Labor flows across firm size, age, and economic sector in Colombia vs. the United States

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Abstract This paper compares labor market flows between a developing economy, Colombia, and a developed one, the United States (US). In a comparative framework, we explore measures of labor market flows across dimensions such as firm size, age, and economic sector. This comparison allows us testing, for both countries, a series of interesting hypothesis suggested in the literature, namely the negative systematic relationship between firm size/age and employment growth rate. We find that labor market fluidity in the US labor market is substantially higher than in Colombia and that the churning rate is twice as high for the US market as it is for the Colombian one. We argue that this fluidity gap between the two economies can be explained by, among other factors, the rigid nature of Colombian labour market institutions.

Keywords Job creation · Job destruction · Hiring · Separations · Firm size · Firm age · Churning · Colombia · US

JEL classifications E24 · J08 · J23 · J30 · J63 · L25 · L26 · M21

1 Introduction

The analysis of labor market flows has gained importance in the field of labor economics. Labor market flows allow the characterization of supply (hires and separations) and demand (job creation and destruction) in a way that is directly linked to labor dynamics. Most of the literature on labor market dynamism is focused on developed countries. However, little is known about labor market dynamics in developing economies. Literature that contains meaningful insights on how labor market dynamism compares between developing and developed economies is even more uncommon. In terms of the behavior of labor flows, some of the hypothesis that have been studied for developed countries (e.g., the relevance of small firms in aggregate job creation) have not been sufficiently explored in developing economies.

In this paper, we aim to shed light on at least two issues. On the one hand, in comparison to the...
United States (US) labor market, how dynamic and flexible the Colombian labor market is? On the second hand, within this comparative framework, what type of firms creates more jobs in both labor markets? In regard to the first question, our paper is similar to other studies that comparatively describe the labor market dynamics of various countries and their labor market institutions (e.g., Baldwin and Picot 1995; Blanchard and Portugal 2001; Boeri and Jimeno 2005; Decker et al. 2014; Gómez-Salvador et al. 2004). Nevertheless, in this study, we compare the US labor market with that of Colombia, a developing economy. Regarding the second question, it is related to the literature on ¿who creates jobs? (Baldwin and Picot 1995; Davis et al. 1996a; De Wit and De Kok 2014; Lawless 2014).

For both countries, we compute job creation and destruction by segments of firms that we categorize by size, age, and economic sector. This study contributes to the existing literature since we analyze all labor market flows, including worker flows and churning, in all economic sectors.

To the best of our knowledge, this is the first paper to compare in a harmonized manner the labor market flows between a mid-low income country and a high-income economy. The labor market in the US is characterized by its fluidity and flexibility; our comparison sheds light on the degree of dynamism of a developing economy such as Colombia. In addition, we make a comparison of both markets in terms of their labor market institutions. The study of labor market flows has an important tradition in the US labor market, but in developing economies there is no clear idea of how fluid these markets are and how their institutions might affect their dynamism. From our comparison, we find that some relationships across labor market flows in Colombia are somewhat similar to those in the US. Similarly to the US, churning rates in Colombia are positive across the spectrum of possible employment growth rates, which means that an important fraction of worker movements is explained by reasons other than job creation and destruction. In other words, churning is an important component of all worker movement. This excess of worker reallocation in relation to job reallocation is also a measure of worker replacement (Morales and Lobo 2017); moreover, it provides evidence that replacement is a firm’s strategy for improving the quality of its workforce and that worker job-to-job transitions are important in the dynamics of the labor market.²

One of our most insightful findings is that job flows in Colombia and the US are relatively similar, but worker movements captured by hiring and separation rates are substantially higher in the US labor market. Therefore, the churning rate is twice as high in the US labor market than in the Colombian one. It might be expected that labour markets’ dynamics are different between both countries; nevertheless, the nature of these differences is not obvious. This fluidity gap is entirely due to workers’ movements—not because, relative to the size of the market, there is more creation or destruction of jobs in the US. In other words, striking differences comes from the supply side flows; US workers move from existing positions more easily and more frequently than their Colombian peers do. In light of this evidence, the Colombian labor market is substantially less dynamic than the US one; herein, we argue that institutional differences could account for such a fluidity gap. To this end, we identify differences between these two labor markets in terms of institutions such as (among others) minimum wage, employment-protection legislation, and non-wage labor costs, which are normally identified in the literature as possibly negative determinants of labor market dynamism.

As commented in the second paragraph of this introduction, this paper is related as well to the literature on ¿who creates jobs?. Identifying the relevancy of specific segments in terms of job creation is crucial for the design of differentiated policies, for example preferential tax schemes or special regulatory treatment for small businesses. Successful design of differentiated policies has been the main motivation for all the literature on “who creates jobs”. The idea that small firms are the ones that create more jobs in the economy has a long tradition in the literature. The first study to argue this idea was by Birch (1981), who used information on the US to explore the questions of which firms create more jobs and which are more sensitive to changes in economic policy. Birch’s most remarkable finding (1981) was that firms with 100 or fewer employees produced around 80% of total job openings. A number of other

² Nevertheless, literature has noted undesirable effects of increasing fluidity. For example, the job losses implicit in worker replacements can lead to lower job security and might increase the incidence of unemployment (Davis and Haltiwanger 2014). From the perspective of the firm, excess of worker turnover increases training costs, and therefore might be damaging to the employer (Burgess et al. 2000).
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The remainder of the paper is organized into five sections. Section 2 presents the data and definitions of the measures of labor flows we used in our analysis. Section 3 presents aggregate labor flows in Colombia, compares these flows with those found in the US, compares each country’s labor institutions, and tells how these institutions can explain the fluidity gap between the two economies. Section 4 presents the dynamics of labor market flows by categories such as firm size, age, and economic sector, in a comparative framework between the Colombian and US labor markets. Section 5 presents panel regressions that confirm some of the results found in Section 4. Finally, Section 6 summarizes the main results and presents some policy implications.

2 Definitions of labor market flows and data

As mentioned, the data employed in this paper for the case of Colombia come from the Integrated Record of Contributions to Social Security (Spanish acronym: PILA), which is a panel that links information about employers and employees. Referring to PILA allows us to build definitions of labor flows based on those used in the literature, in monthly and quarterly frequencies since 2009. Using PILA, we also follow and define as formal those firms that make social system payments such as health and pensions. Such firms do not include informal firms, which provide half of the total employment in Colombia. Nevertheless, as long as firms pay payroll taxes, PILA considers them, including the firm’s owner. However, because excluding self-employees is a common practice in the literature, we exclude self-employees and limit our analysis to firms with two or more than two employees (including the owner as

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3 More recently, Neumark et al. (2011) and De Wit and De Kok (2014), among others, have found evidence in favor of Birch’s (1981) results in several countries, even after controlling for the classification issues mentioned above.

4 Nevertheless, in Colombia, newborn firms (less than 1 year old) are not the ones with the highest employment growth rate, as is the case in the US (Haltiwanger et al. 2013; Lawless 2014) and other developed economies (see Heyman et al. 2018, for Sweden).

5 PILA statistics are available starting in 2008; however, to avoid measurement errors we use information reported since 2009.
employee); therefore, our flow rates for Colombian labor market can be fully comparable with the ones for the US. The reason why literature exclude self-employed individuals from the analysis is that they do not operate under the logic of a firm, which are assume with the faculty of hire or fire other employees.

Following Davis et al. (1996b), we define a plant as a physical location where production takes place, and a firm as an economic and legal entity that encompasses one or more plants. We use the firm as a unit of analysis, which means that any movement of workers between two plants of the same firm is not the same type of measure as a hiring and/or separation. We do not have information about voluntary or involuntary separations in Colombia, although by law this information is reported directly by each firm to the Minister of Health every month. Using PILA, we are able to follow around 369,000 firms and 9,420,000 workers in the last year of the study period.7

As is usual in the labor flows literature (Davis et al. 1996a), we define a job as a position filled by a worker. Because we are not able to observe vacancies, all of our measures are based on observations of a firm’s size and of the flow of workers entering and exiting that firm. Our study uses quarterly frequency data, following Burgess et al. (2000) and Davis et al. (2006) who take as employees only those workers who last at least a quarter in the firm and thus avoid the noise caused by very short employment spells.8 Additionally, we focus only on the private sector.9

To better understand labor flows in Colombia, we compare them with labor market dynamics in the United States, whose labor flows are available from the Census Bureau as Quarterly Workforce Indicators (QWI).10 The QWI began in 2003 and was built using Longitudinal Employer–Household Dynamics (LEHD) data (U.S. Census Bureau 2017). The QWI provide aggregate information about the dynamics of labor market flows by categories such as economic sector, age, and size; excluding self-employees and the public sector. Moreover, to make a more accurate comparison with the quarterly Colombian data, we use as the quarterly employment measure the number of jobs that are held in the US on both the first and last day of the quarter with the same employer (Abowd et al. 2009; Haltiwanger et al. 2014a).

