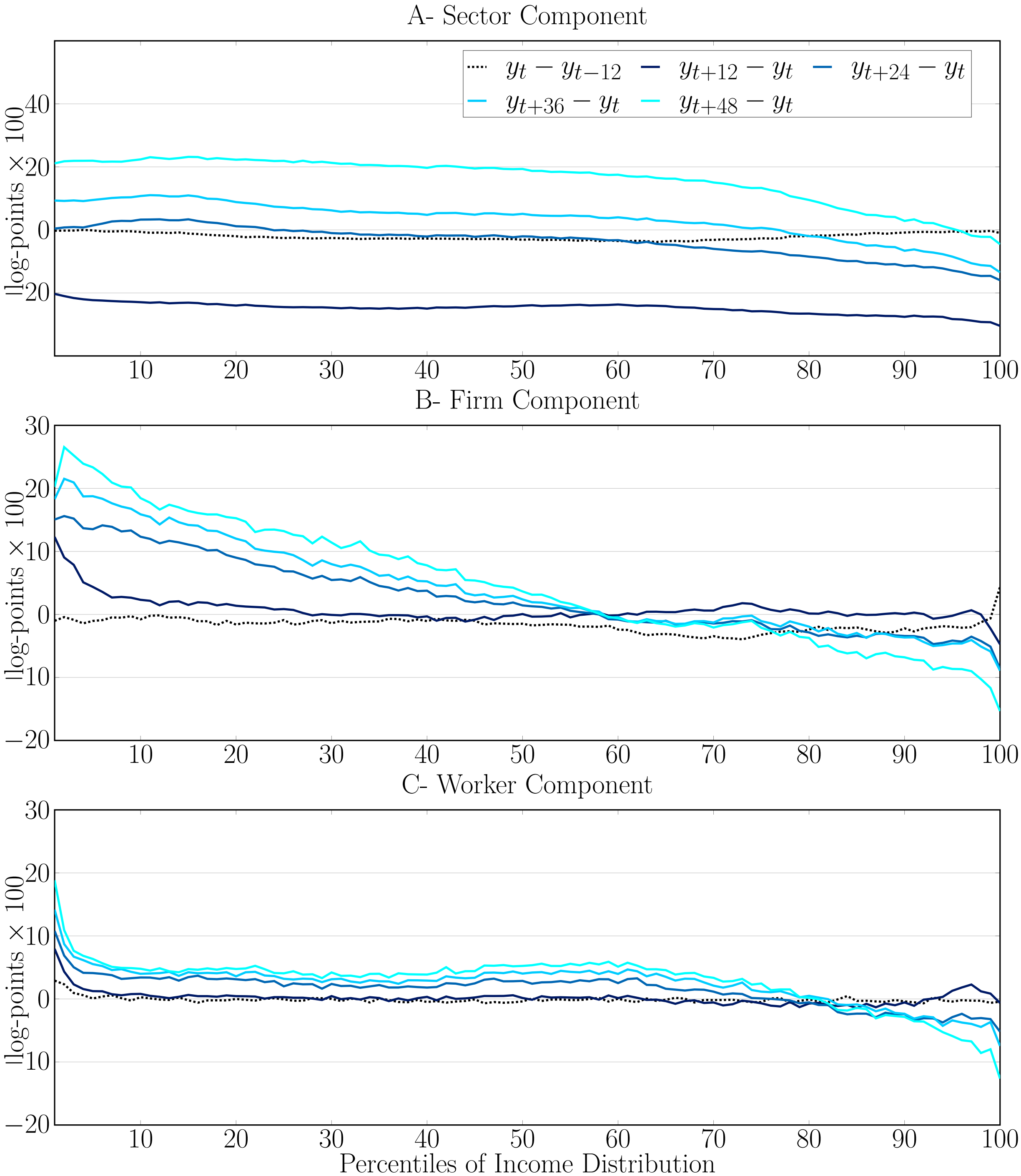
Although the variance decomposition is a useful starting point used in the literature (see for example Song, Price, Guvenen, Bloom and Von Wachter, 2018), it does not provide a characterization of the relevance of the different components (sector, firm, worker) for the recovery of workers located in different parts of the income distribution. Therefore, we complement the previous analysis with a series of counterfactual exercises.

In the first exercise, we gauge the relevance of between-sector heterogeneity across the labor income distribution by asking: how would the dynamics of labor income behave if in each period workers had earned the average income in the sector? That is, for each worker we compute $\Delta\bar{y}_{s(it)}$, where $\bar{y}_{s(it)}$ is the average income in the 4-digit sector employing worker i in period t. By construction, this figure also captures the aggregate average increase in labor income. Figure 8-Panel A plots the results by averaging this counterfactual income growth across workers in each percentile of the pre-devaluation distribution (the ranking of workers is the same as the one used in the baseline Figure 6). The two main findings are: 1) the heterogeneous sectoral labor income growth does not lead to heterogeneous recoveries for workers below the 60th percentile, and 2) part of the decrease in inequality is due to slower recovery of average sectoral labor income in sectors employing workers at the top of the distribution.

To measure the contribution of the between-firm component across the income distribution we ask: how would the dynamics of labor income look like if in each period workers had earned the average income in the firm (net of the average income paid in the sector)? For this we replace the worker's income growth shown before, by the worker's growth in $\bar{y}_{j(it)} - \bar{y}_{s(it)}$, which is the average income paid in firm j employing worker i in period t net of the average income paid in the sector of the firm. Figure 8-Panel B shows that this component is responsible for a large fraction of the "pivoting" observed in the baseline Figure 6. Workers below the 60th percentile of the pre-devaluation income distribution experience a positive income growth from the between-firm component, while workers above this percentile experience a negative income growth. Thus, the decrease in inequality accounted for by the between-firm component is due to a monotonically lower average income growth in firms employing higher-income workers.

Finally, the remaining piece of the decomposition is given by changes in $y_{it} - \bar{y}_{j(it)}$, which is a worker's i labor income in period t net of the average income paid in the firm employing him. Figure 8-Panel C plots the average growth of this components across the distribution. Most of the heterogeneity in the within-firm and between-worker component is coming from a faster income growth for workers below the 10th percentile of the pre-devaluation distribution and a slower growth for workers at the top of the distribution.

Figure 8 – Decomposition of Average income growth conditional on average income in 2000-2001



Notes: The figure describes average income growth conditional on the percentile of the distribution of average monthly real income during 2000-2001. The sample is restricted to workers that had at least 6 months of employment during the 2000-2001 period. Panel A replaces a worker's labor income by the average labor income in the sector of employment. Panel B replaces a worker's labor income by the average labor income in the firm of employment net of the sectoral average labor income. Panel C replaces a worker's labor income by the worker's labor income net of the firm's average labor income.

