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**Strengthening economic resilience to shocks: the role of structural  
policies**

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**Structural policies, worker flows and resilience: evidence for the euro  
area using individual-level micro data<sup>1</sup>**

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## Abstract

Resilience can be defined as the capacity of a country to withstand significant adverse economic shocks by minimising the negative impact of shocks on economic activity. In terms of policies, stringent regulations and institutions may lead to rigidities which inhibit the appropriate response to adverse shocks and thereby amplify output losses. This paper uses individual-level micro data to assess whether structural policies in euro area countries – proxied by indicators of employment protection, product market regulation and centralised collective bargaining – have increased the responsiveness of individual worker flows to changes in economic activity.

Macroeconomic studies suggest that employment-output elasticities in the euro area increased during the recovery from the crisis, especially in those countries that implemented reforms. In this paper, we use micro (individual-level) data from the Eurostat Labour Force Survey to investigate whether a similar change can be found at the micro level. We estimate the probabilities of worker flows across employment and unemployment in euro area countries during the period 2000-2015 in response to GDP growth, structural reforms and individual socio-demographic characteristics. We find evidence of a higher responsiveness of individual worker flows to output changes after the crisis, particularly for a group of countries which implemented significant reforms during the crisis. Furthermore, these results are not only driven by those hired on temporary contracts but also apply to those hired on permanent contracts. We also show that structural reforms, proxied by indicators which capture rigidities in labour and product markets (such as employment protection, product market regulation, centralised collective wage bargaining), can increase worker flows and may explain the increased responsive of worker flows to GDP growth after the crisis in the euro area. This increased responsiveness of worker flows to activity can enhance resilience by facilitating a swifter reaction of employment to adverse shocks, thereby helping firms to maintain profits, output and productivity and preventing larger output and employment losses during downturns while also delivering a higher growth of employment during recoveries. A stronger response of worker flows to activity implies that firms can more easily adjust employment to changes in the economic cycle, thereby increasing profits and output which, in turn, will create higher sustainable employment and GDP growth which will further enhance resilience to adverse shocks.

JEL Classification: J21, J24, C25, K31.

Keywords: individual-level worker flows, linear probability model, labour market regulations, structural reforms, Great Recession.

## Non-technical summary

Resilience can be defined as the capacity of a country to withstand significant adverse economic shocks by minimising the negative impact of shocks on economic activity. In terms of policies, stringent regulations and institutions may lead to rigidities which inhibit the appropriate response to adverse shocks and thereby amplify output losses. This paper uses individual-level micro data to assess whether structural policies in euro area countries – proxied by indicators of employment protection, product market regulation and centralised collective bargaining – have increased the responsiveness of individual worker flows to changes in economic activity.

Previous work using macroeconomic data shows that employment-output elasticities in the euro area increased during the recovery from the global economic and financial crisis, especially in those countries where reforms aimed to facilitate labour market adjustments. Since 2013, a considerable re-connection between output and employment has been observed, with a seemingly employment-rich recovery in some euro area countries, suggesting a possible structural change in their underlying Okun-style relationship.

In this paper, we build on these previous macroeconomic findings by using micro (individual-level) data from the Eurostat Labour Force Survey to investigate the determinants of worker flows (captured by socio-demographic variables such as gender, age, and education) across employment and unemployment in euro area countries during the period 2000-2015 and analyse Okun-style macroeconomic relationships within a micro data estimation framework. In particular, we estimate a linear probability model to examine the responsiveness of individual worker flows (i.e. flows of individuals from employment to unemployment and from unemployment to employment) to GDP dynamics over the period 2000-2015 and whether structural reforms implemented in euro area countries are associated with a change in the flexibility of job transitions after the crisis.