Before describing our fluidity measures, let us introduce some notation and definitions.11 There are two main components of labor flows: job flows, which refer to job destruction and job creation; and worker flows, which are represented by hires and separations. Assume firm j is a set of business establishments with at least two employees. An individual ijt is an employee observed in the payroll of firm j at period t. Given that we have employer–employee information, we can compute hires (htj) as the set of particular employees observed in a given time that were not observed before. Similarly, separations (sjt) are generated as the specific employees found in the previous quarterly periods that were not observed in the current one. Thus the set of hires, separations, and stayers (kjt) in a firm j in the period t are defined as:

\[
\begin{align*}
    h_{jt} &= \{ i : i \in j_t \text{ and } i \notin j_{t-1} \} \\
    s_{jt} &= \{ i : i \notin j_t \text{ and } i \in j_{t-1} \} \\
    k_{jt} &= \{ i : i \in j_t \text{ and } i \notin j_{t-1} \}
\end{align*}
\]

Firm payroll in a given period is denoted as \( e_{jt} = k_{jt} + h_{jt} \), representing the employees who continue working in the firm j plus newly hired workers. We approximate the number of jobs created and destroyed by each firm as changes in the payroll from one period to the next, and assume that an increase (reduction) in the payroll implies the creation (destruction) of jobs. Therefore, job creation \( c_{jt} \) and job destruction \( d_{jt} \) of firm j in the period t is denoted as:

\[
\begin{align*}
    c_{jt} &= k_{jt} + h_{jt} \\
    d_{jt} &= -k_{jt} - h_{jt}
\end{align*}
\]

6 Unfortunately, with PILA we are not able to identify the number of plants or establishments that constitute a firm.

7 Given the information from PILA used in this paper, we are able to follow the change in the number of workers by firm. This measure includes full-time and part-time workers (i.e., workers who contribute to the pension or health system).

8 With this construction, using quarterly data, we lose some information compared to the monthly frequency. We find that the difference between quarterly and monthly formal employees is around 2 million, which in PILA represents around 21.5% of the total employment in Colombia, although by law this information is reported directly by each firm to the Minister of Health every month. Using QWI, we are able to follow around 369,000 firms and 9,420,000 workers in the last year of the study period.

9 The public sector represents, on average, 24.14% of the total employment reported in PILA during the whole period analyzed.

10 The QWI uses the physical location where production takes place as a unit of analysis. Retrieved from https://lehd.ces.census.gov/data/qwi_national_beta.html#downloadable-data

11 Definitions and notation used in this section carefully follow Morales and Medina (2016).
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One worker, it must be true that:

\[ \Delta e_{jt} = \begin{cases} 1 & \{\Delta e_{jt} > 0\} \Delta e_{jt}; \\ -1 & \{\Delta e_{jt} < 0\} \Delta e_{jt} \end{cases} \]

We can calculate aggregated measures for different categories by taking summations of all these previous sets. Thus the aggregate flows of hires \((H_{A,t})\), separations \((S_{A,t})\), job creation \((JC_{A,t})\), and job destruction \((JD_{A,t})\) for category \(A\) are represented as.\(^{13}\)

\[ H_{A,t} = \sum_{j \in A} h_{jt}; \quad S_{A,t} = \sum_{j \in A} s_{jt}; \quad JC_{A,t} = \sum_{j \in A} c_{jt}; \quad JD_{A,t} = \sum_{j \in A} d_{jt}. \]

To simplify the exposition, from now on we omit subscript \(A\). However, all the measures we will discuss in the next section are aggregated at some level. An interesting point about labor flows is that worker flows and job flows are connected. According to Laing (2011, p. 806), given that each job is defined to be filled only by one worker, it must be true that:

\[ \Delta E_t = JC_t - JD_t = H_t - S_t. \]

The most-used measures of labor market fluidity (i.e., mobility) are worker and job reallocation. Worker reallocation (WR) refers to the number of workers who change labor status (employed/unemployed) during a period (Davis and Haltiwanger 1999), which is given by \(WR_t = H_t + S_t\). Job reallocation (JR) refers to the number of jobs that are created and destroyed, which is given by \(JR_t = JC_t + JD\). Using these measures of reallocations, we can build the churning flows (i.e., the excess of worker reallocation over job reallocation):

\[ CH_t = WR_t - JR_t \]

12 By different categories, we mean different firm sizes, ages, and economic sectors.

13 Theoretically, these flows can be generated from traditional equilibrium unemployment models. These models, which were introduced by Mortensen and Pissarides (1994) and by Pissarides (2000), first reproduce the search processes that workers enact when they want to find a job or that firms initiate when they want to fill a vacancy. Then, they focus on how jobs are created and destroyed by the firms, and how workers move from being employed to unemployed. Together, these dynamics flows determine the equilibrium unemployment rate.

Using this notation, the employment level of any category \(A\) can be defined as \(X_{A,t} = \sum_{j \in A} x_{jt}\).

Using the flows at national aggregate level, we find that the relationship between worker and job flows is not trivial, as suggested by Burgess et al. (2000), Burgess et al. (2001), Hamermesh et al. (1996), and Lane et al. (1996), among others. Both expanding and shrinking firms engage in hiring; in addition, both shrinking and expanding firms fire workers. Therefore, churning rates are positive across the spectrum of possible employment growth rates.

Figure 1 illustrates the relationship between worker flows [hiring \((H)\) and separation \((S)\)] and job flows [job creation \((JC)\) and destruction jobs \((JD)\)]. In the horizontal axis, we have the net employment change rates, and in the vertical axis we have the worker reallocation as the sum of hiring and separation rates at the firm level. The 45° line represents the case in which worker reallocation is equal to change in employment (i.e., churning is equal to zero). The difference between any point and the 45-degree line expresses the rate of churning. This figure shows that shrinking firms (those that destroy jobs) have high separation rates but at the same time present a positive hiring rate. It also shows that expanding firms (those that create jobs) present high hiring rates but at the same time positive separation rates; in such cases, churning is always positive. Similar to Burgess et al. (2000), we found that higher churning flow rates tend to be associated with lower absolute job flow rates. Moreover, even when job destruction or job creation rates are equal to zero, the churning rate is positive and not negligible.

According to Burgess et al. (2000, p. 474), there are two reasons for the presence of churning. First, workers decide to quit, so the firm needs to replace them. Second is the firm’s need to hire and fire workers, in order to improve the quality of their workforce or to reconfigure their skill mix by replacing one type of job with one or more other types. In addition, the dynamics of different flows (e.g., worker reallocation, job reallocation, and churning) are affected by institutional features such as the level of the minimum wage, strength of employment protection, wage bargaining power, and non-wage labor costs, among others (Bassanini and Garnero 2013; Blanchard and Portugal 2001; Bottasso et al. 2017; Gómez-Salvador et al. 2004; Haltiwanger et al. 2014a, 2014b; Hopenhayn and Rogerson 1993; Salvanes 1997). The next section presents the difference between

\[ c_{jt} = \begin{cases} 1 & \{\Delta e_{jt} > 0\} \Delta e_{jt}; \\ -1 & \{\Delta e_{jt} < 0\} \Delta e_{jt} \end{cases} \]
labor flows in Colombia and the United States, and shows how these differences can be explained by differences in labor market institutions.

3 Aggregate labor market flows and institutions for Colombia and United States

3.1 Comparison of job market flows between Colombia and the US

A recent body of literature in labor economics has explored labor market dynamism in developed countries, especially in the United States labor market (Bjelland et al. 2011; Davis et al. 2008; Davis and Haltiwanger 2014; Hyatt and Spletzer 2013; Lazear and McCue 2017; Molloyle et al. 2016). Very little is known about labor market dynamics in developing economies. In this section, we compare Colombian job/worker flow measures with those computed for the United States; such a comparison sheds light on the research about labor market dynamics across countries.

For both labor markets, we are able to cover only the formal share of the market, because the information required to generate all labor market flows is only available in surveys or administrative records collected for formal firms. This condition presents a limitation, especially for the Colombian case, in which the informal sector in urban labor market comprises almost half of the market. Nevertheless, our data include very small firms (i.e., two or more employees including the owner as employee). In addition, the contribution of informal firms to aggregated flows it is likely to be small (Morales and Medina 2019). The methodology proposed by the authors of two recent working papers (Morales et al. 2019; Hermida and Morales 2019) for the computation of all labor market flows using information from household surveys permits such computations for informal labor markets as well. The authors of both of these papers find that formal markets are more fluid and dynamic than informal ones, and explain this finding with the facts that most informal workers are self-employed and informal job-to-job transitions have low incidence. In this paper, we cannot compute flows for informal workers, but considering this recently shared evidence, we believe the labor market flows presented in this section might be somewhat higher that they would be for the whole labor market.

In Fig. 2, we present quarterly labor flow rates for the period between the first quarter of 2009 and the first quarter of 2017 for both economies. We observed a positive net employment growth rate for both countries during most of this period, which implies that the job creation rate (JC) [hiring rate (H)] is higher than the job destruction rate (JD) [separation rate (S)]. The Colombian net employment growth rate shows a decreasing trend since 2015, however, which is consistent with a concurrent period of economic slowdown and unemployment rate increase in the Colombian economy.

14 As reported in Morales and Medina (2019), the proportion of all fluidity explained by very small firms is tiny; they argue that firms with two to five employees represent only 1.09% of total worker flow, 3.57% of churning flow, and 5.87% of total job flow.