The main takeaway of this section is that in order to explain the labor income dynamics of individual workers at the top of the income distribution one needs to focus more on the between-sector and within-firm components. On the other hand, to understand the dynamics for workers at the middle and bottom of the income distribution one needs to focus on the between-firm component.

5 Mechanisms

In this section, we analyze a set of potential mechanisms that might explain the drop in income inequality after the 2002 devaluation. We find that labor mobility and unionization are important determinants of the heterogeneous recovery of real income.

5.1 Labor Mobility

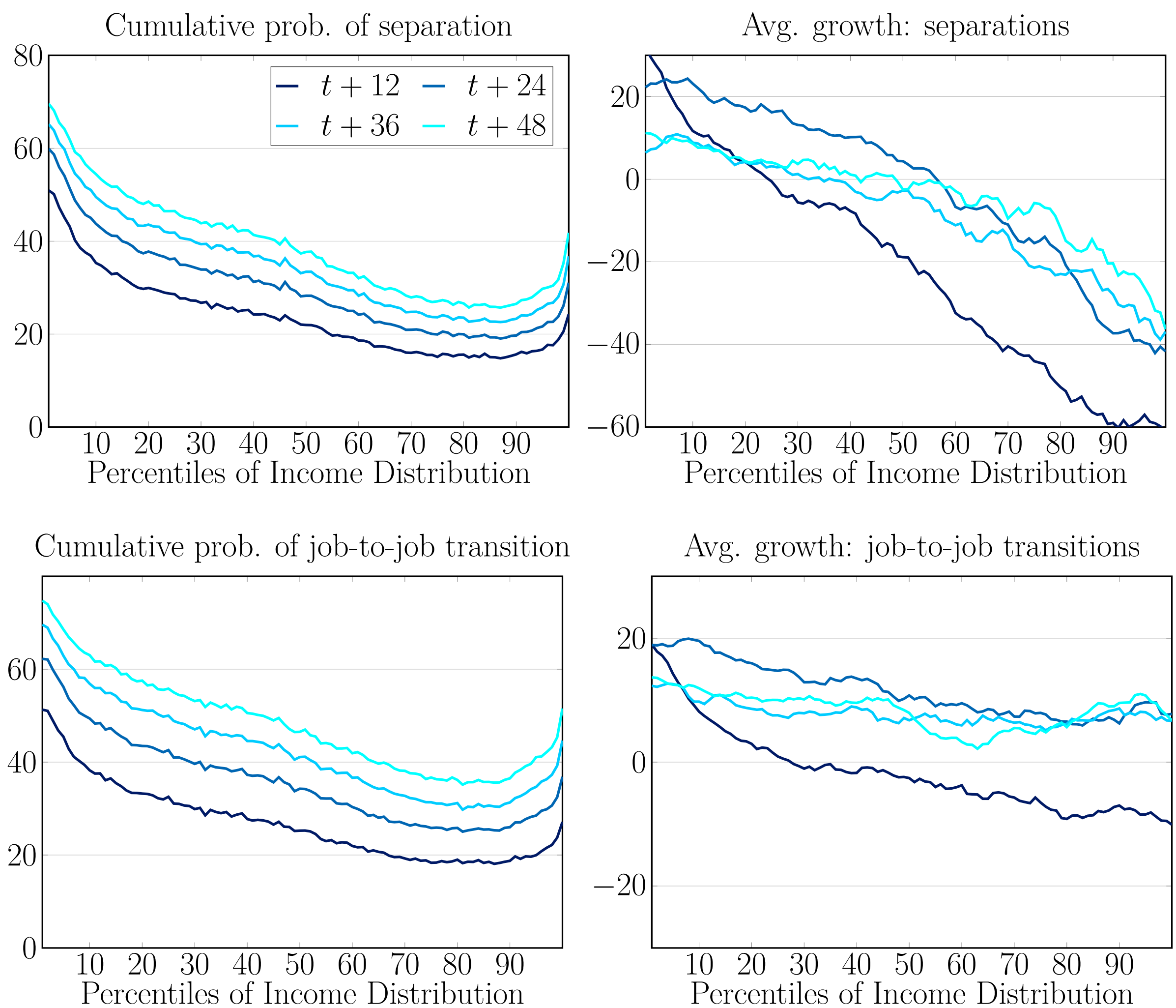
The search literature has identified a mechanism that produces heterogeneous income growth across workers in response to aggregate shocks: labor mobility within the job ladder (see for example Burdett and Mortensen, 1998). A natural question arises: How does mobility across firms affect the heterogeneous recovery after the devaluation? We provide an answer to this question by: i) studying the incidence of different types of transitions across the income distribution, 2) documenting the conditional average income growth by type of transition and across the income distribution, and 3) computing a set of counterfactual income dynamics.

Figure 9-Panel A plots the cumulative probability of experiencing a separation over the first 4 years after the devaluation as a function of a worker's position in the pre-devaluation permanent income distribution (same ranking of workers as in Figure 6). This probability is monotonically decreasing in the position of the distribution, with the exception of workers at the very top. Relatedly, Figure 9-Panel B plots the average income growth across all E-N-E transitions within percentiles of the distribution. In the first year after the devaluation, workers below the 20th percentile experienced a positive average growth, while workers above the 20th percentile experienced large negative growth. In the following years, workers below the 50th percentile experienced larger positive growth during E-N-E transition, while the looses of high-income workers were smaller.

Figure 9-Panels C and D plot the same objects for the case of job-to-job transitions. Qualitatively, the patterns are the same as the ones observed for separations. The only difference is that starting from the second year after the devaluation, workers in all percentiles experienced a positive income growth after a job-to-job transition on average. Importantly, the average income growth is still decreasing in the position in the income distribution.

In summary, workers towards the bottom of the distribution experience separation shocks

Figure 9 – Income Mobility across the Income Distribution



Notes: Panel A plots the cumulative probability of experiencing a separation between the December 2001 and the December in the next 4 years. Panel B plots the average difference between the (log) income in the new job found after a separation during each year after the devaluation and the (log) income in the previous job. Panel C plots the cumulative probability of experiencing a job-to-job transition between the December 2001 and the December in the next 4 years. Panel D plots the average difference between the (log) income in the new job found after a job-to-job transition during each year after the devaluation and the (log) income in the previous job. All figures are conditional on the percentile of the distribution of average monthly real income during 2000-2001. The sample is restricted to workers that had at least 6 months of employment during the 2000-2001 period.

at a higher rate, but on average their income increases in each transition. The opposite is true for higher-income workers. It is also the case that lower-income workers are more likely to make job-to-job transitions and to experience large income growth on average when making such transitions.

