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Article

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Informal work along the business cycle: evidence from Argentina

Abstract

This article sheds light on the dynamics of the Argentine labor market, using quarterly data from the Argentine Labor Force Survey for the period 2003Q3 to 2020Q1. We examine quarterly transition rates in a four-state model with formal employment, informal employment, unemployment, and nonparticipation. We compute the contribution of each transition rate to fluctuations in unemployment and informality rates. We identify five stylized facts: (i) Nearly 40% of the fluctuations in the unemployment rate involves unemployment ins and outs from/to informal jobs. (ii) More than 40% of the fluctuations in informality rate are driven by the variance of the formalization rate (transition from informal to formal employment). (iii) Non-participation matters for the understanding of unemployment volatility but also for the comprehension of the volatility on informality. (iv) Regarding gender differences: transition involving non-participation matters more in the variance of female unemployment and informality rates than for their male counterparts. (v) The informal sector plays an important role as a stepping stone to formal jobs for both men and women. Our article provides empirical targets to discipline theoretical modeling of labor market dynamics with a sizeable shadow economy.

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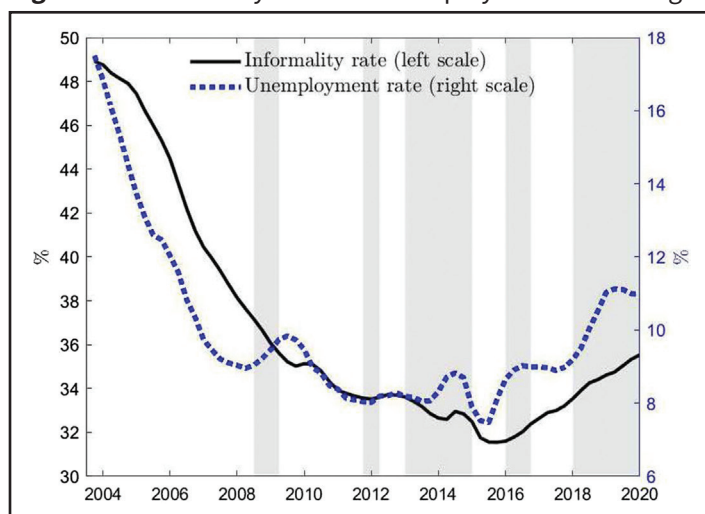
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1 Introduction

Understanding how labor market inflows and outflows shape unemployment fluctuations has led to a large body of research. While worker flows in OECD countries have been extensively documented (Petrongolo and Pissarides, 2008; Fujita and Ramey, 2009; Elsby et al., 2009; Shimer (2012), among others), papers focusing on developing countries are scarce. An important aspect of emerging countries is the large size of the shadow economy. For instance, its share in GDP ranges from 25% to 60% in Central and South America (Schneider and Enste, 2000; OECD/CIAT/IDB, 2016). Furthermore, movements in the share of informal work are strongly cyclical. As shown in Figure 1 for the Argentine economy, the share of informal workers dramatically dropped between 2004 and 2016. After reaching historical highs of about 44% during the 2001 crisis, the ratio fell to 32%. Since 2016, the rate has started to grow again. The large changes in Argentine informality provide natural experiments to evaluate their contributions to unemployment fluctuations. This article sheds light on the dynamics of the Argentine labor market, using quarterly data from the Argentine Labor Force Survey for the period 2003Q3 to 2020Q1. We examine quarterly transition rates in a four-state model with formal employment (F), informal employment (I), unemployment (U), and non-participation (N) and wonder how much of the fluctuations in stocks are accounted for by movement in each worker flows.

To that extent, to the best of our knowledge, three papers are related to ours: Bosch and Maloney (2008), Bosch and Maloney (2010), Souza and Zylberstajn (2016), and Moreira et al. (2018). While these papers provide interesting work on Brazilian and Mexican worker flows, we argue that they suffer from technical issues. In particular, in our article, we apply Elsby et al. (2015)'s methodology, while it is not the case for existing papers on work flows with informal work. We argue that Elsby et al. (2015)'s methodology is relevant as it makes sure that worker flows are consistent with observed labor stocks (error correction margin) and proposes variance decomposition in a non-steady-state environment. We subscribe to

Figure 1 Informality rate and unemployment rate in Argentina (in %).



Source: EPH 2003Q3-2020Q1 Argentina and authors' calculation. The share of informal work is defined as the number of workers employed in the informal sector divided by total employment. Shaded areas denote recession periods based on the Argentine Central Bank (BCRA) calculations.

Elsby et al. (2015)'s view that these are key dimensions for proper measurement of worker flows.¹

Our approach also contributes to the theoretical literature based on two-sector search and matching models (see Boeri and Garibaldi (2006), Zenou (2008), Ulyssea (2010), Bosch and Esteban-Pretel (2012), Bosch and Esteban-Pretel (2015), Charlot et al. (2015), among others). These models are useful to study the impact of various labor market reforms such as introducing unemployment insurance, reducing taxes, modifying enforcement policies, or changing the product and the labor market regulations. However, evaluating the consistency of the model with respect to the data is challenging given that time series of workers flows in emerging countries are severely lacking. The contribution of the paper lies in documenting labor market fluctuations with informal work at a business cycle frequency. In this article, we build quarterly time-series, stylized facts, and variance decompositions to provide an empirical background for the development of labor market models embedding an informal sector. The worker flows may serve as long-run targets for theoretical models but also give stylized facts at business cycle frequencies on unemployment and informality dynamics.