The results presented in this paper are consistent with previous results using aggregate data and show a higher responsiveness of individual worker flows to changes in GDP after the crisis, particularly for a group of euro area countries which implemented significant reforms. We find that a number of measures which decrease the stringency of regulation (such as reforms which reduce employment protection legislation, product market regulation, and the degree of collective bargaining) increase the flexibility of the labour market by increasing worker flows and also increase the responsiveness of worker flows to changes in GDP, especially in reforming countries. Moreover, our finding of an increase in the worker flows-to-GDP elasticity in the post-crisis period – particularly

for a selected group of euro area reforming countries – is robust for both temporary and permanent contracts, as results hold when the model is re-estimated only for unemployed workers flowing to employment and hired under a permanent contract. As a result, we conclude that the general increased responsiveness of flows to output is not driven by those hired on temporary contracts but also applies to those hired on permanent contracts. Finally, we show that the above results still hold after various robustness checks and alternative specifications are carried out and estimated. Overall, this increased responsiveness of worker flows to activity can enhance resilience by facilitating a swifter reaction of employment to adverse shocks, thereby helping firms to maintain profits, output and productivity and preventing larger output and employment losses during downturns while also delivering a higher growth of employment during recoveries. A stronger response of worker flows to activity implies that firms can more easily adjust employment to changes in the economic cycle, thereby increasing profits and output which, in turn, will create higher sustainable employment and GDP growth which will further enhance resilience to adverse shocks.

## 1. Introduction

The global economic and financial crisis brought about a major “disconnect” in the relationship between economic performance and employment. While before the crisis euro area employment and GDP growth had co-moved closely, with the on-set of the crisis this relationship broke, with many euro area countries showing different output-unemployment responses (i.e., Okun’s law)<sup>2</sup>. This suggests that unemployment was not only driven by output fluctuations but also by country-specific policies, institutions and shocks<sup>3</sup>. Nevertheless, since the start of the recovery in euro area activity in early 2013, a re-connection between output and employment has been observed, with a seemingly employment-rich recovery in some euro area countries, suggesting a possible structural change in their underlying relationship<sup>4</sup>. Mostly macroeconomic evidence suggests that labour and product market reforms implemented during the crisis in some euro area countries have made it easier to adjust employment in response to changing economic conditions<sup>5</sup>. The next paragraphs of this section provide a review of selected literature studying the impact of labour and product market reforms on transitions into and out of employment.

The literature expects reforms which increase flexibility via reductions in employment protection legislation for regular contracts to lower the expected cost of future lay-offs, thereby facilitating employment exits and encouraging hiring. Empirical studies have generally found that in the short-run, such reforms tend to increase lay-off rates (Boeri and Jimeno, 2005; Von Below and Thoursie, 2010; Marinescu, 2009; Cacciatore et al., 2012), while the effects on hiring are limited as it takes time for employers to anticipate the lower costs of job dismissals in hiring decisions (Behagel et al., 2008). However, a positive “honeymoon effect” on employment has been observed for reforms applying to new hires, which are perceived to be relatively easier to dismiss (Boeri and Garibaldi, 2006). On the other hand, the effects of more flexible employment protection on hiring, firing and job reallocation

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<sup>2</sup> For example, during the recession, in Ireland and Spain the unemployment rate increased by about 7½ percentage points, despite the fact that output dropped by more than 8 percent in Ireland but by only half as much in Spain. Moreover, although Germany suffered an output drop of about 7 percent, its unemployment rate actually decreased.

<sup>3</sup> See International Monetary Fund (2010), “Rebalancing Growth”, World Economic Outlook (WEO), pp. 69-107.

<sup>4</sup> See European Central Bank (2016), “The employment-GDP relationship since the crisis”, Economic Bulletin, Issue 6, Box 3, “Recent employment dynamics and structural reforms”, pp. 53-71, Article 1.