To quantify how important labor mobility is to explain the heterogeneous recovery of income we construct several counterfactual series of income. First, we compute counterfactual income dynamics without changes due to job-to-job transitions. For each worker, we compute the income growth rate for each pair of subsequent incomes. Then, we identify the changes in income that are due to job-to-job transitions and replace them with a zero. Finally, we reconstruct for each worker the time series of the level of labor income with these counterfactual growth rates. These counterfactual income dynamics reflect observed income growth for incumbent workers and omit income growth experienced during job-to-job transition.

Figure 10-Panel A compares the baseline results with the counterfactual income dynamics (for ease of exposition, Figure 10-Panel B plots the difference between both lines). We can see that job-to-job transitions do not generate any heterogeneous income growth before and immediately after the devaluation. However, during the recovery phase, we see that job-to-job positively contributed to higher income growth for workers below the 60th percentile, and only slightly negatively for workers at the top of the distribution. Quantitatively, job-to-job transitions generate a significant fraction of the pivoting observed in Panel B of Figure 8 (which also shows similar changes before and immediately after the devaluation, followed by positive income growth for workers below the 60th percentile).

Next, we perform a similar exercise with the aim of quantifying the role of mobility due to separations. In this case, we identify the changes in income that are due to separations and replace them with a zero. With this counterfactual growth rates, we reconstruct the time series of labor income for each worker. Figure 10-Panel B shows the results. In this case, the pivoting that can be attributed to income growth generated by separations is even stronger. The average cumulative income growth for workers below the 60th percentile was 5.4%. Instead, workers at the very top experience an average cumulative income growth of -2% due to separations.[12]

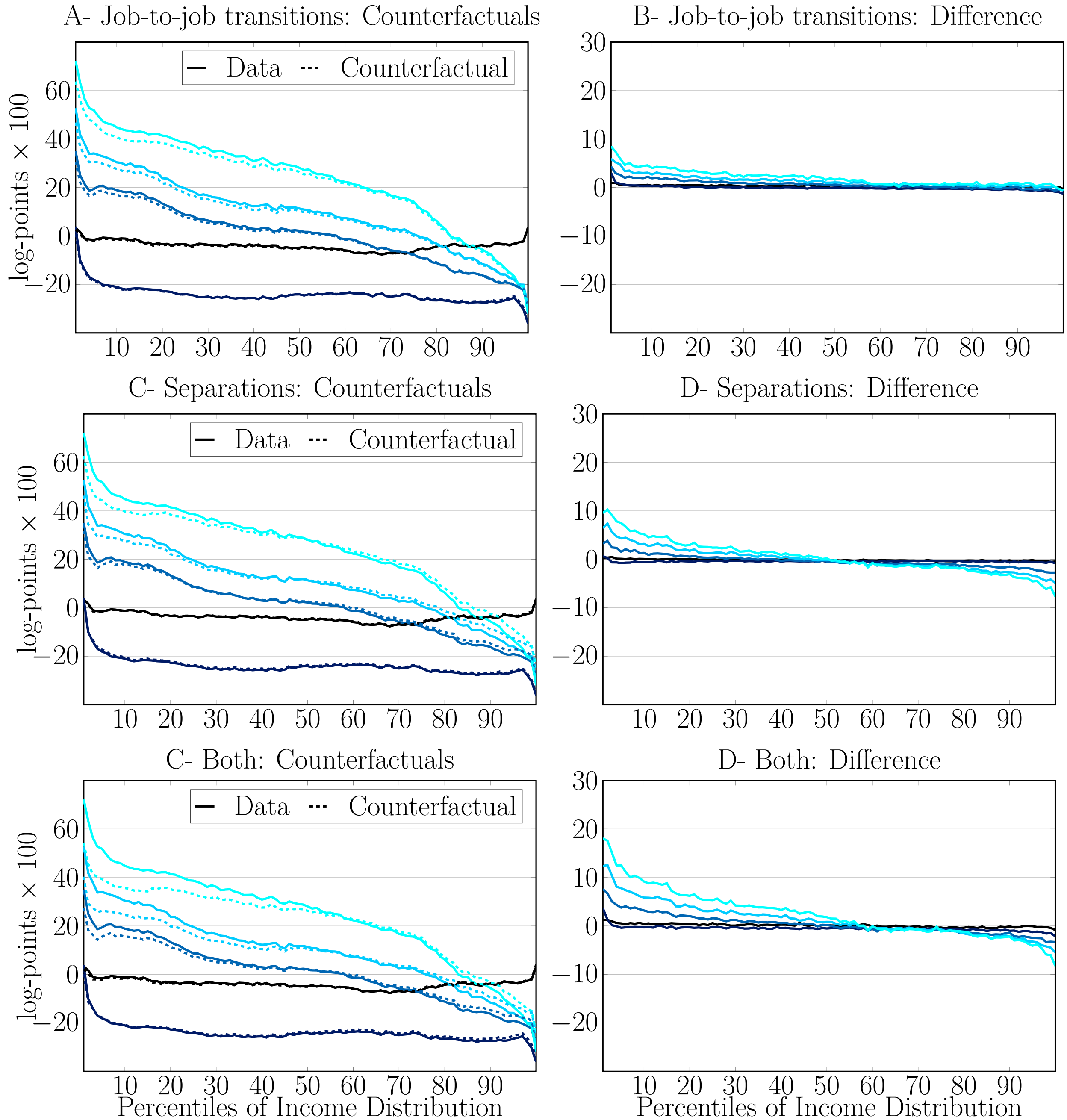
5.2 Unionization

Can unionization status explain the heterogeneous individual recoveries across the income distribution? Yes. We answer this question in three states. First, we briefly describe the role of unions. Second, we study the role of unions within sectors. As we show above, the primary source of heterogeneous recovery of labor income is within industries. Finally, we reproduce our main fact by unionization status and find significant differences by unionization.

A single union has monopoly power to represent workers and negotiate a CBA at a sectoral level. A CBA determines the minimum labor income for all workers in that sector

[12] As a comparison, the average cumulative income growth for workers below (above) the 60th percentile in Panel B of Figure 8 was 11.3% (-4.8%).