15 Morales et al. (2019) show that the formal market has considerably higher magnitudes of worker reallocation rates and churning rates than the informal share of the market.
On the one hand, Fig. 2 shows that the average hiring (separation) rate for the US during the same period was 21% (20%),\(^\text{16}\) while in Colombia the average hiring (separation) rate was 16.3% (14.8%); this difference means that worker flows are more intense in the US. On the other hand, the average creation (destruction) rate for Colombia was 8.6% (7.2%), while in the US the average creation (destruction) rate was 6.2% (5.3%). The most striking indication from this comparison of Colombian and US labor dynamics is that worker’s movements, captured by hiring and separation rates, are substantially higher in the US labor market. Nevertheless, the size of job movement in terms of job destruction and creation rates is slightly higher in the Colombian labor market. This configuration produces an excess of worker reallocation or churning that is substantially higher for the US. As we argue below, higher churning rates are an empirical regularity of more flexible markets.

Figure 3 presents the job and worker reallocation rates for the Colombian and US labor markets during the same period. These rates show an increase in worker reallocation (WR) in both countries, as well as an increasing trend since 2010. The WR measures workers’ movements in and out of jobs in the labor market. As previously mentioned, the magnitude of these movements was substantially higher in the US than in Colombia during this period. On average, WR was almost 11 percentage points (pp) higher in the US. In terms of the total aggregation of job creation and destruction rates, the Colombian labor market was slightly more dynamic. For the study period, JR is on average higher in Colombia by 4.2 pp than the US. This difference is explained partly by the sharp reduction that the JR experienced in the US after 2010; during this same period, the JR in Colombia shows a sharp volatility, fluctuating around the 16% level.

As suggested by Davis and Haltiwanger (2014), we do not expect these flows to be similar between the two countries; instead, we acknowledge that these measures are “strongly influenced by labor market institutions, the structure of production and employment, data quality, and measurement methods—all of which can differ substantially across countries” (p. 7). Nevertheless, the configuration of the measures for Colombia and the US, which we find to be pretty much comparable, shed light on an interesting fact: The US labor market is substantially more dynamic than the Colombian one in terms of the excess of worker reallocation over job flows (i.e., churning). Churning rate (CH) captures the amount of hires that are not jobs created and the amount of separations that are not jobs destroyed (Morales and Medina 2019). Churning flow represents job–worker matches that came from replacing workers who quit or were laid off; implicitly, they also capture worker replacements for fixed job positions (Morales and Lobo 2017). Churning can also be explained by several other factors, such as worker movements all along the job ladder or

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\(^{16}\) All of these measures are expressed as a percentage of the total employment; therefore, during an average quarter, separations and hires represent 20% and 21% of total employment in US, respectively.
employer intentions to improve the quality of their workforce (Burgess et al. 2000).

The two bottom graphs of Fig. 3 present churning rates (CH) for both labor markets during the period of 2009 to 2017. The averages CH for the US and for Colombia were 30.1% and 15.3%, respectively; that is, the CH for US was double the Colombian one. Because churning represents the excess of workers reallocation over job flows, it describes the capacity of an economy to mobilize workers and jobs across the labor market. Churning is highly related to the degree of fluidity of a labor market, because it describes how easy it is for workers to move from one job position to another and for employers to perform simultaneous firing and hiring. In other words, churning measures how easy it is for employers to replace workers in order to improve the quality of their workforce or to reconfigure their skill mix (Burgess et al. 2000). Since there is heterogeneity in the composition of the firm-specific human capital investment, at the firm level, churning is heavily influenced by this composition.

The two bottom graphs of Fig. 3 present churning rates (CH) simultaneously with the unemployment rate of each economy. The pro-cyclicality of labor market fluidity, in terms of the CH, is well documented in the literature for developed economies (for the US specifically, see Davis et al. 1996a and Davis and Haltiwanger 2014). Theoretical reasons for the negative relationship between labor market fluidity and unemployment rate are described and tested in Davis and Haltiwanger (2014); these authors argue that an increase in fluidity implies that workers face a more rapid arrival of job offers, which in turn results in shorter jobless spells. For the Colombian case, the benign effects of higher CH on unemployment rates have been corroborated by Morales and Medina (2019). In Fig. 3, we show how the unemployment rate reached its minimum around
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Colombia and the OECD countries

derived from the comparison of minimum wages in market produces better aggregate economic results. 17

protections); evidence also shows that a more fluid labor institutions (e.g., high minimum wage and strong labor protections); evidence also shows that a more fluid labor market produces better aggregate economic results. 17

The evidence presented in the previous section shows that, from the perspective of churning flows, the Colombian labor market is substantially less dynamic than the US one. For our period of study, Colombian churning flows represented 51% of the US churning flows. In this section, we briefly identify differences between the institutions of these two labor markets that could account for this difference. The literature contains ample evidence that a lack of dynamism in the labor market is the result of rigidities caused by economic policies and institutions (e.g., high minimum wage and strong labor protections); evidence also shows that a more fluid labor market produces better aggregate economic results. 17

Figure 4 presents a comparison between some of the most important labor market institutions in Colombia and the US, such as minimum wage, employment protection legislation, market regulation, and non-wage labor costs. One of the most relevant institutions that affects labor market outcomes is the minimum wage; in terms of the standard ratio minimum wage/median wage (upper-left panel), minimum wage relative to median wage is substantially higher in Colombia than the US (Arango and Flórez 2017). The same conclusion can be derived from the comparison of minimum wages in Colombia and the OECD countries’ average. 18

In terms of protection legislation (upper right panel), Colombian labor market legislation is substantially stricter than US legislation. The standards in terms of the protection of temporary and regular workers in Colombia are similar to the average of the OECD countries. 19 Colombia ranks 29th among 71 countries in the OECD protection index for permanent workers.

Several papers have argued that employment protection laws reduce labor market fluidity (Bassanini and Garnero 2013; Blanchard and Portugal 2001; Boeri and Jimeno 2005; Bottasso et al. 2017; Decker et al. 2014; Gómez-Salvador et al. 2004; Haltiwanger et al. 2014a, 2014b; Messina and Vallanti 2007; Micco and Pages 2012). Blanchard and Portugal (2001) 20 argue that by reducing dynamism, higher employment protection generates longer unemployment duration. Gómez-Salvador et al. (2004) and Haltiwanger et al. (2014a, 2014b) find evidence that the strictness of employment protection legislation reduces job creation and thereby reduces job reallocation. Finally, Salvanes (1997) presents evidence that stricter dismissal costs reduce job creation and destruction.

An additional set of rules that could restrict labor market flexibility are non-wage labor costs (e.g., payroll taxes). The Colombian labor market is characterized as having elevated non-wage costs, even for the standards of a developing economy. Figure 4 (bottom right panel) shows how these labor extra costs are higher in Colombia than for the OECD average country and substantially higher than the US. In 2012, Colombia implemented a tax reform that reduced payroll taxes by a total of 13.5 pp of wages; it has been shown in several papers that this reduction produced an increase in formal employment (Bernal and Eslava 2015; Fernández and Villar 2017; Morales and Medina 2019). Nevertheless, even after this reduction (13.5 pp in payroll taxes), Colombian non-wage labor costs remain higher both than in the US and the OECD average; this difference is indicated in the darkest colored bars, representing Colombia, which show non-wage costs after the tax reform of 2012.

Finally, we consider another set of institutions that might slow down labor dynamics: regulations in the real sector beyond the labor market. Figure 4 (bottom-left

17 For the specific case of the North American economy, Autor et al. (2006) and Autor et al. (2007) present evidence of the adverse effects of labor protection laws on employment and total factor productivity (Morales and Medina 2019).

18 The average indicators of the OECD countries allow us to compared Colombia case with a benchmark for all developed economies.

19 Figure 4 presents a comparison of employment protection legislation in terms of OECD indicators; these are synthetic indexes that measure the costs associated with worker dismissal (including notice periods, severance payments, and difficulty of the process).

20 Blanchard and Portugal (2001) present a theoretical model that relates employment protection regulation and labor flows, according to the traditional models of Mortensen and Pissarides (1994), with endogenous job destruction. The authors show that high employment protection lowers layoffs (worker flows) because it increases the firm costs while strengthening the bargaining power of workers, but also produces longer unemployment duration. They find that high employment protection explains the lower labor flows in Portugal compared to the United States.
panel) presents comparative measurements of market regulation in the US, OECD countries, and Colombia, based on the Economy-Wide Product Market Regulation Index produced by OECD. This index takes into account three elements: complexity of regulatory procedures, administrative burdens on startups, and barriers to foreign direct investment (FDI). The aggregate index, which OECD refers to as overall restrictiveness, combines all three of these dimensions. Overall, Colombian restrictions exceed not only the ones in the US but also the ones for the average OECD country; the most striking differences occur with regard to the complexity of regulatory procedures and the administrative burdens placed upon startups. This restrictiveness in business making (a distinctive feature of the Colombian economy) reveals itself in indexes such as the cost of doing business indicator in the OECD. This cost is 14% of the per capita income in Colombia, but only 1.1% of the US per capita income (World Bank 2018).