<sup>5</sup> For example: regarding macroeconomic results showing an increased employment-GDP elasticity after the crisis, particularly for euro area reforming countries, see the article in the ECB Economic Bulletin Issue 6/2016 ‘The employment-GDP relationship since the crisis’, including Box 3 ‘Recent employment dynamics and structural reforms’; on the micro side, see ECB OP 210 and the latest Wage Dynamics Survey (2016) which surveyed around 25,000 firms across 25 EU countries asking whether labour markets were perceived to be more flexible at the end of 2013 compared to 2010. A significant number of firms felt that flexibility had increased in this period, particularly in countries such as Portugal, Spain, Greece and Cyprus. A very high proportion of firms in Spain and Greece also answered that a major reason behind the greater easiness of adjusting employment during this period was due to labour reforms.

have been found to increasingly materialise in the longer run, both within and across sectors (Gomez Salvador et al., 2004; Jackman et al., 1996; Autor et al., 2006; Micco and Pagés, 2006; Behagel et al., 2008; Ahsan and Pagés, 2009; Bassanini and Garnero, 2013; Murin and de Serres 2014).

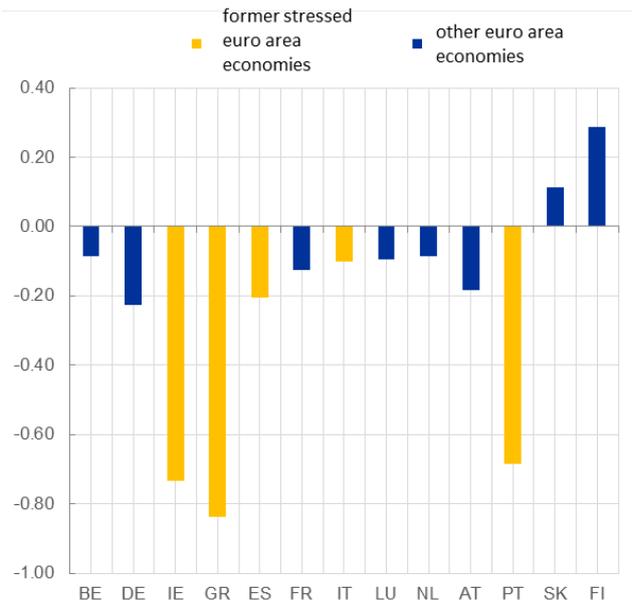
Product market reforms aim at improving the flexibility of goods and services markets by facilitating the entry of new competitive firms, which in turn increases competitive pressures, thereby bringing about price reductions as well as productivity, employment and output gains. Aparicio-Fenoll (2015) finds that more competitive markets lead to lower cost-price margins, which have been found to translate into lower job security. Product market reforms are also generally associated with a productivity boost, which materialises in part through job reallocations from less productive to more productive firms and staff cuts, implying higher rates of job transitions (Olley and Pakes, 1996; Disney et al., 2003). At the same time, Bassanini (2013) finds that restrictive regulation is associated with smaller rates of within-industry job-to-job transitions, in particular towards permanent jobs. In the long term however, empirical studies confirm a general positive association between product market reforms and employment (Alesina et al., 2005; Schiantarelli, 2010; Gal and Theising, 2015; OECD, 2016).

Martins (2014) finds that extensions of collective bargaining coverage negatively affect employment and may increase the informal sector. In fact, these extension procedures are likely to set higher floors in minimum wages and other work conditions than government legislated minima (Boeri, 2012), which many firms and workers may not find appropriate, especially if unions involved in collective bargaining are not representative of these firms. In response to this issue, Greece (2011), Portugal (2011), and Spain (2012) allowed for plant-level bargaining to dominate over industry or national bargaining outcomes, by potentially setting wages below the ones set at “higher” bargaining levels. France and Italy also extended the scope of derogations from multi-employer bargaining. However, it is not always clear if reforms to wage setting will always increase worker flows. On the one hand, if reforms make wages more flexible to changing conditions during the cycle, then this may result in a reduction in worker flows (i.e., from a firm perspective, more adjustment on the nominal side of the labour market may imply less need for adjustment on the quantity side). On the other hand, more wage adjustment may encourage higher inflows and outflows regarding employment and unemployment (i.e., from a worker perspective, greater wage variation across firms and during the cycle may encourage more employment and unemployment transitions).