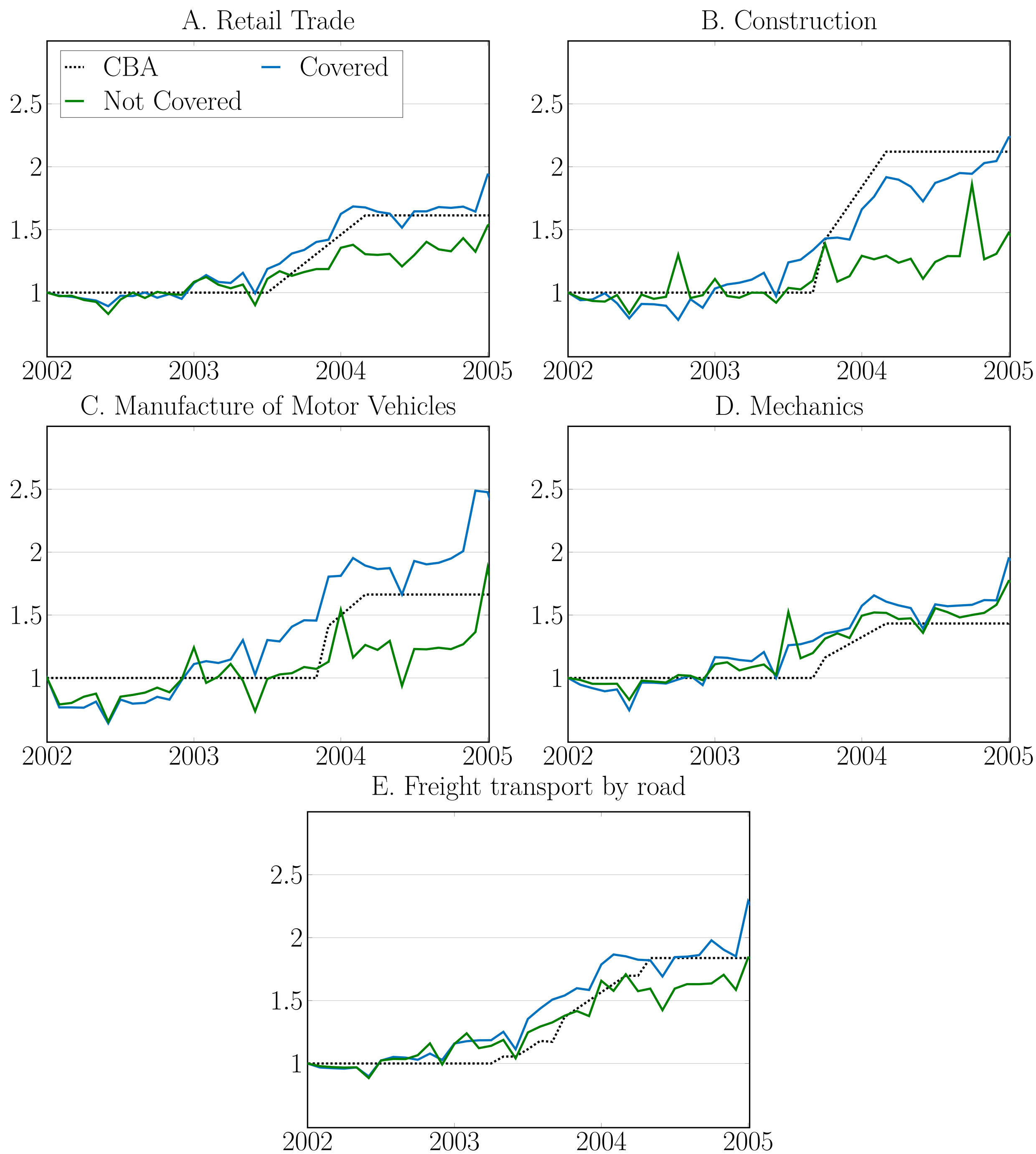
Figure 10 – Contrafactual Income Growth across the Distribution



Notes: Panel A describes both the actual average income growth and the counterfactual income growth that omits income changes experienced during job-to-job transitions. Panel B plots the difference between the actual and the counterfactual dynamics to ease the comparison. Panel C describes both the actual average income growth and the counterfactual income growth that omits income changes experienced after separations. Panel D plots the difference between the actual and the counterfactual dynamics to ease the comparison. Panels E and F present similar results for the combined effects of job-to-job transitions and separations. All figures are conditional on the percentile of the distribution of average monthly real income during 2000-2001. The sample is restricted to workers that had at least 6 months of employment during the 2000-2001 period.

across occupations. The CBA covers workers regardless of membership that by law has to be above the national minimum wage. Additionally, for the largest firms in some sectors, unions at firm–level also negotiate firm–specific CBAs.

Figure 11 – Normalized labor income by union coverage, and labor income in CBAs



Notes: The panels A to E plot (in the following order) the average labor income across occupations in the CBAs agreements, the average labor income of workers covered and not covered by unions. A worker belongs to the group "Covered" if it is unionize in June 2003 and her income is between the lowest and highest income across occupations in CBAs. A worker belongs to the group "Not Covered" if it is not unionize in June 2003.

Following the 2002 devaluation, unionized workers whose wages were covered by a CBA saw their labor income recover faster than those non-unionized workers. Figure D.2 shows income by unionization state for some sectors with strong unions. The figure presents the average income in CBA across occupations, the average income of covered and non-covered workers by a union contract. For covered workers, we use their unionization status in June 2003, and we add the additional condition that their labor income is within the range of incomes establish by the CBA across occupation in October 2002.[13]

For all the industries in which CBAs were above inflation, the nominal income growth of unionized workers growth 30% more than non-unionize workers. The labor income growth rate for unionized workers closely follows the average growth rate specified by the CBA across occupations. This qualitative pattern holds in retail trade, construction, motor vehicle manufacturing, and freight transport by road. Finally, there is one sector (i.e., mechanics) in which CBAs income growth is almost equal to the cumulated inflation between 2002-2005. In that sector, the income growth between 2002-2005 does not vary by unionization status.