The evidence we have presented so far seems to suggest a possible explanation of the fluidity gap between the Colombian and US labor markets. We find that Colombia has more restrictive institutions than the US, such as a high minimum wage (relative to median wage); more restrictive legislation in terms of employment protections and regulations in the real sector; and, finally, high non-wage labor costs. These differences persist even after ambitious reductions in the tariffs of payroll taxes were implemented in Colombia after 2012.

As explained in Koske et al. (2015), barriers to entrepreneurship are measured using licenses and permits, communication, and simplification of rules and procedures. Administrative burdens on startups are measured using administrative burdens of corporations and barriers to foreign direct investment (FDI). The aggregate index, which OECD refers to as overall restrictiveness, combines all three of these dimensions. Overall, Colombian restrictions exceed not only the ones in the US but also the ones for the average OECD country; the most striking differences occur with regard to the complexity of regulatory procedures and the administrative burdens placed upon startups. This restrictiveness in business making (a distinctive feature of the Colombian economy) reveals itself in indexes such as the cost of doing business indicator in the OECD. This cost is 14% of the per capita income in Colombia, but only 1.1% of the US per capita income (World Bank 2018).

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4 Analyzing labor market flows in Colombia and the United States by firm’s size, age, and economic sector

4.1 Firm size

A subset of the literature on labor flows, which focuses on understanding the role of firm size and age on labor dynamics, can be traced to the seminal paper by Birch (1981). From a more theoretical viewpoint, this literature has focused on explaining why Gibrat’s Law, the proposition that firm growth is independent of size, does not hold (Ayyagari et al. 2014). In this section, we focus on flow measures by firm size. Following Davis et al. (1996b) to avoid the problem of size distribution fallacy and the regression to the mean bias or regression fallacy, we use the annual average size definition to categorize firm size (i.e., we define firm size as the annual moving average of the employment level observed for the firm during the previous four quarters). In their comparison of size definitions, De Wit and De Kok (2014) show that the average size definition offers similar results to the dynamic classification and that both definitions are immune to regression to the mean bias. Their finding explains why the metric of average size definition is broadly used in the literature (Davis et al. 1996b; Neumark et al. 2011). For the United States, the QWI defines firm size as the sum of all workers employed at each establishment in the firm on March 12 of the previous year.

Table 5 in Appendix presents a short description of the distribution of firms and employment across size categories for the United States and Colombia. We found the distribution of employment across firms to be skewed in both countries. For example, around 38.6% of total employment in Colombia belongs to firms with more than 500 employees, while in the United States this proportion is even higher (50.3% of total employment). For small firms of 2 to 19 employees, the proportion of employment in both countries is very similar (around 19% of total employment).

Table 6 and Figs. 8 and 9 in Appendix present the dynamics of worker and job flows in Colombia for the period of January 2009 to September 2017 and in the US for the period of January 2009 to March 2017. We observed that worker flows in both countries decrease across firm size, more remarkably in Colombia for firms with more than 50 employees. Furthermore, although both countries present an increasing trend in their worker flows, the worker reallocation rate (WR) is on average 10 pp higher in United States than Colombia. This difference is even larger for small firms of 2 to 19 employees (around 17 pp). This difference in the WR between Colombia and the United States might be explained by the strict employment regulation in Colombia, which can have an important effect upon small firms. Bassanini and Garnero (2013) and Bottasso et al. (2017) have found evidence among developed economies that worker reallocation is reduced by strict regulations; Bartelsman et al. (2009) have found evidence of strong effects for small firms in particular.

When we compared the dynamics of the job flows between the two countries, we found that job reallocation rate (JR) also decreases across firm size and that this trend is very stable across time in both countries. One interesting feature of the JR is that this rate in Colombia is higher compared to the United States (around 6 pp), especially for small firms of 2 to 19 employees, whereas firms with more than 500 employees present similar JR rates. Therefore, even in Colombia, where non-wage labor costs and minimum wage are higher than in the US, the job creation (JC) rate is significant, especially for firms with fewer than 50 employees.

Evidence that job creation in countries with less flexible labor markets is comparable to or even higher than in the US has been reported previously in the literature. Blanchard and Portugal (2001) find that annual job creation and destruction are actually higher in Portugal than in the US. This result is in line with other studies of European Union countries which have found that annual job creation and destruction often appear to be similar or even larger in European countries than in the US (Bertola and Rogerson 1997).

As discussed in Section 2, total churning is defined as the difference between worker reallocation and job reallocation \[ CH_t ≡ WR_t − JR_t \]. Figure 5 presents churning rate dynamics for Colombia and the United
States. In general, both countries present an increasing churning rate across time for all firms’ size categories, with the exception of firms with more than 500 employees in Colombia.

Average churning rates are also summarized in Table 1. We found an increasing churning rate (CH) across the firm size categories for Colombia but we did not find a clear relationship with churning rate in the US. Column 4 of Table 1 presents the ratio between churning and worker reallocation (CH/WR) suggested by Burgess et al. (2000); these measures imply that in the US, 73% of worker reallocation is explained by churning, whereas in Colombia this measure is around 50%. Moreover, contrary to the US, larger firms in Colombia (more than 500 employees) present the highest CH. These results imply that in Colombia, strict regulation, high minimum wage, and high non-wage labor costs, among other factors, may have a significant effect on worker reallocation—especially for small firms. Larger firms, which are more able to afford the high costs imposed by strict regulation, might implement more rotation in their hiring and separation strategies.

The last column of Table 1 presents the net change in employment ($\Delta E = H - S = JC - JD$). These results show that for both the United States and Colombia, small firms (2 to 19 employees) have a higher employment growth rate compared to the large firms, while firms with more than 500 employees present the lowest employment growth. (Note that small firms might have higher creation rates because of their relatively small size). However, when we compare job creation flows as a proportion of the total job creation in each economy, we found that small firms (between 2 and 19 employees) create 35.7%, while firms with more than 500 employees create just 19% (see Table 5 in Appendix).

![Fig. 5 Churning rates by size: Colombia and United States. 2009–2017 (quarterly). Sources: PILA and QWI; authors’ calculations, seasonally adjusted, and moving average order three](image)

Table 1 Churning by firm size

| Number of employees | WR   | JR   | CH   | CH/WR | $\Delta E/E$ |
|---------------------|------|------|------|-------|--------------|
| **Panel A: Colombia** |      |      |      |       |              |
| 2 to 19             | 35.54| 27.92| 7.61 | 0.21  | 2.79         |
| 20 to 49            | 36.89| 22.62| 14.28| 0.39  | 2.30         |
| 50 to 249           | 33.28| 16.49| 16.78| 0.50  | 1.53         |
| 250 to 499          | 29.08| 12.02| 17.06| 0.59  | 0.79         |
| 500 and more        | 26.45| 7.99 | 18.46| 0.70  | 1.01         |
| All                 | 31.09| 15.77| 15.33| 0.51  | 1.60         |
| **Panel B: United States** |      |      |      |       |              |
| 2 to 19             | 53.03| 21.40| 31.62| 0.60  | 2.17         |
| 20 to 49            | 47.51| 13.39| 34.12| 0.73  | 0.79         |
| 50 to 249           | 43.81| 10.88| 32.93| 0.75  | 0.70         |
| 250 to 499          | 43.38| 9.92 | 33.53| 0.77  | 0.75         |
| 500 and more        | 35.80| 7.83 | 27.97| 0.78  | 0.44         |
| All                 | 41.79| 11.53| 30.28| 0.73  | 0.86         |

Table entries are means of quarterly values in time interval, seasonally adjusted
Sources: PILA and QWI; authors’ calculations

25 In 2013, Colombia implemented a tax reform, which importantly reduces payroll taxes. This reform affected all firms with at least two employees; nevertheless, there is some evidence that the reform had the highest impact on the largest firms (Morales and Medina 2017). The reduction on churning in firms with 500 employees or more from 2015 on might be a delayed effect of the reform. As we discuss in Section 4 of this paper, the reform plausibly had a positive impact on WR and JR, but higher of the former than the later; in situations like these, churning reductions are expected, since churning is the difference between WR and JR.
We also found evidence that supports Birch’s (1981) finding that the smallest firms present higher employment growth rates. Small firms in the US account for 36% of total job creation, which is almost the same as the percentage of jobs created by the largest firms.

4.2 Firm age

In this section, we present the dynamics of labor flows of Colombia and United States conditional to firm age. To be able to compare these results, we follow the age categories utilized in QWI: 0 to 1 years, 2 to 3 years, 4 to 5 years, and more than 6 years. Table 7 in Appendix presents a short description of the distribution of firms and employment across age categories. For both countries, we found that more than 80% of the total employment belongs to firms that are 6 or more years old.

Table 8 and Figs. 10 and 11 in Appendix present the dynamics of the worker-and-job flows for Colombia and the United States. In both countries, we observed that worker flows and job flows decrease with firm age. Moreover, there is an important difference in WR and JR rates for younger firms (0 to 1 years old) in Colombia compared to the same group in the United States (−30 pp and 28 pp respectively). For older firms (more than 6 years), WR rates are 10 pp higher in the US, whereas JR rates remain very similar for both countries.