Our main findings are as follows:

- **Fact 1**, regarding fluctuations in the unemployment: nearly 40% of the fluctuations in the unemployment rate involve unemployment ins and outs from/to informal jobs (*UI* and *IU*). In addition, volatility in exit rate from informal employment (*IU*) alone accounts for one-fourth of the unemployment rate variance.
- **Fact 2**, regarding fluctuations in the informality rate: more than 40% of the variance of informality is driven by the variance of the formalization rate (transition from informal to formal employment *IF*). Transitions between formal and informal employment (*IF* and *FI*) account for more than 60% of the variance of the informality rate.
- **Fact 3**, nonparticipation matters for the understanding of unemployment volatility but also for that of informality. Forty-five percent of unemployment volatility can be traced to the variance between nonparticipation from unemployment (*UN* and *NU*). Nearly 15% of volatility in the informality rate is driven by *NI* inflows to informal jobs from nonparticipants. Since stylized fact 3 points at the importance of nonparticipation, and since nonparticipation is very different across gender (as displayed in Figure 5), we investigate the gender differences in stylized facts 4 and 5.
- **Fact 4**, regarding gender differences: transition involving nonparticipation matters more in the variance of female unemployment and informality rates than for their male counterparts. The main differences across genders are:
 - (i) For the unemployment rate: the transitions *UN* and *NU* account for more than 50% of female unemployment rate (vs. less than 35% for male unemployment rate)
 - (ii) For the informality rate: nearly 20% of the variance in the female informality rate is explained by changes in the inflows into informal jobs from female nonparticipants (*NI*) versus 0% for male informality rate.

¹ The existing papers do not perform the error correction margin, and only consider the steady-state approach.

Fact 4 shows that Fact 3 is particularly relevant for female workers.

- **Fact 5**, common features across genders are: flows between unemployment and informality *UI* and *IU* explain nearly the same share (35–40%) of the unemployment rate volatility for men and women. Similarly, for the informality rate where more than 40% of the volatility of informal employment is explained by the sole exit rate from informality to formality *IF*.
- Fact 5 shows that Facts 1 and 2 are relevant for male and female workers.

The article is organized as follows. We describe the data in Section 2 and present a brief descriptive analysis in Section 3. Variance decompositions of unemployment and informality rates are presented in Section 4. Section 5 concludes.

2 Data and methodology

2.1 Data source

2.1.1 The Argentine Permanent Household Survey

We use survey data from the Argentine Permanent Household Survey (Encuesta Permanente de Hogares, EPH), a nationally representative survey of the urban population (around 85% of the total population). The EPH collects information on employment status, hours and type of work, tenure of the current job, and demographics (gender, level of education, age, etc.). The EPH has a rolling unbalanced panel structure, which allows to follow workers across surveys at a quarterly frequency since 2003² and to compute transition rates across employment types. Households are interviewed for two consecutive quarters, rotate out for two quarters, and then rotate in for two additional quarters.

2.1.2 Definition of informality

To distinguish informal workers from formal ones we take advantage of the information provided on social security contributions. Workers whose employer does not make social security contributions are classified as informal. This is in line with the standard definition of informality proposed by the International Labour Organization and the literature (Leonardo and Tornaroli, 2009; Drenik, 2015). The sample includes all men and women between age 16 and 64 that were classified as either employed, unemployed, or out-of-the labor force. Within the group of employed individuals, all self-employed and business owners are dropped as EPH does not allow these individuals to be classified as formal or informal. Only individuals who work as salaried employees (whether formal or informal) are included in the sample.

2.2 Measuring worker flows

The worker flows are obtained by exploiting the rotating-panel structure of the Argentine survey data. Individuals in a given survey are linked longitudinally to their response in the

² In the previous design of the EPH (pre-2003), it was only possible to follow workers at semi-annual frequency.

subsequent survey. This property allows us to estimate worker flows and their associated transition probabilities. For example, the probability that an unemployed worker finds a formal job can be computed as the share of the unemployed in a given survey who report in the subsequent survey that they are in formal employment. We can then compute transition probabilities between employment in formal and informal jobs, unemployment, and nonparticipation.

To build worker flows, we adopt a Markovian representation. The mapping between labor force stocks and flows is modeled as a simple discrete-time Markov chain:

$$X_t = \ell_t X_{t-1} \quad (1)$$

where $X_t = (F_t, I_t, U_t, N_t)$ denotes the four labor market stocks, namely, F formal employment, I informal employment, U unemployment, and N non-participation. ℓ_t is a square matrix of size 4, whose elements $\ell_{i,j}$ capture the transition probability from labor status i to labor status j .

We adjust the data along three dimensions as mentioned in Elsby et al. (2015). We first seasonally adjust gross flows using the X12 ARIMA process. We then compute transition probabilities that are consistent with the observed changes in stocks (F_t, I_t, U_t, N_t) (correction for margin error, see Appendix A.1). Finally, as gross flows provide transition probabilities observed at discrete points in time, we correct these measures for possible transitions occurring between consecutive surveys (Shimer, 2012, see Appendix A.2). We then get instantaneous transition rates (also referred to as hazard rates) λ_{ij} , derived from a continuous-time model of labor market transitions. Adjusted transition probabilities are then derived from instantaneous transition rates as $1 - e^{-\lambda_{ij}}$. Further details are provided in Appendix A. Time-series of transition probabilities are displayed in Appendix B.