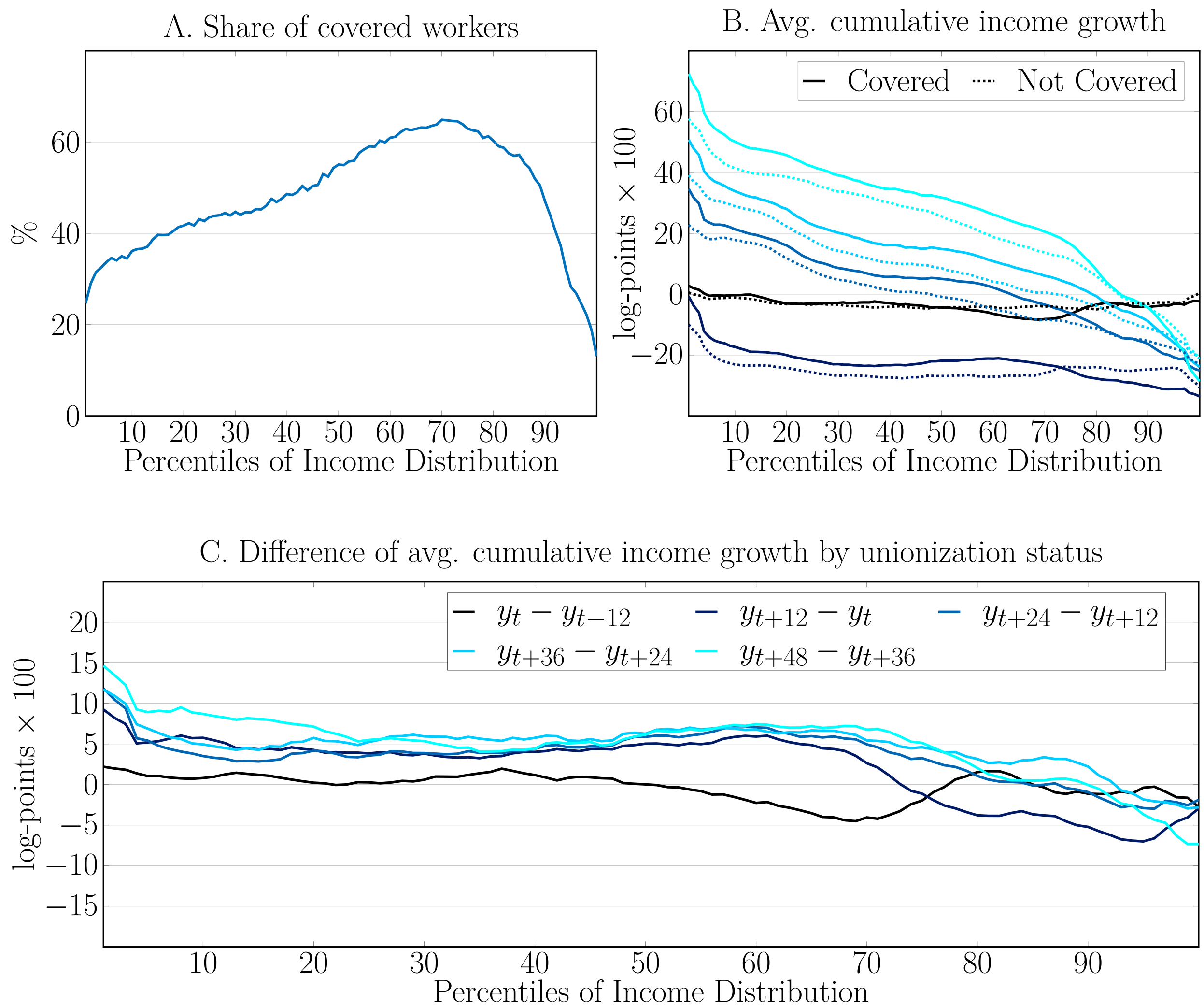
Until now, we have focused on the role of the unionization status in the recovery of labor income. We found a strong difference between unionized and non-unionized workers. Now, we present the contribution of unionization status to the main fact of this paper. Figure 12 reports the share of unionized workers and average labor income growth by unionization status in the same format as Figure 6. For Figure 12, coverage only represents unionization status.[14]

The share of unionized workers is increasing in the percentile for the worker between the 0 and 70th percentile, and decreasing from the 70 to 100th percentile. The share of unionized workers is above 40% between the 20th and 80th percentiles. Thus, unionization status appears to affect only workers in the middle-to-top of the income distribution and does not affect workers at the top nor at the bottom of the distribution. Moreover, the average cumulative income growth was higher for unionized workers than non-unionized workers. The average difference of the income growth across unionization status is close to zero between December 2002 and December 2001. If we focus attention to the percentiles less than the 70th, it is apparent that the differences of income growth for unionized worker

[13] These groups are constructed using the unionization status variable in the SIPA data and income covered by the CBAs. The unionization variable starts in June 2003, and present a high degree of persistence in the sample. For this reason, we are confident that the majority of these workers were unionized (or not) between 2002 and 2003. Since unions negotiate minimum labor income across workers, we added the second condition to identify workers near that minimum in October 2002. We use that date since between 1995 and November of 2002 unions did not change their CBAs.

[14] The digitalization of all industries CBAs and the merge with SIPA data is outside the scope of this paper. Each industry has its own industry specific contract format that changes over time. Therefore, we were not able to standardize CBAs across all industries to merge with SIPA data. Nevertheless, we reproduce Figure D.2 in the Online Appendix with different definition of unionization status to show how these definitions affect income by unionization status.

Figure 12 – Average income growth conditional of average income 2000-2001 by unionization status



Notes: Panel A shows the shared of unionize workers by percentiles of income as in Figure 6. Panel B shows the average cumulative income growth by percentiles and unionization status. Panel C shows the difference of the average cumulative income growth between unionize and not unionize workers by percentiles.

relative to non-unionized workers increased over time. The average difference one year after the devaluation was 4%, and that difference becomes 6% four years after the devaluation.

5.3 Sectoral Trade Exposure

Can trade exposure explain the heterogeneous individual recoveries across the income distribution? No, except for workers above the 80th percentile of the income distribution. The workers above the 80th percentile of the income distribution were employed mainly in sectors with a relative low labor income recovery—we describe these sectors below. We analyze this question using a broad classification of trade exposure, i.e., tradable and non-tradable sectors. We leave our analysis of sectoral trade exposure at the 3-digit SIC level for the Online Appendix.

Trade exposure explains the heterogeneous individual recoveries across the income distribution if two conditions are satisfied. First, RER and sectoral labor income are correlated, and their correlation is a function of trade exposure. Second, workers' permanent income pre-devaluation and sectoral labor income recovery are correlated, and this correlation is also a function of trade exposure. While we find strong support for the first condition, while we do not find support for this second condition for workers with incomes below the 80th percentile of the income distribution.