Table 2 Churning by firm age

| Firm age    | WR   | JR   | CH   | CH/WR | ΔE/E |
|-------------|------|------|------|-------|------|
| Panel A: Colombia |      |      |      |       |      |
| 0 to 1      | 77.06| 66.47| 10.59| 0.14  | 4.57 |
| 2 to 3      | 58.07| 40.63| 17.44| 0.31  | 10.33|
| 4 to 5      | 50.85| 33.50| 17.35| 0.36  | 10.31|
| 6 or more   | 26.40| 11.35| 15.05| 0.57  | 1.46 |
| All         | 30.33| 15.05| 15.28| 0.54  | 2.26 |
| Panel B: United States |      |      |      |       |      |
| 0 to 1      | 107.51| 38.36| 69.15| 0.64  | 13.40|
| 2 to 3      | 71.29 | 21.06| 50.23| 0.70  | 1.47 |
| 4 to 5      | 61.71 | 18.10| 43.61| 0.71  | 1.07 |
| 6 and more  | 37.46 | 9.85 | 27.61| 0.74  | 0.48 |
| All         | 41.88 | 11.49| 30.39| 0.73  | 0.95 |

Sources: PILA and QWI; authors’ calculations

Table entries are means of quarterly values in time interval, seasonally adjusted. Due to data limitations for Colombia, 12% of firms were excluded. These correspond to firms whose age could not be calculated.

Figure 6 presents churning rate dynamics for both countries across firm ages. In general, we find an increasing trend across time. Average churning rates are also summarized in Table 2. For Colombia, we did not find any relationship between churning rate (CH) and firm age, but for the United States there is a clear negative relationship.

The last column of Table 2 presents the net change in employment (ΔE = H − S = JC − JD). These results show that for Colombia, firms that present the highest employment growth rate are those between 2 to 5 years old; not the youngest, as is the case for the US (Haltiwanger et al. 2013; Lawless 2014) and other developed economies (see Heyman et al. 2018, for Sweden). Nevertheless, relatively young Colombian firms (2 to 3 years old) have the better performance in terms of employment growth. That being said, Colombian growth dynamics seem not to be explained by firm age. Finally, one common result is the low employment growth rate for the oldest firms in both countries (6 years and older).

4.3 Economic sector

This section presents the dynamic of labor flows for Colombia and United States across economic sectors. To be able to compare the two economies, we use the sectors presented by QWI and aggregate the information from PILA in the following categories:

- Agriculture and Mining
- Manufacturing
- Construction
- Transportation and Trade
- Private Services

Table 9 in Appendix presents employment shares of each sector in Colombia and the United States. In Colombia, the Agriculture sector represents 10.5% of the total employment, while in the United States this sector represents just 2.7%. This difference is important because the Agriculture sector in Colombia is mostly rural with low technology, which is typical for a developing country. Another remarkable difference appears in the Transportation and Trade sector and the Private Services sector.

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26 To build these groups, we aggregated some sectors as follows: Agriculture and Mining includes agriculture, forestry, fishing, and mining; Transportation and Trade includes transportation, warehousing, information, trade, hotels, and food; Private Services includes real state, rental, leasing, and finance. For Colombia, we referred to the Clasificación Industrial Internacional Uniforme (Spanish acronym: CIIU), also known as the International Standard Industrial Classification (ISIC). For the US we referred to the QWI, which uses the industry categories defined by the North American Industry Classification System (NAICS).
sector, which in United States represent 56% and 13% of total employment, respectively, while in Colombia these sectors respectively represent 23.5% and 46%.

Table 10 and Figs. 12 and 13 in Appendix present the dynamics of worker and job flows for Colombia and the United States according to economic sectors. In both countries, we observe an important heterogeneity among sectors. However, excluding Agriculture and Mining, we find that in both countries Construction is the sector with the highest WR and JR rates, while Manufacture is the sector with the lowest rates. These results were also found by Davis et al. (2006), who compared worker and job flows between the construction and manufacturing sectors in the United States and found that “job flow rates are three times higher in construction than in manufacturing” (p. 7). Moreover, Lazear and McCue remark that “manufacturing has the lowest hires and separations rates in each data source” (2017, p. 21).

However, there is an import difference in the levels of labor flows by sector between the two countries, which is evident when comparing churning rates per sector (see Fig. 7). For example, the churning rate for Construction is around 19% in Colombia but around 40% in the United States, while for Manufacture, the difference is less marked: 13% for the United States and 9.5% for Colombia (see Table 3). For Colombia, there seems to be a convergence in the churning rate for the Agriculture, Manufacture, and Transportation sectors. Private Services also indicates an important difference.
between countries. In Colombia, this sector presents the second highest churning rate (similar to Construction); in the US, it presents the lowest level, on par with Manufacture.

Finally, Table 3 presents the employment growth rate across economic sectors for both countries. Again excluding Agriculture and Mining, in both countries the sector with the highest employment growth is Construction (3.02% in Colombia, 1.20% in the United States); coincidentally, Construction also has the highest churning rate in both countries. This sector is followed by Transportation and Trade, with an employment growth rate of 1.9% in Colombia and 0.89% in the United States. The sector with the lowest employment growth rate in Colombia is Agriculture and Mining (1.13%); in the United States, it is Manufacture (0.10%).

Table 3 Churning by economic sectors

| Sector                        | WR  | JR  | CH  | CH/WR | ΔE/E |
|-------------------------------|-----|-----|-----|-------|------|
| Panel A: Colombia             |     |     |     |       |      |
| Agriculture and Mining        | 28.18 | 16.16 | 12.02 | 0.43 | 1.13 |
| Manufacture                   | 22.55 | 13.07 | 9.48  | 0.42 | 1.69 |
| Construction                  | 48.99 | 30.13 | 18.94 | 0.38 | 3.02 |
| Transportation and Trade      | 25.89 | 13.78 | 12.12 | 0.47 | 1.90 |
| Private Services              | 34.16 | 15.28 | 18.88 | 0.55 | 1.42 |
| All                           | 31.00 | 15.75 | 15.29 | 0.49 | 1.64 |
| Panel B: United States        |     |     |     |       |      |
| Agriculture and Mining        | 101.15 | 28.27 | 72.88 | 0.72 | 1.26 |
| Manufacture                   | 19.36 | 6.57  | 12.79 | 0.66 | 0.10 |
| Construction                  | 60.23 | 21.07 | 39.16 | 0.65 | 1.20 |
| Transportation and Trade      | 46.93 | 11.67 | 35.25 | 0.75 | 0.89 |
| Private Services              | 22.61 | 7.94  | 14.67 | 0.65 | 0.45 |
| All                           | 41.00 | 11.46 | 29.54 | 0.71 | 0.72 |

Tables entries are means of quarterly values in the time interval, seasonally adjusted
Sources: PILA and QWI; authors’ calculations

The analyses presented in previous sections; they allow us to obtain a measure of the correlation between characteristics and fluidity measures while controlling for other covariates, time effects, seasonal fixed effects, and firm fixed effects. The aim of this study is not finding causal effects in our analysis; our goal is in a comprehensive manner, pinpointing relevant determinants of the labor flows. The identification of causal effects remains as an open question for future research; nevertheless, we control for possible endogeneity bias, by using fixed effects, lagged variables, or in some cases, using variables that assumed as exogenous in the literature.

Taking advantage of our data, we estimated panel fixed effects regression using firm data for the case of Colombia. The estimated equations are of the form:

$$ f_{jt} = \alpha + x'_k \beta + r'_p \phi + \gamma_j + \delta_t + \epsilon_{jt} $$

(2)

where the dependent variable $f_{jt}$ represents the fluidity measures considered in this paper: worker re-allocation (WR), job re-allocation (JR), and churning.

27 Because QWI data does not give access to information at the establishment level, we were unable to perform a similar regression for the US case.
rates (CH). In addition, we estimated regressions with the net employment growth rate as the dependent variable. All variables in the regressions were generated on a quarterly basis at the firm level. The vector $x_{it}$ contains firm characteristics such as size. The vector $r_{it}$ contains characteristics that account for the labor market rigidities faced by firms; $\gamma_i$ is a firm-specific fixed effect; and $\delta_t$ stands for time fixed effects. In addition, $e_{it}$ is an error term with zero mean and a variance constant. The standard errors are clustered at firm level.28

The first variable we include as measure of institutional rigidities is the minimum wage compliance cost (MWC). There is a long tradition of studies, which use this variable to identify the effects of variation of minimum wage on labor outcomes (Card and Krueger 1994; Giuliano 2013; Hirsch et al. 2015). The MWC represents the proportional extra-cost of comply with increments in minimum wage assuming workers and hours stay fixed after the change:

$$\text{MWC}_{it} = 1 + \left( \frac{\sum (W_{i,j} < M_{i,j}) M_{i,j} - h_{i,j-1}}{\sum (W_{i,j} < M_{i,j}) W_{i,j} - h_{i,j-1}} \right)$$

where $M$ represents the minimum wage, $W$ stands for wages, and $h$ for worked hours; the parenthetical term is summed over the workers for whom minimum wage is binding (i.e., $W_{i,j} < M_{i,j}$). Time is indexed by $y$ because changes in the minimum are annual; $i$ and $j$ subscripts stand for individuals and firms. Since firms have null control over changes in minimum wages, literature assumes MWC is an exogenous variable; nevertheless, the results should be interpreted with caution.29

The second variable we use as measure of institutional rigidities is a proxy for firms’ payroll taxes. We construct the variable as the wage-tax tariff multiplied by the lagged payroll:30

$$W_{tax} = \tau_{it} (\sum W_{i,j,t-1} \epsilon_{i,j,t-1})$$

In May of 2013, Colombia implemented a reform of the tax code, which reduced payroll taxes; the new tax code reduced payroll taxes on wages by 13.5 percentage points for workers earning up to ten times the minimum wage (Morales and Medina 2017). To consider this policy changes in the estimation, we include a dummy variable that equals one after second quarter of 2013, and an interaction between this dummy and $W_{tax}$. It is not the purpose of this study to evaluate the impact of the tax reform, or any other specific policy; we include this set of variables as controls, measuring another institutional rigidity in the Colombian labor market. Nevertheless, our results are in line with the positive effect on employment that have been identified in the literature (Bernal et al. 2017; Fernández and Villar 2017; Kugler et al. 2017; Morales and Medina 2017).