3 A first look at the data: Descriptive analysis

3.1 Preliminary facts on informal work

In this section, we lay out several preliminary facts about informal workers. The average characteristics of the sample period are presented in Table 1. Over the sample period, informality is pervasive: 37% of Argentine employees are in informal employment. Fifty-seven percent of formal workers are male versus 50% in informal employment. Women are more likely to have informal jobs than men. In addition, 8% of formal workers are aged 16–24 versus 27% in informal jobs. The incidence of informality among low-skilled workers is higher than among high-skilled workers. This result is consistent with Albertini and Terriau (2019) who use the schooling degree as a proxy for skill and La Porta and Shleifer (2014) who document the productivity gap between formal and informal firms. It also suggests that informal jobs may often be the only opportunity available to unskilled workers. Table 1 suggests that, with respect to formal workers, workers in informal jobs are more likely to be female, young, low-skilled, and single. People associated with a weaker labor market position are more likely to work informally than others. This is consistent with the literature (Gunther and Launov, 2012; Albertini and Terriau, 2019) and the view that salaried informal jobs can be a subsistence strategy for workers who lack opportunities in the formal sector. Finally, informal employees are also more

Table 1 Socio-demographic characteristics of employment

	Formal	Informal
Gender		
Male	57.48(a)	50.49
Female	42.52	49.51
Age		
to 24 years	8.24	26.71
to 54 years	79.58	64.54
to 64 years	12.18	8.75
Education		
Primary school and less	14.34	30.07(b)
Marital status		
Married or common-law couples	65.23	47.15
Widowed, divorced, separated	8.19	8.39
Single	26.58	44.46
Job		
Weekly hours	40.50	35.64
Formality premium	1.38(c)	

(a) A total of 57.48% of workers in formal employment are male.

(b) A total of 30.07% of workers in informal employment are low-educated (educational attainment in primary school and less).

(c) Formality premium: average hourly wage in formal job is 1.36 higher than in informal employment.

Source: EPH, 2003–2020.

likely to work less (41 h a week in formal work vs. 36 h in informal work) for a lower hourly wage (nearly 30% lower) than their counterparts in formal employment.

3.2 Labor market stocks

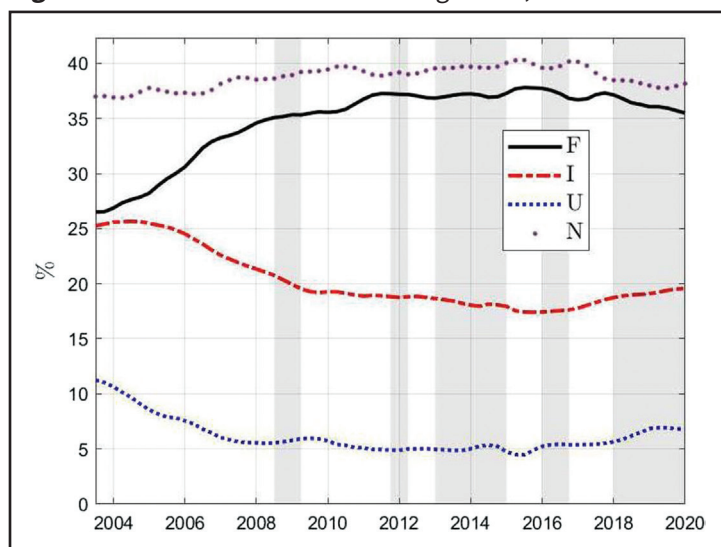
Figure 2 depicts the evolution of the Argentine labor market stocks between 2003Q3 and 2020Q1, as a percentage of the working-age population. First, let us notice that non-participation remains rather stable. This might suggest that nonparticipation plays a little role in accounting for unemployment changes. However, a given change in nonparticipation can actually be driven by large fluctuations in workers' transitions in opposite directions, thereby canceling out each other. This problem, known as the “stock-flow fallacy” (Elsby et al., 2015), arises when using a stock-based analysis of the labor market. Our stock-flow framework will actually disentangle the role of fluctuations in transitions from/to nonparticipation in driving unemployment dynamics.

Second, employment in formal and informal jobs both exhibit an interesting pattern at the beginning of our sample. In 2003, formal and informal employment was on the rise until 2005Q1. From 2005Q2 onward, informal employment has been going down while formal employment kept expanding. Between 2012 and 2018, the Argentine labor stocks remained fairly stable. Since 2018, unemployment has started picking up, while formal employment and participation have started declining. In 2020Q1, the Argentine labor market shows early signs of deterioration.

3.3 Long-run averages of transition probabilities

Table 2 reports average transition probabilities between formal and informal employment, unemployment, and nonparticipation. The first striking feature concerns the labor market turnover. Unemployed workers face a total of 30.43% probability each quarter of finding a job, whether formal or informal, (which corresponds to an average duration on unemployment spell of 3.29 quarters). The average job separation rate in the informal sector amounts to 6.42% each quarter and 1.31% in the formal sector. For the sake of comparison, in the US, the total monthly job finding rate (40%) is more than twice as larger and the average unemployment duration (2.5 months) is about 7 months shorter (Shimer, 2012). In the US, the monthly job separation rate is around 3%, which is significantly larger than in Argentina. The lower turnover on the Argentine labor market calls for a methodology that accounts for changes in out-of-the-steady-state stocks to measure accurately worker flows and the variance decomposition of unemployment fluctuations (see Section 4.1).

Figure 2 Labor market stocks in Argentina, in% of the working-age population.



Source: Argentine Household Survey, 2003Q3-2020Q1, and authors’ calculation. Stocks are expressed as a percentage of the working-age population. Notice that *U* refers here to unemployed workers as a% of the working-age population while Figure 1 displays the unemployment rate. Shaded areas denote recession periods based on the Argentine Central Bank (BCRA) calculations.

Table 2 Average quarterly transition probabilities (in%)

State $t + 1$	F	I	U	N
State t				
F	2*91.49	2*4.72	2*1.31	2*2.48
I	2*10.16	2*69.16	2*6.42(a)	2*14.26
U	2*6.74	2*23.69(b)	2*35.53	2*34.04
N	2*1.82	2*7.74	2*5.34	2*85.10

“F,” “I,” “U,” and “N” indicate formal employment, informal employment, unemployment, and nonparticipation, respectively.