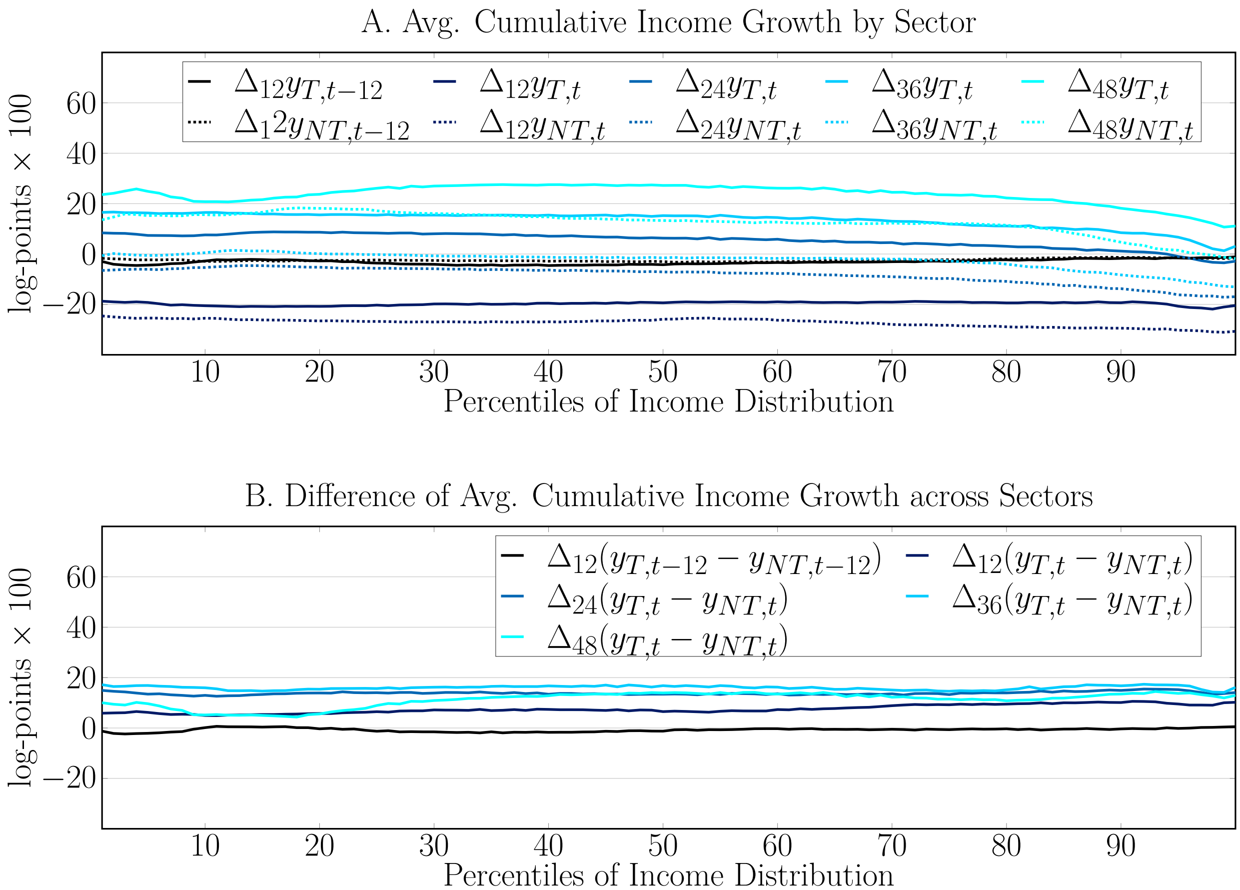
Figure 13-Panel A shows sectoral income growth across tradable and non-tradable sectors and Figure 13-Panel B shows its difference. We construct these figures in two steps. First, we divide workers across the percentiles of income with the same filter as in Section 4 and in tradable and non-tradable sectors departing from a four digits-level SIC classification. The tradable sector includes agriculture, livestock, and hunting, fishing and related services, mining, and the manufacturing industry. Second, for each percentile of the income distribution, we aggregate the sectoral income growth of all workers in tradable and non-tradable sectors separately, using as weights share of workers in each sector in that period.

The labor income of tradable sector workers permanently increased by 10% relative to that of non-tradable sector workers after December 2001.The average difference across percentiles of income is 1% in favor of the non-tradable sector between December of 2000 and 2001.[15] Following the 2002 devaluation, there is a faster recovery of the tradable sector labor income than in the non-tradable sector. The average differences across percentiles in over the course of 4 years are 7%, 12%, 14%, and 9% in chronological order. In conclusion, there is a significant difference in labor income dynamics across the tradable and non-tradable sectors resulting from the predicted increase of revenue in the tradable sectors relative to the non-tradable qualitatively.

The heterogeneous sectoral labor income recovery applies to top percentiles of the distribution, i.e., more significant than the 80th percentile. The share of high-income workers (i.e., above the 80th percentile) is close to 36% in the tradable sector, close to the unconditional average across all workers. Thus, one cannot explain the dynamic of these workers using their concentration in non-tradable sectors. Rather, this dynamic results from these workers' specialization across four sectors with large negative income growth after the 2002 devaluations. Within the non-tradable sectors, these workers specialize in the financial intermediation and telecommunication sectors. Within the tradable sectors, they specialize in industries producing medical products and motor vehicles. These two sectors heavily rely

[15]Figure D.5 in the Online Appendix shows that the relative wages of tradable workers was slightly decreasing relative to non-tradable workers between 1994 and 2001.

Figure 13 – Average income growth conditional for tradable and non-tradable sectors



Notes: Panel A (resp. Panel B) plots average income growth in the tradable and non-tradable sector (resp. the difference between tradable and non-tradable sectors) conditional on the percentile of the distribution of average monthly real income during 2000-2001. The sample is restricted to workers that had at least 6 months of employment during the 2000-2001 period.

on imports with a low elasticity of substitution in the short run.