Table 4 shows the results of the estimation of Eq. 2 for reallocation rates, churning, and net employment growth rate as dependent variables. We divided the sample to analyze the heterogeneity by economic sectors, and we report the estimation results for the whole sample as well; we will focus in the interpretation of the later. For ease in interpretation of the coefficients, the dependent variable $f_{jt}$ and all variables in vector $x_{it}$ are standardized; therefore, marginal effects are interpreted as changes of $f_{jt}$, expressed in terms of standard deviations, as a result of an increment in one standard deviation of the independent variable.

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28 For firm size, we used the annual average measure, which presents variation across time.

29 We compute for each month MWC, this the extra-cost of the payroll due to increments in the minimum wage, keeping hours fixed; in the regressions, we average the MWC by year; nevertheless, results do not change if we use the monthly MWC, or the average of the last quarter of the year. In additional exercises, we use the ratio of the real minimum wage to median wage, instead of the MWC as a measure of rigidity; results are similar to the ones obtained with the MWC. These results will be provided by request.

30 We use the lag of the payroll because for some of our independent variables, as the employment growth rate, using payroll contemporaneously would cause a problem of reverse causality; this because the contemporaneous employment would show up in the dependent and independent variables.
| Variable                                         | Overall | A&M     | Manufacture | Construction | T&T       | Private S | Overall | A&M     | Manufacture | Construction | T&T       | Private S | Overall | A&M     | Manufacture | Construction | T&T       | Private S |
|-------------------------------------------------|---------|---------|-------------|--------------|-----------|-----------|---------|---------|-------------|--------------|-----------|-----------|---------|---------|-------------|--------------|-----------|-----------|
| Employment                                      | -0.052*** (0.004) | -0.045*** (0.001) | -0.082*** (0.009) | -0.037*** (0.006) | -0.049*** (0.006) | -0.047*** (0.004) | 0.078*** (0.005) | -0.073*** (0.010) | -0.101*** (0.010) | -0.058*** (0.009) | -0.078*** (0.007) | -0.071*** (0.005) |
| Unemployment rate                              | -0.009*** (0.001) | -0.013*** (0.004) | -0.010*** (0.003) | -0.007* (0.004) | -0.009*** (0.002) | -0.008*** (0.002) | 0.005*** (0.001) | -0.006* (0.004) | -0.004 (0.003) | 0.002 (0.004) | -0.005*** (0.003) | -0.007*** (0.002) |
| Percentage of men in the payroll                | 0.007*** (0.002) | -0.022*** (0.005) | -0.015*** (0.005) | 0.077*** (0.004) | -0.007*** (0.002) | 0.018*** (0.002) | 0.009*** (0.001) | -0.034*** (0.005) | -0.016*** (0.004) | 0.022*** (0.004) | -0.015*** (0.004) | -0.006*** (0.002) |
| Percentage of employees under 25 years          | 0.045*** (0.001) | 0.042*** (0.003) | 0.040*** (0.002) | 0.047*** (0.003) | 0.047*** (0.001) | 0.044*** (0.002) | 0.014*** (0.001) | 0.014*** (0.001) | 0.016*** (0.002) | 0.006*** (0.002) | 0.015*** (0.001) | 0.015*** (0.001) |
| Min. wage compliance costs                      | -0.004*** (0.001) | -0.001 (0.003) | -0.004 (0.003) | -0.009*** (0.002) | -0.001 (0.002) | -0.006*** (0.001) | 0.006*** (0.001) | -0.003 (0.001) | -0.009*** (0.001) | 0.002 (0.002) | -0.007*** (0.001) | -0.008*** (0.001) |
| Payroll taxes                                   | -0.016*** (0.006) | -0.032*** (0.006) | -0.052*** (0.011) | -0.013*** (0.005) | -0.041*** (0.005) | -0.014*** (0.005) | 0.022*** (0.005) | -0.034*** (0.005) | -0.057*** (0.005) | -0.033*** (0.005) | -0.046*** (0.005) | -0.021*** (0.005) |
| $1[t≥ 2013q2]$                                 | 0.036*** (0.003) | 0.077*** (0.003) | -0.034*** (0.011) | -0.096*** (0.015) | 0.058*** (0.006) | 0.044*** (0.006) | 0.100*** (0.003) | 0.134*** (0.011) | 0.09 (0.01) | 0.053*** (0.006) | 0.11*** (0.005) | 0.108*** (0.005) |
| Payroll taxes*1[t≥ 2013q2]                      | 0.005* (0.003) | -0.004 (0.004) | 0.001 (0.004) | 0.003 (0.004) | -0.001 (0.004) | 0.007** (0.004) | 0.007** (0.003) | -0.003 (0.003) | -0.000 (0.002) | 0.008 (0.005) | 0.000 (0.004) | 0.011*** (0.003) |
| Constant                                        | -0.164*** (0.003) | -0.192*** (0.009) | -0.110*** (0.009) | -0.062*** (0.013) | -0.164*** (0.005) | -0.171*** (0.005) | 0.251*** (0.006) | -0.282*** (0.005) | -0.176*** (0.005) | -0.244*** (0.005) | -0.240*** (0.004) | -0.257*** (0.003) |
| Observations                                    | 4,813,923 | 452,885 | 596,848 | 383,766 | 1,526,732 | 1,843,400 | 4,813,923 | 452,885 | 596,848 | 383,766 | 1,526,732 | 1,843,400 |
| R-squared within                                 | 0.007 | 0.009 | 0.011 | 0.007 | 0.008 | 0.007 | 0.008 | 0.011 | 0.013 | 0.005 | 0.009 | 0.008 |

**Table 4**: Regression results of estimation with firms' data.
The regression results for job/worker reallocation and churning rates support the patterns outlined in the previous sections. After we controlled for different covariates and unobserved firm-specific fixed effects, we still found a negative and significant correlation between firm size and worker/job reallocation rates. This correlation held true for estimations on the whole sample as well as for all particular sector subsamples. Furthermore, the churning rate presents a positive and significant relationship with plant size, which is consistent with the evidence from the unconditional means analysis (Table 1). Finally, we found a negative and significant relationship between firm size and net employment growth rate. This result is consistent with results presented in Section 4.

The magnitude of the effect of firm size on labor market fluidity is not negligible; WR and JR rates decrease 0.05 and 0.08 standard deviations, respectively, per standard deviation of increment in firm size; this implies marginal effects of 1.6 and 2.9 percentage points (pp). Churning rate increases 0.04 standard deviations (0.4 pp) per standard deviation of increment in firm size. The effect of firm size on net employment growth rate is negative. Net growth rate decreases 0.09 standard deviations (3 pp) per standard deviation of increment in firm size. Such evidence is consistent with what we observe in Table 1, in which the growth rate decreases with average plant size. These findings support the hypothesis that, relative to their size, small firms create more jobs.