(a) Each quarter, 6.42% of informal workers lose their jobs.

(b) Each quarter, 23.69% of unemployed workers find a job in the informal sector.

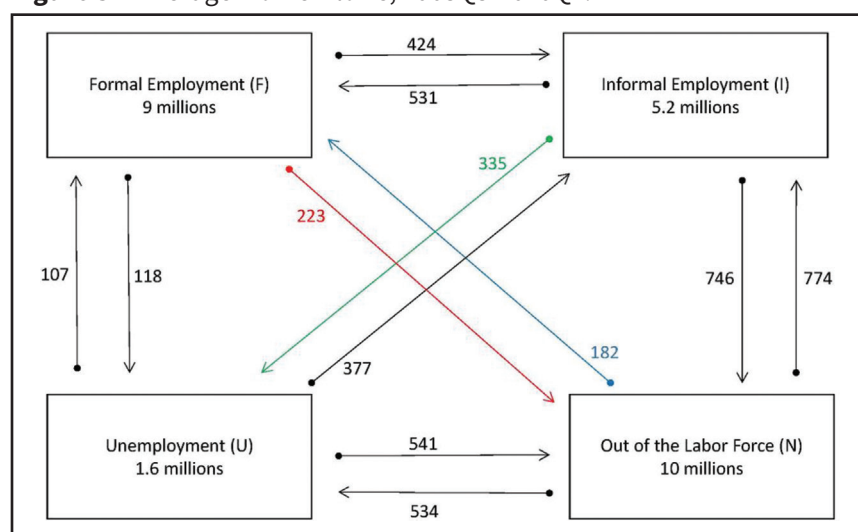
Source: Encuesta Permanente de Hogares 2003Q3-2020Q1 and authors’ calculation.

A second striking feature is that informal work appears as an unstable labor market status. Inflows and outflows are several times larger than that of formal work. Each quarter, 6.42% of informal workers lose their jobs and 14% of them directly join the pool of nonparticipants. These outflows from informal work to nonemployment (whether to unemployment or nonparticipation) are five times larger than outflows from formal work (1.31% and 2.48% respectively). Finally, the chances of getting a job are higher in informal employment than in formal employment. Indeed, transition rates from unemployment to employment as a whole are largely explained by the transition rates from unemployment to informal employment. Specifically, the transition rate from unemployment to informal employment (23.69%) is much higher than that from unemployment to formal employment (6.74%), and from nonparticipation to informal work (7.74% per quarter vs. 1.82% to formal work).

Is informal employment a stepping stone to formal employment? Each quarter, 10.16% of informal workers become formal workers in the following quarter. While this rate involves a slow formalization process, it is still substantial when compared with the formal job finding probability from unemployment (*UF* at 6.74%) and nonparticipation (*NF* at 1.82%). Once the worker succeeds in getting a formal job, this labor market status appears very stable with a low quarterly separation rate of 1.31% to unemployment and 2.48% to nonparticipation. To that extent, we consider that informality introduces duality in the Argentine labor market, with fragile/unstable informal work and protected/stable formal work. This duality is reminiscent of the Spanish and French duality based on permanent versus temporary labor contract (Silva and Vazquez-Grenno, 2013; Cahuc et al., 2016).

Figure 3 summarizes the quarterly average worker flows between the four labor market states. With respect to Table 2, Figure 3 indicates the volume of quarterly flows in thousands of individuals. Table 2 is not informative enough on the magnitude of the worker flows as transition probabilities in the table apply to stocks of different sizes. In particular, as can be seen in Figure 2, the largest stocks are nonparticipation and formal employment. Over the whole

Figure 3 Average worker flows, 2003Q3-2020Q1.



Source: Argentine Household Survey, authors' calculation. Worker transitions are expressed as the total number of people in thousands. For example, each quarter, out of the 1.6 million unemployed workers, 107,000 find a formal job, 377,000 find an informal job, and 541,000 leave the labor force.

period, the Argentine working population amounts to 25.8 million on average, with 9 million in formal employment, 5.2 million in informal employment, 1.6 unemployed workers, and 10 million out-of-the labor force.

Flows involving informal work are large: each quarter, 335,000 informal workers become unemployed, 746,000 of them leave the labor force. Flows in the reverse direction are also sizable: each quarter, 377,000 unemployed workers and 774,000 nonparticipants find an informal job. All inflows into informal employment involve 1,575,000 workers each quarter, while outflows from informal employment amount to 1,672,000 workers. Inflows are as large as outflows, which illustrate the “stock-flow fallacy”: a smooth evolution of stocks in Figure 2 actually hides large ins and outs. This illustrates why we need to look at worker flows to improve our understanding of the Argentine labor market.

4 Understanding the fluctuations of Argentine unemployment and informal work

4.1 Methodology

We now decompose cyclical fluctuations in the unemployment rate into contributions attributable to each of the flow hazards. To do so, we adapt the dynamic decomposition of Elsby et al. (2015) to our empirical model. We obtain the following β statistic measuring the share of unemployment variance that is accounted for by the hazard rate from i to j :

$$\beta^{ij} = \frac{\text{Cov}(\Delta u_{t-1,t}, \Delta \tilde{u}_{t-1,t}^{ij})}{\text{Var}(\Delta u_{t-1,t})} \quad (2)$$

where Δ is the first difference operator and $\tilde{u}_{t-1,t}^{ij}$ the counterfactual unemployment rate obtained when only one worker flow fluctuates. To compute $\tilde{u}_{t-1,t}^{ij}$, we proceed as follows. First, we compute labor market stock changes that are driven by contemporaneous but also *past* changes in transition rates. This recursive formulation of stock variations is at the heart of the non-steady-state decomposition. Second, we express the variance of any given labor market stock as the sum of its covariance with any counterfactual obtained in the previous step. Note that in Eq. (2) a covariance appears in the expression of β such that negative values of β can possibly appear.