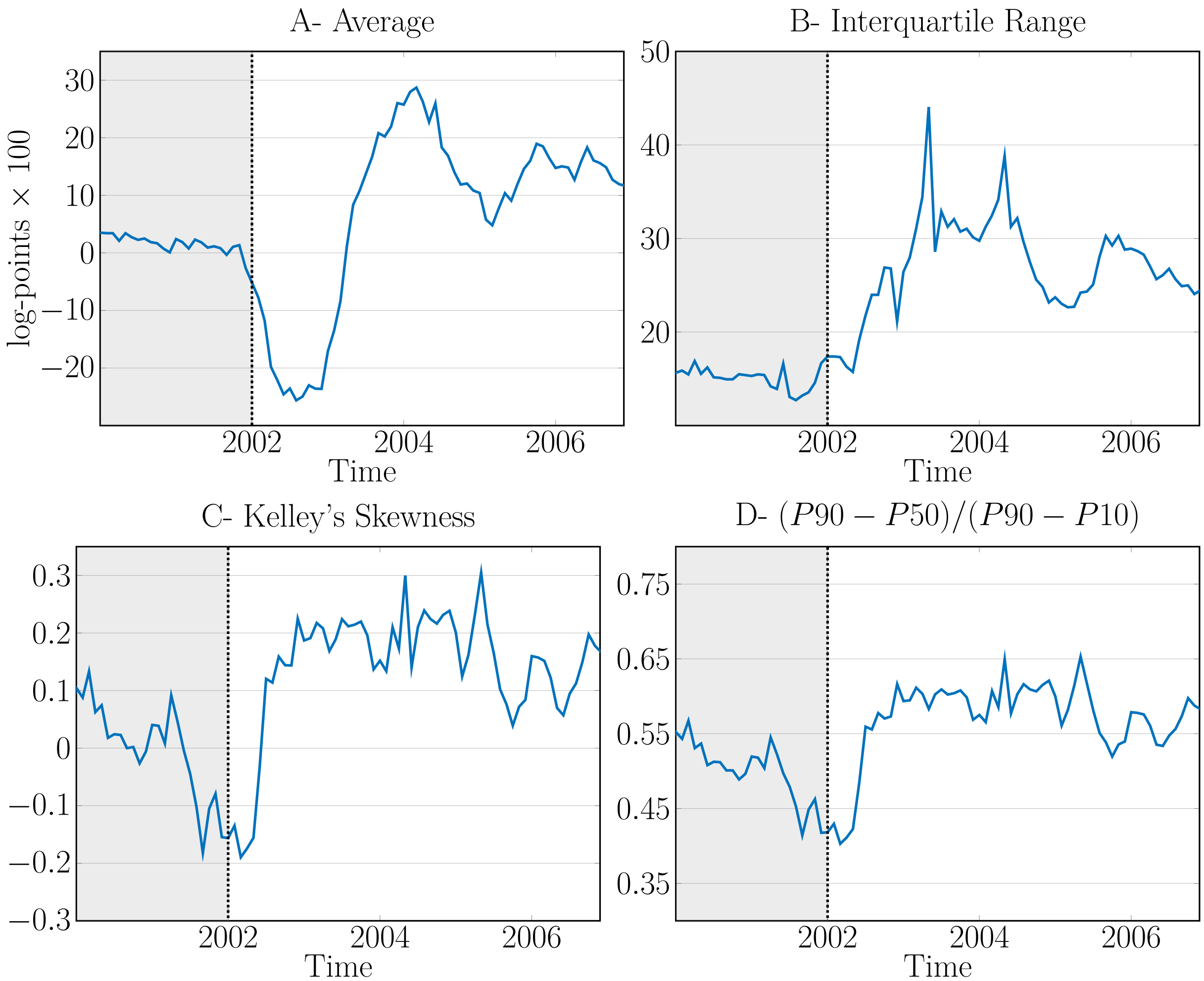
5.4 Changes in Labor Income Risk

Can the decrease in inequality be explained by a lower labor income risk? To illustrate the logic of this question, suppose that the income process follows a standard AR(1) process. Then, a decrease in the standard deviation of the innovation would translate into a compression of the stationary distribution. Thus, a decrease in the standard deviation of income growth could explain a lower level of inequality. One potential source of a decline in labor income risk is the observed sharp decrease in the separation rate after the 2002 devaluation. The literature has previously documented that job displacements are typically associated with large cumulative earnings losses (see for example Davis and Wachter, 2011). Thus, if the incidence of such large negative shocks decreases, the distribution after the devaluation could become more equal.

Nevertheless, the requirements for this mechanism to work are not observed in the data: Inequality decreased *despite* an increase in the standard deviation of income growth. Figure (14) shows selected moments of the distribution of labor income growth. During the recession and before the devaluation, the interquartile range of the distribution of labor income growth is almost constant and Kelley's skewness continuously decreases (similar patterns have been documented for the US by Guvenen, Ozkan and Song, 2014). After the devaluation, there is a significant increase in the dispersion of year-over-year income growth. Figure (14)-Panel B shows a sharp and persistent increase in the interquartile range of year-over-year income growth from below 20% up to 40%. Moreover, the increase in dispersion is not symmetric. After the devaluation, there is a reversal in the negative trend in the skewness, which changes from -0.2 to an average of 0.15. In other words, the right tail of the distribution of income growth expands. As Panel D shows, most of the movements in skewness come from changes in the distribution above the median—60% of Kelley's skewness can be attributed to the upper tail after the devaluation.

Two mechanisms could explain the increase in labor income risk. First, a larger reallocation of labor, since the reallocation of workers across employment states, firms, and sectors is associated with large income variations, as previously shown. Second, the fact that the standard deviation of income growth of job stayers also increases (see Figure D.9 in Web Appendix) points to an additional mechanism: heterogeneous arrival rates of adjustment times of nominal income in the short run after a devaluation, and heterogeneous growth in real income conditional on adjustment in the medium run.

Figure 14 – Moments of the distribution of labor income growth



Notes: The panels A to D plot (in the following order) the average, the interquartile range, Kelley's skewness ($\frac{P90+P10-2\times P50}{P90-P10}$), and the decomposition of the Kelley's skewness ($\frac{P90-P50}{P90-P10}$) of year-over-year income growth from 2000 to 2007. See Figure D.9 in Web Appendix D for the complete time series.

6 Robustness and Confounding Factors

This section analyzes whether the main fact presented in Section 4 could be driven by other factors. We provide evidence that this is not the case. In order to address this most valid concern, we check that the results are present in the other devaluations in the sample. We also establish that they were not driven by confounding factors from other policies affecting the labor market in Argentina. We provide a summary of the results here, and the analysis can be found in the Web Appendix E.

Changes in the minimum wage. The nominal monthly minimum wage in Argentina has been fixed at 200$ from August 1993 until July 2003.[16] After the 2002 devaluation, there is a continuous drop in the real minimum wage, until its first adjustment in July 2003. Since then, it has experienced a series of increases, and by the end of 2005, its real value became equivalent to the 10th percentile of the real income distribution.