Another important finding from these regressions is the effect of increments in the minimum wage on fluidity rates. Minimum wage increments have a negative and significant effect on WR and JR. In addition, minimum wage has a significant negative relation with net employment growth rates. Increments of one standard deviation in MWC are associated with reductions on the net employment growth rate by 0.03 standard deviations (1 pp). Even though our results not necessarily imply a causal relation, we argue that the variable we use to measure minimum wage increments, MWC, is likely a source of exogenous variation from the standpoint of an individual firm (i.e., is not correlated with the regression error). The reason is that an individual firm might not influence the determination of changes in the

| Table 4 (continued) |
|---------------------|
| Variable            | Overall | A&M       | Manufacture | Construction | T&T       | Private S  | Overall | A&M       | Manufacture | Construction | T&T       | Private S  |
| Payroll taxes*1{t ≥ 2013q2} | −0.006*** (0.001) | 0.000*** (0.002) | −0.008*** (0.002) | 0.129*** (0.02) | 0.140*** (0.03) | 0.095*** (0.04) | 0.004*** (0.002) | 0.003*** (0.002) | 0.006*** (0.002) | 0.007*** (0.002) | 0.002*** (0.002) | 0.005*** (0.002) | 0.007*** (0.002) | 0.008*** (0.002) |
| Constant            | 0.126*** (0.014) | 0.147*** (0.016) | 0.363*** (0.024) | 0.066*** (0.002) | 0.046*** (0.002) | 0.038*** (0.002) | 0.006*** (0.002) | 0.007*** (0.002) | 0.008*** (0.002) | 0.007*** (0.002) | 0.006*** (0.002) | 0.007*** (0.002) | 0.008*** (0.002) |
| Observations        | 4,813,923 | 452,885 | 596,848 | 383,766 | 1,526,732 | 1,843,400 | 4,813,923 | 452,885 | 596,848 | 383,766 | 1,526,732 | 1,843,400 |
| R-squared within    | 0.004 | 0.006 | 0.004 | 0.004 | 0.004 | 0.004 | 0.004 | 0.006 | 0.004 | 0.004 | 0.004 | 0.004 |

Standard errors in parentheses. *p < 0.1; **p < 0.05; ***p < 0.01. All robust standard errors are computed clustered by firms. A&M stands for Agriculture and Mining; T&T stands for Technology and Trade; Private S stands for Private Services. Employment corresponds to the number of employees of a firm in a given month. All regressions include time period fixed effects but coefficients are not reported for the sake of brevity. All regressions are estimated using fixed effects panel regressions methodology.
minimum wage policy or anticipate those changes with precision.²³

In regard to our second measure of institutional rigidities, we find that payroll taxes are negatively correlated with worker and job reallocation. Since the effect of payroll taxes is more sizeable on JR, and churning is the difference between WR and JR, the effect of payroll taxes on CH turns out to be positive. In both cases, WR and JR, the interaction of payroll taxes with the dummy post tax reform is positive and significant; therefore, the negative effect of payroll taxes on worker and job reallocations decreases after a reduction in the tax rate policy. We find a similar result in the case of net employment growth; an increase in one standard deviation in payroll taxes reduces employment growth in 0.014 standard deviations, which is equivalent to a reduction of 0.5 pp in the growth rate; in addition, this negative effect decreases after the tax reform implemented in 2013.

Estimations include the unemployment rate to control for the economic cycle. We found a negative and significant coefficient of the unemployment rate in the regressions for JR and WR; this suggests a pro-cyclical behavior of these flows, which is consistent with results found by Morales and Medina (2016) for Colombia. In addition, we found a positive and significant relationship between the percentage of the payroll for workers under 25 years old and all reallocation measures and growth employment rates. This result supports the hypothesis presented by Shimer (2001), who finds a positive effect on employment of the share of youths (25 and younger) in the working age population. As explained by Shimer (2001), the more salient the participation of young people in the working-age population, the cheaper the recruitment of new employees is for the firms, because young people are more mobile and therefore more likely to switch jobs. Under such circumstances, firms find that creating jobs in younger labor markets is more profitable and thereby boost job creation and reduce unemployment (Morales and Medina 2016).

Table 4 presents regression results according to economic sector subsamples. In general, the results in each subsample are similar to the ones in the overall sample for all outcomes. Nevertheless, the magnitudes of the marginal effects of employment on all outcomes are usually higher for Manufacturing.²²

6 Final remarks and policy implications

In this paper, we explore and compare, in a harmonized manner, labor market flows in Colombia and the United States and argue that this comparison sheds light on the degree of dynamism of a developing economy such as Colombia, relative to the US market, which is characterized by its high fluidity levels. Within this comparative framework, we test two hypotheses previously explored in the literature about job creation for developed economies: namely, the negative relationships between firm size, and age, with job creation. In regard to firm size, small firms in both labor markets have higher creation and employment growth rates. In addition, the share of jobs created in both countries by these small firms is greater than the share created by medium and very large firms. In regard to firm age, we find that in the US, newborn firms (younger than 1 year) have the highest growth rates; by contrast, the firms in Colombia with the highest growth rates are between 2 and 3 years old. In any case, for both markets, relatively young firms have the better performance in terms of employment growth and, in general, worker flows and job flows decrease with a firm’s age.

As in the US and other developed economies, in Colombia churning rates are positive across the spectrum of employment growth rates. In regard to worker flow rates, we find that during the period between 2009 and 2017, workers’ movements (captured by hiring and separation rates) were substantially higher in the US labor market. Nevertheless,

²³ In Colombia, the minimum wage is determined by a bargaining between economic guilds and unions, where the government is an intermediary. In the case that firms and workers cannot agree, the Government determines the policy.

²² The low within R squared suggests that the within transformation of the covariates explains little of the variation in labor market flows. As noted by Burgess et al. (2000), the idiosyncratic unobserved firm-specific fixed effect is very important in the explanation of labor flows. Those authors explain these results as a consequence of a particular recruiting policy that is persistent and sustainable across time; however, the interesting questions thus raised about optimal recruiting decisions are beyond the scope of this paper.
when we examine job flows, we find that the size of job movements in terms of job destruction and creation rates was slightly larger in the Colombian labor market for the period of study. Because churning is the excess of worker reallocation in relation to job reallocation (see Eq. 1), we conclude that the churning rate in the US labor market is twice that of the Colombian one; for our study period, average churning rate were 29.5% and 15.7% for US and Colombia, respectively. Churning describes the capacity of an economy to mobilize workers across the labor market. We may therefore infer that the US labor market is far more dynamic than the Colombian one and that this is so entirely due to workers’ movements—not because, relative to the size of the market, there is more creation or destruction of jobs in the US. In other words, US workers move from existing positions more easily and more frequently than their Colombian peers do and, in turn, this higher level of movement explains the greater fluidity of the US labor market.

The fluidity gap between the two economies can also be explained by the greater rigidity of Colombian labor market institutions. Although a causal assessment is beyond the scope of this paper, we present some evidence at this regard. The minimum wage in Colombia is relatively high, even compared to the OECD average (Arango and Flórez 2017); the employment protection legislation is also more restrictive than in the US; and finally, in terms of non-wage costs, Colombia has substantially higher non-labor costs than the US. Ample evidence in the literature has already shown that lack of dynamism in labor markets is the result of rigidities caused by economic policies such as minimum wage and strong labor protection legislation, among other factors (Blanchard and Portugal 2001; Boeri and Jimeno 2005; Decker et al. 2014; Gómez-Salvador et al. 2004). Regressions from a panel of Colombian firms reveal that the minimum wages compliance cost and payroll taxes, our measures of labor market rigidities, have a negative correlation with job reallocation, worker reallocation, and employment growth.

Another interesting finding of this study is that churning rate increases with firm size. In both countries, for larger firms, around 70% of worker reallocation is explained by churning flows (CH/WR). In Colombia, this share decreases dramatically for smaller firms, reaching 21% for the smallest ones. These results imply that in Colombia, strict regulations, high minimum wage, and high non-wage labor costs, among other factors, may have significant effects upon the reallocation of workers—especially for small firms. Larger firms, which are more able to afford the high costs imposed by regulation, might implement more rotation in their hiring and separation strategies. These results are similar to Burgess et al. (2000), who find that bigger firms are constantly reevaluating the value of their worker–job match, improving the quality of their workforce, and/or reconfiguring their skill mix.

In this paper, we have discussed how rigid institutions might reduce labor market fluidity. Literature on the topic provides evidence of a relationship between fluidity and better labor market performance (Davis and Haltiwanger 2014; Molloy et al. 2016; L. Morales and Medina 2019); this evidence indicates that plausible beneficial effects of policies that enhance flexibility might be expected. The comparison between US and Colombian labor market fluidity vs. their respective institutions enriches the discussion on the plausible unwanted consequences of rigid institutions.

Such discussion is vibrant on developing economies in the Latin American region, where recent policy changes are expected to increase labor market flexibility. In 2012, Mexico implemented a reform that introduced more flexible labor contracts. In 2016, Ecuador introduced a reform that subsidized contracts for young workers. In 2012, Colombia implemented fiscal reform that reduced payroll taxes, which might have served the purpose of increasing flexibility by reducing non-wage labor costs (Arango and Flórez 2018; Morales and Medina 2016). For the specific case of Colombia, additional policies such as simplification of rules and procedures and reduction of the administrative burdens on start-ups would also help introduce more fluidity to the labor market.
## Firms size

### Table 5  Shares by firm size

| Number of employees | H   | S   | JC  | JD  | Employment | Firms |
|---------------------|-----|-----|-----|-----|------------|-------|
| Panel A: Colombia   |     |     |     |     |            |       |
| 2 to 19             | 23.61 | 22.39 | 35.72 | 35.90 | 19.22 | 85.52 |
| 20 to 49            | 12.57 | 12.31 | 15.07 | 15.05 | 10.38 | 8.14  |
| 50 to 249           | 22.74 | 22.95 | 22.13 | 22.47 | 21.52 | 5.00  |
| 250 to 499          | 9.26  | 9.68  | 7.45  | 7.97  | 10.26 | 0.72  |
| 500 or more         | 31.82 | 32.66 | 19.62 | 18.61 | 38.63 | 0.62  |
| Panel B: United States |     |     |     |     |            |       |
| 2 to 19             | 24.60 | 23.57 | 36.07 | 34.26 | 18.95 | n.a   |
| 20 to 49            | 10.91 | 10.98 | 11.03 | 11.38 | 9.63  | n.a   |
| 50 to 249           | 16.04 | 16.16 | 14.37 | 14.64 | 15.37 | n.a   |
| 250 to 499          | 5.86  | 5.88  | 4.89  | 4.86  | 5.67  | n.a   |
| 500 or more         | 42.76 | 43.41 | 33.64 | 34.85 | 50.39 | n.a   |