As part of the response to the crisis, a significant number of euro area countries implemented many of the reforms described above. One way to track the progress in structural reforms is to look at the

changes over time of selected institutional indicators, measuring the progress by comparing latest values of the indicators with their values before the crisis. In this paper, we select the following indicators which focus on measuring reforms that instil greater flexibility in product market regulation (Product Market Regulation indicator from the OECD), employment protection legislation (Employment Protection Legislation from the OECD), and also look at policies and framework conditions in the area of collective bargaining (Centralized Collective Bargaining indicator<sup>6</sup> from the Fraser Institute). As shown in the chart below, many euro area countries have undertaken reform efforts to improve the flexibility of product and labour markets, especially former stressed euro area economies like Greece, Portugal, Ireland, Spain and Italy which show significant progress in improving product and labour market structures between 2008 and 2013.

**Figure 1**  
Progress in labour and product market reforms in the euro area



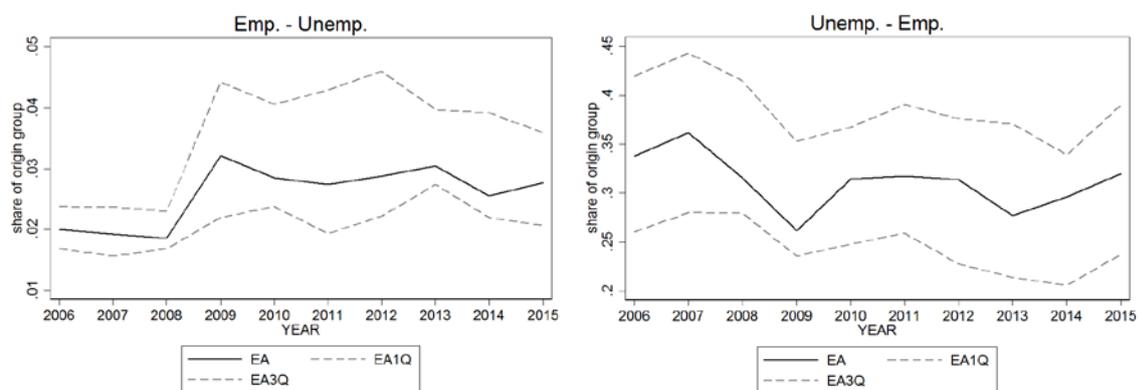
Notes: reform progress is defined as the change between 2008 and 2013 in a composite indicator comprising labour and product market indicators, namely the Product Market Regulation and the Employment Protection Legislation indicators from OECD, and the Centralized Collective Bargaining indicator from the Fraser Institute. These indicators are aggregated into the composite indicator by taking their arithmetic average.  
Source: OECD, Fraser Institute and authors' computations.

Against this background, this paper uses micro (individual-level) data from the Eurostat Labour Force Survey (EU-LFS) on worker flows across employment and unemployment, and their socio-demographic compositions (i.e., gender, age, and education) to further investigate whether the

<sup>6</sup> Indicator rescaled on the strictness of the Employment Protection Legislation and Product Market Regulation indicators.

flexibility of euro area employment with respect to output has changed over the course of the crisis and the subsequent recovery period, and whether structural reforms have changed the behaviour of labour market flows in euro area countries during the period 2000-2015. A first inspection of the micro individual-level data shows that, similar to the aggregate employment dynamics, worker flows are responsive to output growth. Despite strong heterogeneity across countries, worker flows across employment and unemployment share a common pattern in all the countries, showing in particular a sizable change during the downturn which then changes in the opposite direction as the recovery in output begins (Figure 2)<sup>7</sup>.

**Figure 2**  
Evolution of worker flows in the euro area



Notes: Worker flows from unemployment to employment and from employment to unemployment. Data aggregated across individuals and countries to proxy the euro area. Solid black line depicts the euro area median and the dashed lines represent the first and third quartiles (1Q and 3Q, respectively). Source: EU-LFS.