We provide evidence showing that changes in the real minimum wage could not have been the main driver behind the drop in inequality after the devaluation. First, we show that the timing of this potential explanation is misaligned. Six months after the devaluation, divergent dynamics of the bottom and top percentiles of the income distribution emerge. This occurs while at the same time the real minimum wage kept *decreasing* due to a lack of adjustment and became even less binding. Thus, the drop in inequality precedes the increase in the real minimum wage. In addition, it is worth pointing out that after the large increase in the real minimum wage in September 2004 of more than 20 log points we do not see any further large changes in inequality.[17]

Second, the heterogeneous recovery we observe in Figure 6 is almost a linear function of the position of a worker in the pre-devaluation income distribution. It is highly unlike that changes in the minimum wage had spilled over up to the 80th or 90th percentile in such a short period of time.

Changes in severance payments. Real labor income and job separations decreased during the 2002 devaluation, suggesting that incumbent workers' wages are allocative. For this reason, we study the role of another policy that could by an important driver of the separation rate.

The Argentinean government doubled severance payments in February of 2002. We study the effect of this policy change with three exercise. For each exercise, we construct two groups of workers, one that is affect by the severance policy and another that is not. The former groups is the control group that allow us to study the impact of changes in severance payment. In the first exercise, we study the separation group in formal and informal workers. By construction, informal workers do not receive severance payment. In the second exercise, we study the separation by tenure groups using the discontinuous changes of severance payment in specific months. For example, by law, workers with less than three (resp. more) months of employment don't (resp. do) receive severance payment. In the third exercise, we study the separation by date around January 2003 using the discontinuous change of

[16]Given the lack of adjustment in such a long period of time, it is not surprising that the monthly minimum wage became binding for a small fraction of the population. In 2001, it was equivalent to the monthly nominal income of a worker in the 2nd percentile of the income distribution.

[17]We do see an increase in the gap between the 10th percentile and the median in the month of the increase of the real minimum wage of 6%. However, this difference is coming from a compression between the 25th percentile and the median, both of which are far from the minimum wage even after its increase.

severance payment in that date for new hires. Workers before (resp. after) January 2003 do (resp. don't) receive double severance payment.

Across all the exercises and for workers with less than 15 months of tenure, we find a limited role for the increase in severance payment to explain the the drop in the separation rate. Workers with less than 15 months of tenure are almost 70% of total separations. While this seems puzzling from an economic perspective, some institutional changes rationalized the limited roles. First, only 6 every 10 male workers in the formal sector receive severance payment.[18] Second, the same law that increased the severance payment also denied indexation in the economy to all payments. Since the severance payment is a function of past nominal income and yearly inflation expectation were around 90% in 2002, real severance payment after going to the judiciary would not increase in real terms. The supreme court allowed indexation of severance payments in August 2003.

Changes in hours versus hourly wages. Throughout the paper, we report facts about monthly real labor income and not hourly wages due to data limitations. Nevertheless, we performed three exercises to show that the main facts presented in Section 4 are not driven by fluctuations in hours of work, but instead by changes in hourly wages. For a detailed description of this robustness check, see Web Appendix Section E.4.

In the first exercise, we computed average weekly hours and the distribution of average weekly hours by quintiles of the income distribution in the national labor force survey, which does contain information on hours of work. While average hours worked drop by at most 2% after the 2002 devaluation, this magnitude cannot explain the drop of real labor income of almost 30%. We also find almost no difference in the evolution of hours worked across quintiles of the income distribution. Moreover, the small drop in hours is homogeneous across the income distribution. Thus, differences across income groups cannot account for the large decrease in inequality. In the second exercise, we analyzed workers' real hourly wages using the same data. We find that the dynamics of the distribution of hourly wages follows closely the dynamics of the distribution of monthly income.

In the last exercise, we divide workers according to their full- and part-time status using information on workers' types of labor contract in the SIPA dataset.[19] We find quite similar dynamics of the mean real labor income across groups of full- and part-time workers. We also

[18] There are two reasons why the severance payment do not apply in some cases. One, none of the workers who lost their jobs because the contract came to an end in a fixed-term contract report receiving severance. Second, an ineffective judiciary together that layer's fees are usually a share of the severance payment, implies that only workers with higher severance payment can find a lawyer willing to represent her/him.

[19] The full-time group includes workers with and without a termination date specified in their contracts. The part-time group also includes seasonal workers, trainees, and temporary workers. In order to be overly cautious, we also include in this group all workers in the agriculture, mining, fishing, and construction sectors due to the intermittent working periods these sectors have.

find similar dynamics in the interquartile range and the standard deviation of the distribution of labor income across groups.

Worker-specific inflation. If we are interested in a worker's consumption possibilities after a devaluation, the appropriate deflator for a worker's nominal income (y_i) should be based on each worker's consumption basket (p_i) instead of the aggregate CPI (p). We can decompose real income of interest as: $y_i/p_i \equiv (y_i/p) \times (p/p_i)$. In this paper, we focus on the first component y_i/p to make the comparison of real income dynamics across workers more transparent.

In Web Appendix Section E.5 we reproduce Figure 6 constructing measures of worker-specific deflators. Using micro-data from the national expenditure survey in Argentina, we document that it is indeed the case that households with lower incomes experienced a higher inflation rate after the devaluation, since their consumption basket is tilted towards goods with prices that co-move more with the nominal exchange rate (as in Cravino and Levchenko, 2017). However, these differences in worker-specific inflation rates are not large enough to overturn our main fact.

The informal labor market. In Web Appendix Section E.6, we provide a broader picture of the Argentine labor market during devaluations by extending the analysis to the informal labor market. First, regarding the dynamics of labor income, we find that it also decreases in the informal market after devaluations. In fact, the drop is larger and even more persistent that in the formal sector. However, we do not see a clear compression of the cross-sectional distribution of informal income. This is consistent with the fact that unions –which are present only in the formal sector– explain a faster recovery of real incomes.

Regarding the dynamics of informal employment, we find that after the devaluation the share of informal employment decreases, which is in line with improving conditions in the formal labor market. In addition, since the decline of the informality rate is associated with transitions from the informal to the formal sector (which on average pays higher wages), labor mobility plays an additional role in compressing the overall income distribution.

7 Conclusion

We study labor income dynamics during large devaluations in Argentina. Our main fact is a heterogeneous recovery of the real income across the income distribution. We explore potential mechanisms for this fact, finding empirical support for mechanisms involving heterogeneous labor mobility and heterogeneous degrees of unionization across the income distribution. We do not find empirical support for mechanism involving an increase in labor market risk and heterogeneous exposure to trade. Incorporating these facts to a canonical model of sudden stops is the next step in this research agenda.

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