Tables entries are means of quarterly values in time interval, seasonal adjusted. PILA and QWI; authors’ calculations

### Table 6  Job and worker flows by firm size

| Number of employees | Worker flows | Job flows |
|---------------------|--------------|-----------|
|                     | H  | S   | WR  | JC  | JD  | JR  |
| Panel A: Colombia   |    |     |     |     |     |     |
| 2 to 19             | 19.16 | 16.37 | 35.54 | 15.36 | 12.56 | 27.92 |
| 20 to 49            | 19.58 | 17.32 | 36.89 | 12.46 | 10.16 | 22.62 |
| 50 to 249           | 17.41 | 15.87 | 33.28 | 9.01  | 7.48  | 16.49 |
| 250 to 499          | 14.95 | 14.13 | 29.08 | 6.41  | 5.61  | 12.02 |
| 500 or more         | 13.73 | 12.72 | 26.45 | 4.50  | 3.49  | 7.99  |
| All                 | 16.34 | 14.75 | 31.09 | 8.68  | 7.08  | 15.77 |
| Panel B: United States |    |     |     |     |     |     |
| 2 to 19             | 27.60 | 25.43 | 53.03 | 11.79 | 9.62  | 21.40 |
| 20 to 49            | 24.15 | 23.36 | 47.51 | 7.09  | 6.30  | 13.39 |
| 50 to 249           | 22.26 | 21.55 | 43.81 | 5.79  | 5.09  | 10.88 |
| 250 to 499          | 22.15 | 21.28 | 43.38 | 5.34  | 4.59  | 9.92  |
| 500 or more         | 18.13 | 17.68 | 35.80 | 4.14  | 3.69  | 7.83  |
| All                 | 21.33 | 20.49 | 41.79 | 6.19  | 5.33  | 11.53 |

Tables entries are means of quarterly values in time interval, seasonal adjusted. Source: PILA and QWI; authors’ calculations
Fig. 8 Worker and Job flows in Colombia (quarterly data). a Worker flows. b Job flows
Fig. 9 Worker and job flows in United States (quarterly data). a Worker flows. b Job flows
Table 7  Shares by firm age

| Firm age | $H$   | $S$   | JC    | JD    | Employment | Firms |
|----------|-------|-------|-------|-------|------------|-------|
| Panel A: Colombia  |       |       |       |       |            |       |
| 0 to 1   | 6.25  | 6.20  | 10.31 | 11.68 | 1.94       | 8.13  |
| 2 to 3   | 9.80  | 8.21  | 13.29 | 10.80 | 4.89       | 12.81 |
| 4 to 5   | 9.51  | 8.18  | 11.80 | 9.86  | 5.89       | 12.67 |
| 6 and more | 74.44 | 77.41 | 64.60 | 67.66 | 87.28      | 66.39 |

Panel B: United States  |     |     | |     |            |       |
| 0 to 1   | 9.20  | 7.50  | 13.53 | 7.71  | 3.25       | n.a   |
| 2 to 3   | 6.25  | 6.28  | 6.67  | 6.86  | 3.68       | n.a   |
| 4 to 5   | 5.46  | 5.52  | 5.74  | 6.02  | 3.72       | n.a   |
| 6 and more | 79.10 | 80.71 | 74.07 | 79.41 | 89.36      | n.a   |

Tables entries are means of quarterly values in time interval, seasonal adjusted.
Source: PILA and QWI; authors’ calculations

Table 8  Job and worker flows by firm age

| Firm age | Worker flows | Job flows |
|----------|--------------|-----------|
|          | $H$          | $S$       | WR       | JC    | JD    | JR    |
| Panel A: Colombia  |     |     |     |     |     |       |
| 0 to 1   | 40.83        | 36.23     | 77.06    | 35.52 | 30.95 | 66.47 |
| 2 to 3   | 34.23        | 23.84     | 58.07    | 25.48 | 15.15 | 40.63 |
| 4 to 5   | 30.62        | 20.23     | 50.85    | 21.90 | 11.59 | 33.50 |
| 6 and more | 13.91 | 12.49 | 26.40    | 6.40  | 4.94  | 11.35 |
| All      | 16.29        | 14.04     | 30.33    | 8.65  | 6.39  | 15.05 |

Panel B: United States  |     |     |     |     |     |       |
| 0 to 1   | 60.44        | 47.06     | 107.51   | 25.88 | 12.48 | 38.36 |
| 2 to 3   | 36.39        | 34.90     | 71.29    | 11.27 | 9.79  | 21.06 |
| 4 to 5   | 31.39        | 30.32     | 61.71    | 9.58  | 8.51  | 18.10 |
| 6 and more | 18.97 | 18.49 | 37.46    | 5.16  | 4.69  | 9.85  |
| All      | 21.42        | 20.46     | 41.88    | 6.22  | 5.27  | 11.49 |

Tables entries are means of quarterly values in time interval, seasonal adjusted. Due to data limitations for Colombia, 12% of firms were excluded. These correspond to the firms to which the age could not be calculated.
Source: PILA and QWI; authors’ calculations
Fig. 10 Worker and job flows in Colombia (quarterly data). a Worker flows. b Job flows.
Fig. 11  Worker and job flows in United States (quarterly data).  

a  Worker flows.  
b  Job flows
### Economic sectors

#### Table 9  Shares by economic sector

| Sector                  | $H$  | $S$  | JC  | JD  | Employment | Firms |
|-------------------------|------|------|-----|-----|------------|-------|
| **Panel A: Colombia**   |      |      |     |     |            |       |
| Agriculture and Mining  | 9.50 | 9.72 | 10.50| 11.27| 10.50      | 9.46  |
| Manufacture             | 9.93 | 9.48 | 11.39| 10.81| 13.43      | 11.30 |
| Construction            | 10.85| 10.60| 12.90| 13.12| 6.62       | 7.27  |
| Transportation and Trade| 19.97| 19.11| 21.11| 19.78| 23.48      | 29.51 |
| Private services        | 50.08| 51.08| 44.10| 45.02| 45.97      | 42.45 |
| **Panel B: United States** |  |      |     |     |            |       |
| Agriculture and Mining  | 6.58 | 6.61 | 6.47 | 6.73 | 2.67       | n.a   |
| Manufacture             | 9.30 | 9.54 | 10.91| 11.83| 19.93      | n.a   |
| Construction            | 13.03| 12.98| 16.14| 16.25| 8.85       | n.a   |
| Transportation and Trade| 64.14| 63.96| 57.84| 56.46| 56.02      | n.a   |
| Private services        | 6.95 | 6.92 | 8.64 | 8.74 | 12.53      | n.a   |

Tables entries are means of quarterly values in time interval, seasonal adjusted

Source: PILA and QWI; authors’ calculations

#### Table 10  Job and worker flows by economic sectors

| Sector                  | Worker flows | Job flows |
|-------------------------|--------------|-----------|
|                         | $H$  | $S$  | WR  | JC  | JD  | JR  |
| **Panel A: Colombia**   |      |      |     |     |     |     |
| Agriculture and Mining  | 14.64| 13.54| 28.18| 8.65| 7.52| 16.16|
| Manufacture             | 12.10| 10.44| 22.55| 7.38| 5.69| 13.07|
| Construction            | 25.95| 23.03| 48.99|16.57|13.56|30.13 |
| Transportation and Trade| 13.88| 12.01| 25.89| 7.84| 5.94| 13.78|
| Private services        | 17.78| 16.38| 34.16| 8.35| 6.93| 15.28|
| All                     | 16.30| 14.73| 31.00| 8.69| 7.06| 15.75|
| **Panel B: United States** |  |      |     |     |     |     |
| Agriculture and Mining  | 51.29| 49.86| 101.15|14.77|13.51|28.27 |
| Manufacture             | 9.73 | 9.62 | 19.36| 3.34| 3.23| 6.57 |
| Construction            | 30.71| 29.52| 60.23|11.13| 9.93|21.07 |
| Transportation and Trade| 23.91| 23.02| 46.93| 6.28| 5.39|11.67 |
| Private services        | 11.53| 11.08| 22.61| 4.19| 3.74| 7.94 |
| All                     | 20.86| 20.14| 41.00| 6.09| 5.37|11.46 |

Tables entries are means of quarterly values in time interval, seasonal adjusted

Source: PILA and QWI; authors’ calculations
Fig. 12 Worker and job flows by economic sectors in Colombia (quarterly data). a Worker flows. b Job flows
Fig. 13  Worker and job flows in United States (quarterly data).  a Worker flows.  b Job flows.
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