The paper estimates a linear probability model to examine the responsiveness of worker flows to output dynamics and finds in the first part of the paper that in countries where reforms were implemented, job transitions after the crisis seem more responsive to changes in GDP compared to the pre-crisis period. In particular, the higher responsiveness of worker flows to GDP growth is most notably observed in a group of reforming countries, namely Greece, Spain and Portugal<sup>8</sup>. It is worth noting that this result applies to the flow of workers with any type of contract, i.e. the results are robust to whether workers on all contracts are included in the estimation sample or whether the

<sup>7</sup> For further related work on labour market flows and unemployment dynamics see, for example, the important contributions by Burda and Wyplosz (1994), Davis and Haliwanger (1999) and Elsby et al (2013).

<sup>8</sup> This group of euro area reforming countries was selected due to their significant reform activity over the period examined according to the following indicators: employment protection legislation, product market regulation and the degree of centralisation of collective bargaining. For additional details, please refer to Figure 1.

sample is restricted to only permanent contracts. In the second part of this paper, we also use similar econometric specifications to those mentioned above to examine whether labour and product market regulation and institutions affect worker flows – by including indicators capturing Employment Protection Legislation (EPL), Product Market Regulation (PMR) and the degree of centralisation of collective bargaining – and whether they also explain the increased responsiveness of worker flows to GDP growth after the crisis in the euro area. As expected, we find that stricter regulation tends to reduce worker flows. In addition, interaction terms between GDP growth and the above institutional variables are statistically significant and provide a direct indication that reforms may explain the increase in the responsiveness of worker flows to GDP growth. Therefore, reforms which reduce these rigidities can enhance labour market flexibility by decreasing excessive employment protection and/or making wage adjustments more responsive to the economic cycle, thereby influencing the probability of flowing to and from employment and unemployment. In addition, higher competition-enhancing product market regulation may affect the probability of flowing to and from employment and unemployment, by encouraging the creation of new companies and the expansion of existing ones, as well as increasing the exit rate of less productive companies, or by making profit margins more responsive to the cycle.

## 2. Data

The analysis is conducted using micro (individual-level) data from the EU-LFS. This database is compiled by Eurostat from surveys among private households and contains individual-level data about socio-demographic characteristics and job status for individuals in the EU. Specifically, we access the anonymised individual-level dataset, which has annual frequency and a cross-section structure.<sup>9</sup> The anonymised version of the LFS microdata does not allow tracking people across waves: the household numbers are randomized per dataset. Our database is an unbalanced panel<sup>10</sup> with the bulk of the data covering the period 2000-2015.

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<sup>9</sup> Further details on the EU-LFS are given in an Annex and on the Eurostat website:

<https://ec.europa.eu/eurostat/web/microdata/european-union-labour-force-survey>.

<sup>10</sup> The microeconomic data are available for all euro area countries but Ireland. The period covered varies across countries because several questions were not compulsory for all the countries until recent years. In this respect, there are annual data for the period 2000-2015 for Belgium, Cyprus, Germany, Estonia, Spain, Finland, Greece, Italy, Luxembourg, Portugal and Slovenia. In addition, starting from 2001, Lithuania, Latvia and Slovakia are available. From 2006, Austria, France and Netherlands became part of the dataset. Finally, data for Malta are only available from 2009 onwards.

With regard to the variables used in the analysis, we include information about individual characteristics such as gender, age, and educational attainment levels. Worker flows are constructed from the declared employment status of the previous year<sup>11</sup>. In particular, we compare the job status of an individual in the year of the survey to the one in the previous year and generate a dummy variable for each type of flow under analysis: one from employment to unemployment (E-U), and a second one from unemployment to employment (U-E). The E-U dummy variable has a value of 1 if the individual flows from employment to unemployment in each specific year, and 0 if she remains employed. Conversely, the U-E dummy variable has a value of 1 if the individual flows from unemployment to employment in each specific year and 0 if she remains in the origin group, i.e. unemployed. One caveat of this measurement is that transitions regarding employment status from one year to the next could be affected by the time aggregation bias resulting from the lack of observations of changes in employment status within a given year, given that only information about the professional status one year before the survey is provided. Hence job creation and job destruction rates are likely to be somewhat higher on a higher frequency, compared to a yearly basis. Nevertheless, as explained in Jimeno et al. (2015)<sup>12</sup>, which compares the annual worker flows for Spain from the EU-LFS to the annualized quarterly transitions computed from the Spanish Labour Force Survey based on quarterly data, the time evolution of the annual and quarterly measures are qualitatively similar. Hence, we consider our focus on data for annual transitions to be a reasonably valid approach.