As we are not interested in the decomposition of stock changes *per se* but rather the decomposition of the unemployment rate, we use a first-order Taylor expansion to approximate unemployment changes:

$$\Delta u_t = \frac{(1-u_{t-1})\Delta U_t - u_{t-1}\Delta E_t}{L_t} \quad (3)$$

with E_t being the total employment stock and L_t the labor force (the sum of U_t and E_t). Note that we should have $\sum \beta^{ij} \approx 1$ where the difference from unity is accounted for by approximation errors. Similarly, changes in the informality rate are such that:

$$\Delta i_t = \frac{(1-i_{t-1})\Delta I_t - i_{t-1}\Delta F_t}{E_t} \quad (4)$$

with i the informality rate and E_t the total employment stock (the sum of I_t informal employment and F_t formal employment).

4.2 Variance decomposition

Column (1) of Table 3 reports the shares of the variance of the unemployment rate accounted for by each hazard rate λ_{ij} . The originality of our contribution lies in documenting transitions to/from formal and informal work. Column (1) of Table 3 leads to stylized fact 1.

Fact 1, regarding fluctuations in the unemployment rate: nearly 40% of the fluctuations in the unemployment rate involve unemployment ins and outs from/to informal jobs (*UI* and *IU*). In addition, volatility in the exit rate from informal employment (*IU*) alone accounts for one-fourth of the unemployment rate's variance.

Column (2) of Table 3 displays the variance decomposition of the share of informal work in total employment. This leads to fact 2.

Fact 2, regarding fluctuations in the informality rate: More than 40% of the variance of informality is driven by the variance of the formalization rate (transitions from informal to formal employment *IF*). Transitions between formal and informal employment (*IF* and *FI*) account for more than 60% of the variance of the informality rate.

Workers' transition *IF* captures the stepping-stone effect or the formalization rate, that is, the ability of informal workers to get a formal job. Changes in this transition rate play a major role in the fluctuations of the informality rate in the Argentine economy.

The results also confirm the relevance of looking at labor participation when studying the Argentine labor market dynamics.

Fact 3, nonparticipation matters for the understanding of unemployment volatility but also for that of informality. 45% of unemployment volatility can be traced to the variance

Table 3 Variance Decomposition based on β in%. 2003Q3-2020Q1

	Unemployment	Informality
	(1)	(2)
<i>FI</i>	3.08	20.28
<i>FU</i>	0.56	-0.86
<i>FN</i>	5.66	16.92
<i>IF</i>	2.58	44.27(b)
<i>IU</i>	25.38	-12.75
<i>IN</i>	-1.00	4.68
<i>UF</i>	5.58	8.11
<i>UI</i>	13.99(a)	-1.18
<i>UN</i>	17.08	0.95
<i>NF</i>	-1.01	2.32
<i>NI</i>	-1.33	14.27
<i>NU</i>	29.43	2.99
<i>IU</i> and <i>UI</i>	39.37	-0.23
<i>NU</i> and <i>UN</i>	46.51	3.94
<i>FI</i> and <i>IF</i>	5.67	64.55

"F," "I," "U," and "N" indicate formal employment, informal employment, unemployment, and nonparticipation, respectively.

"unemployment": β decomposition of changes in the unemployment rate. "informality": β decomposition of changes in the share of informal work in total employment.

(a) Changes in *UI* account for 13.99% of fluctuations in the unemployment rate.

(b) Changes in *IF* account for 44.27% of fluctuations in share of informal work in total employment.

between nonparticipation from unemployment (*UN* and *NU*). Nearly 15% of volatility in the informality rate is driven by *NI* inflows to informal jobs from nonparticipants.

Finally, since the aggregate evidence points out the importance of nonparticipation, we further investigate this point by looking at labor market dynamics by gender as nonparticipation is known to be different across genders (See Figure 5, panel D). Male and female worker transitions probabilities are displayed in figure 6. Table 4 decomposes the contribution of the different flows for fluctuations in the male and female unemployment rates (columns (1) and (2)). Stylized fact 4 summarizes the main differences across gender.

Fact 4, regarding gender differences: transition involving nonparticipation matters more in the variance of female unemployment and informality rates than for their male counterparts. The main difference across genders is

- for the unemployment rate, the transitions from/to nonparticipation to/from unemployment *NU* and *UN* account for more than 50% of the female unemployment rate (vs. 35% for male unemployment rate)
- for the informality rate, nearly 20% of the variance in the informality rate is explained by changes in the inflows into informal jobs from female nonparticipants *NI*, versus 0% for male nonparticipants.

Fact 4 shows that Fact 3 is particularly relevant for female workers.

Table 4 Variance decomposition by gender based on β

	Unemployment rate		Informality rate	
	Men	Women	Men	Women
	(1)	(2)	(3)	(4)
<i>FI</i>	3.48	1.83	14.88	18.49
<i>FU</i>	8.44	-2.06	12.41	2.34
<i>FN</i>	3.48	4.76	10.42	10.60
<i>IF</i>	0.24	2.99	43.20 (b)	46.40
<i>IU</i>	24.18	24.69 (a)	-16.48	-11.43
<i>IN</i>	0.25	-3.82	13.52	3.37
<i>UF</i>	5.88	8.57	12.42	4.77
<i>UI</i>	16.68	11.66	4.22	-0.71
<i>UN</i>	19.07	7.16	0.77	-0.79
<i>NF</i>	0.59	-0.37	1.17	6.34
<i>NI</i>	1.13	-2.44	-0.32	19.16
<i>NU</i>	16.57	47.03	3.78	1.47
<i>IU</i> and <i>UI</i>	40.86	36.35	16.64	4.06
<i>NU</i> and <i>UN</i>	35.65	54.19	4.55	0.68
<i>FI</i> and <i>IF</i>	3.72	4.83	58.09	64.89

“F,” “I,” “U,” and “N” indicate formal employment, informal employment, unemployment, and nonparticipation, respectively.

“unemployment”: β decomposition of changes in the unemployment rate.

“informality”: β decomposition of changes in the share of informal work in total employment.

(a) Changes in *IU* account for 24.69% of fluctuations in the female unemployment rate.

(b) Changes in *IF* account for 43.20% of fluctuations in share of informal work in total male employment.

Interestingly, Facts 3 and 4 corroborate the idea of the added worker effect. It originally refers to an increase in the labor supply of married women when their husbands become unemployed (Mincer, 1962; Lundberg, 1985). As shown by Panel D of Figure 5, nonparticipation seems to evolve in opposite direction across genders: after the 2014 recession, more women left the labor market, their nonparticipation increased, while more men entered the labor market. Table 4 shows that female flows from nonparticipation account for a larger share of the variance in informality (*NI*) and unemployment (*NU*) than for men. Consequently, our results suggest the presence of an added worker effect that takes the form of larger transitions from nonparticipation to informal employment. In the case of Argentina, this effect seems to be confirmed by Martinoty (2014) during the 2001 Argentine crisis. Moreover, most studies point out the fact that it is deepened when households face credit constraints (Lundberg, 1985; Bingley and Walker, 2001) as it is the case in Argentina.

Fact 5 puts forward common features across genders: flows between unemployment and informality *UI* and *IU* explain nearly the same share (35-40%) of the unemployment rate volatility for men and women. The same occurs for the informality rate where more than 40% of the volatility of informal employment is explained by the sole exit rate from informality to formality *IF*.

Fact 5 shows that Facts 1 and 2 are relevant for male and female workers. Fact 5 also suggests that the flows from and into informality are important to understand unemployment fluctuations for men and women. For the informality rate, the formalization rate plays an important role in accounting for cyclical changes in informality, regardless of gender.

5 Conclusion

Understanding movements in inflows and outflows of workers has now become the conventional approach for studying labor market dynamics. Worker flows provide a rich story about labor adjustments along the business cycle and the driving forces behind the cyclicity of the stocks. Beyond traditional decomposition exercises, time series of worker flows are useful for the calibration and estimation of theoretical frameworks. There is now a vast literature that strives to find what theoretical foundations are relevant for reproducing salient facts from data.

In emerging countries, worker flows are still difficult to compute over a sufficiently large period, a prerequisite for the analysis of the labor market at business cycle frequencies. In this article, we tackle this issue by building quarterly transition rates in Argentina over the last two decades, including the aftermath of the deep recession in 2001. In addition, the Argentine labor market involves upswing and downswing in the unemployment rate and the informality rate, providing an interesting environment for analyzing the contribution of the inflows and outflows at different points of the cycle. Our work provides novel evidence on worker flows in emerging countries and can be used to discipline theoretical frameworks embedding an informal sector.

Our article documents business cycle fluctuations of unemployment and informality rates based on worker flows. The variance decompositions that the ins and outs of informal employment are key drivers of Argentine labor market fluctuations. We therefore highlight five stylized facts. All point to the importance of fluctuations in informality to understand the dynamics of unemployment and informality rates. Our results also suggest that nonparticipation shall also be considered for a proper modeling of labor dynamics in an economy with sizeable shadow economy.

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Appendix

A Data

A.1 Margin error

The goal of margin-error adjustments is to address the discrepancy between the stocks and the gross flows. The stocks are computed using the whole sample of cross-sectional data; the gross flows, on the other hand, require longitudinal linking, and therefore their measurement suffers from sample attrition, imperfect matching, etc. The margin-error adjustment below reconciles the predicted changes in stocks with the actual changes calculated on stocks using the whole sample of cross-sectional data.

Elsby et al. (2015) rewrote the dynamics of changes in the observed stocks Δl_t as a function of stock-consistent transition probabilities p_t and stocks from the previous period S_{t-1} .

$$\Delta l_t = S_{t-1} p_t \quad (5)$$

From the data, we can only get transition probabilities that are not fully stock-consistent, which we denote \hat{p}_t . To recover stock-consistent transition probabilities p_t , Elsby et al. (2015) minimized the weighted sum of squares of margin-error adjustments under the constraint of Eq. (5)

$$\text{Min } (p_t - \hat{p}_t)' W_t^{-1} (p_t - \hat{p}_t) \quad (6)$$

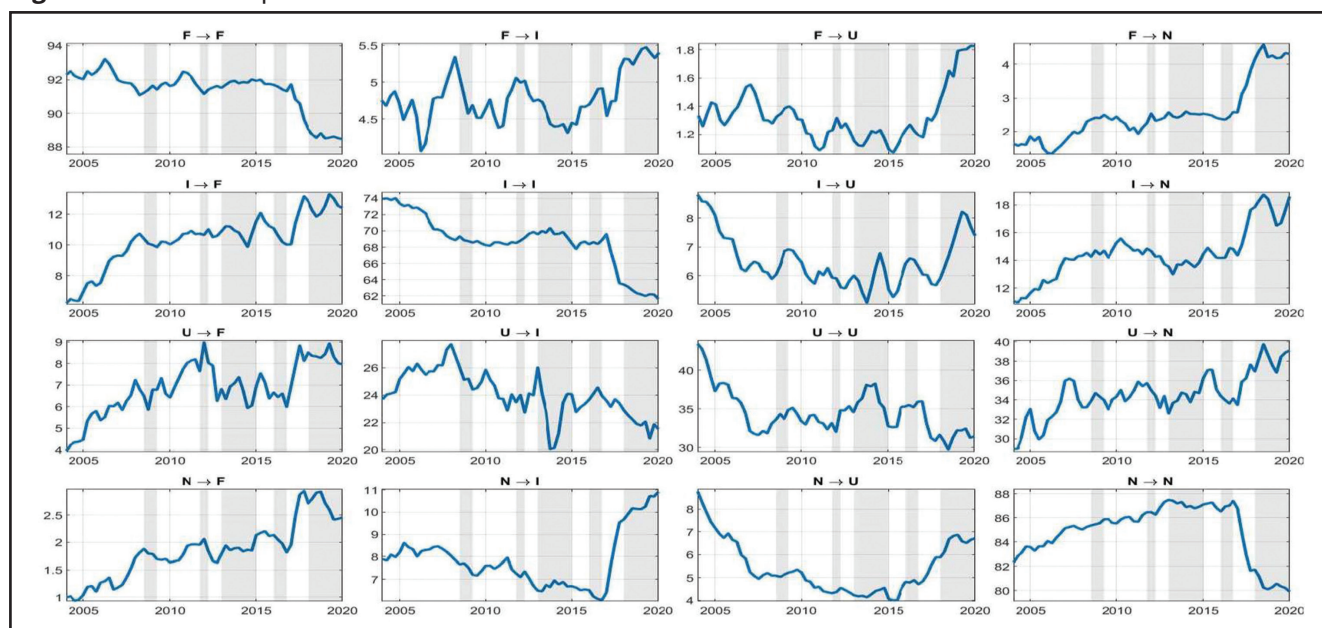
where W_t is a weighing matrix proportional to the covariance matrix of \hat{p}_t . The solution of this minimization problem is \hat{p}_t as a function of the observed data: p_t , Δl_t and S_{t-1} .

A.2 Time aggregation

Let us denote H_t the continuous-time analog of X_t . If the eigenvalues of H_t are all distinct, then H_t can be written as: $H_t = V_t C_t V_t^{-1}$, where C_t is a diagonal matrix of eigenvalues and V_t is the matrix of associated eigenvectors. Furthermore, one can show that X_t can be decomposed as: $X_t = V_t D_t V_t^{-1}$ where D_t is a diagonal matrix whose elements are the exponentiated eigenvalues in C_t , and that this relationship is unique if the eigenvalues of D_t are, in addition to distinct, real, and nonnegative. These relationships can be used to obtain time series of estimates of the adjusted hazard rates λ_t^{ij} . In every period t , we compute the eigenvalues of the discrete transition matrix X_t and check whether they are all distinct, real and nonnegative. We then take their natural logarithm to obtain the eigenvalues of the continuous-time analog H_t . Finally, we compute λ_t^{ij} , and use the relationship: $p_t^{ij} = 1 - e^{-\lambda_t^{ij}}$ to obtain a series of time-aggregation adjusted transition probabilities.

B Evolution of worker flows

Figure 4 and 6 display the evolution of transition rates over the business cycle. The transition rates appear to be very cyclical, which contrasts with the smooth evolution of stocks displayed in Figure 2 and 5 respectively. This contrast illustrates the relevance of the “stock-flow” fallacy as smooth changes in stocks actually hides large fluctuations in underlying worker transitions.

Figure 4 Transition probabilities in%.

“F,” “I,” “U,” and “N” indicate formal employment, informal employment, unemployment, and nonparticipation, respectively. For example, “ $F \rightarrow I$ ”: the transition from formal to informal work. Shaded areas denote recession periods based on the Argentine Central Bank (BCRA) calculations.

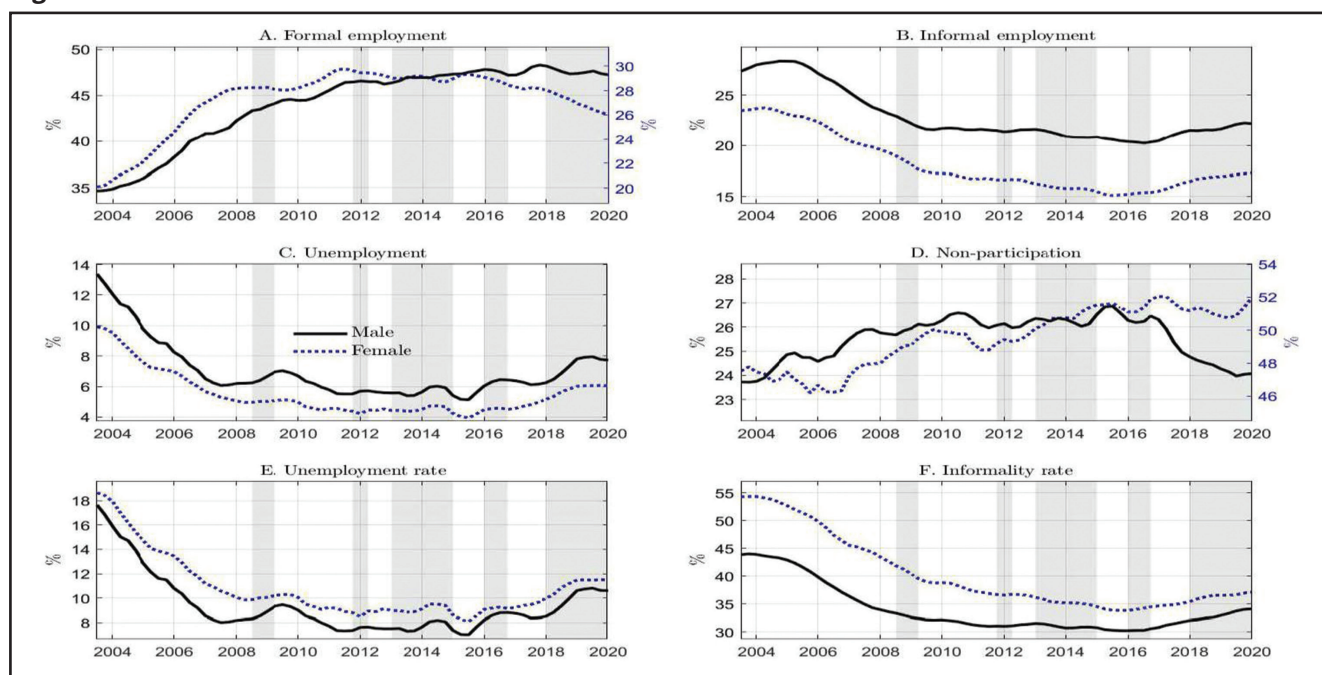
How different is the cyclical behavior of worker flows from that of OECD countries? We compare our results to Elsby et al. (2015) to highlight the difference between developed and developing countries.

As in other OECD countries, the probability of finding a formal job (UF and NF), is procyclical. The informal job finding rates (UI and NI) depict very similar patterns albeit the NI flows are almost constant at the beginning of the sample. Outflows from employment to unemployment behave similarly in the formal and informal sectors. They increase sharply when the economy enters the recession and decline rapidly as the economy recovers. Outflows from employment to nonparticipation (FN and IN) remain barely unchanged during the recession like in the US case. However, the expansionary phase of the cycle is marked by a surge in labor force exits, which contrasts with the US experience. Job-to-job transitions (IF) reveal a significant increase in access to formal jobs by informal workers after the recession.

Last but not least, Elsby et al. (2015) document two important stylized facts: (i) the nonparticipation to unemployment transition (NU) is countercyclical and (ii) the unemployment to nonparticipation (UN) transition is procyclical. The former seems valid in the case of Argentina for the recovery in 2004, but not thereafter. The latter follows a very different path. It changes very little during the 2004 recovery and remains flat afterwards. These results suggest that fluctuations in the Argentina labor market are the outcomes of different adjustments than those in the US.

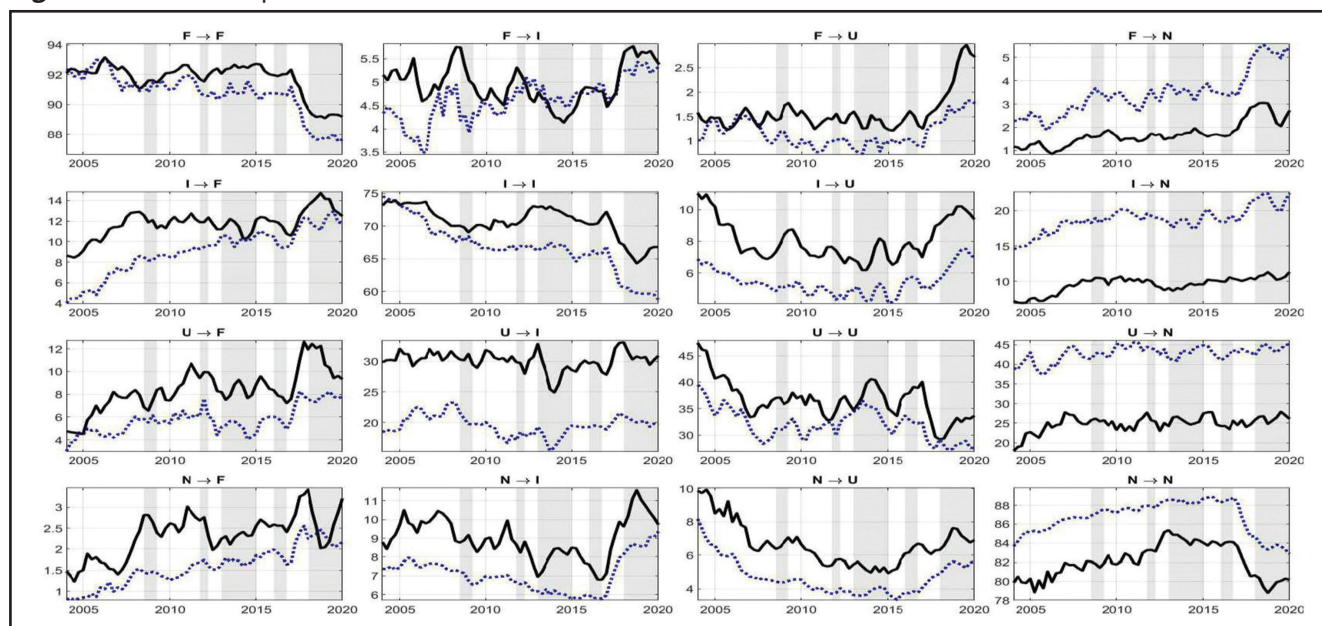
C Evolution of stocks and transition probabilities

Figure 5 Stocks: Male versus female.



Source: Argentine Household Survey. Panels A, B, C, and D: stocks as% of the working-age population. Shaded areas denote recession periods based on the Argentine Central Bank (BCRA) calculations.

Figure 6 Transition probabilities - Male versus Female in%.



Source: Argentine Household Survey. The solid black lines are the transitions for men and the dashed blue are those for women. “F,” “I,” “U,” and “N” indicate formal employment, informal employment, unemployment, and nonparticipation, respectively. For example, “F → I”: the transition from formal to informal work. Shaded areas denote recession periods based on the Argentine Central Bank (BCRA) calculations.