Regarding sample representativeness, we use the yearly individual weight coefficients provided by the EU-LFS database. However, given that methodological changes<sup>13</sup> in the weighting scheme occurred during the period of analysis, the weighting scheme has been corrected for all the countries in the sample by adjusting<sup>14</sup> the old weights to the new methodology.

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<sup>11</sup> Each survey provides information on the “professional status one year before survey”.

<sup>12</sup> Casado, J. M., Fernandez, C. & Jimeno, J. F., 2015. Worker flows in the European Union during the Great Recession, ECB Working Paper Series.

<sup>13</sup> The methodology changed in 2005 for all the countries, with the exception of Finland and Ireland, for which the weighting scheme changed in 2007.

<sup>14</sup> To this end, we just rescale the old weights matching the total of the country weights for every year with the average of the totals for every country over the period in which the new methodology applies.

### 3. Empirical analysis

In this section, we develop an empirical econometric analysis of the relationship between worker flows and GDP dynamics. For this purpose, we use individual-level data on job status, age, education and gender, and macro data on GDP growth over 2000-2015, for almost all euro area member states.

The core model specifications used in our empirical analysis can be summarised as follows:

$$Flow_{i,c,t} = GDP\ growth_{c,t-1} + crisis_{c,t} + GDP\ growth_{c,t-1} * crisis_{c,t} + X_{i,c,t} + FE + u_{i,c,t} \quad (1)$$

$$Flow_{i,c,t} = GDP\ growth_{c,t-1} + crisis_{c,t} + GDP\ growth_{c,t-1} * crisis_{c,t} + X_{i,c,t} + I_{c,t} + FE + \varepsilon_{i,c,t} \quad (2)$$

We estimate a Linear Probability Model, weighting each observation by the inverse of its probability of being sampled. The estimation is carried out separately for each type of flow under analysis; hence the dependent variable is a dummy variable denoting once the worker flows from unemployment to employment (U-E) and another time from employment to unemployment (E-U).  $GDP\ growth_{c,t-1}$  is measured in percentage points and is included to capture the impact of changes in overall macroeconomic activity on the flows (i.e., capturing an “Okun” style relationship for the flows). Given that individual characteristics may also affect the probability of job transitions, we include  $X_{i,c}$  which are dummy variables identifying individuals’ socio-demographic characteristics such as gender (male, female), educational attainment levels (low, medium, and high), and age (grouped as 15-24; 25-34; 35-44; 45-54; 55-64). Two dummy variables are also included in the specification to capture various distortions and asymmetries during the crisis, namely: (1) a  $crisis_{c,t}$  dummy – which has a value of 1 when the GDP growth in a given country-year is negative in the period from 2008 onwards and 0 otherwise; and (2) an interaction term between the  $crisis_{c,t}$  dummy and  $GDP\ growth_{c,t-1}$ .  $I_{c,t}$  in equation (2) represents policy variables (i.e. employment protection legislation, product market regulation and the degree of centralisation of collective bargaining) which are included in the model one at a time.  $FE$  represents country and time fixed effects while  $u_{i,c,t}$  and  $\varepsilon_{i,c,t}$  are error terms.

We include the intercept  $crisis_{c,t}$  dummy variable (when GDP growth is negative during the crisis) as well as an interaction of this dummy with GDP growth to remove various distortions due to: (a) the extraordinarily sharp downturns in GDP during the crisis and the associated somewhat volatile responses of both employment and unemployment during this time; (b) possible breakdowns in the GDP-employment-unemployment relationship during the crisis due to various short-time working

policies which reduced hours worked rather than reducing employment,<sup>15</sup> and/or changing perceptions as to whether the shock was temporary or more persistent (which can affect the degree of labour hoarding). By including these dummy variables we hope to remove various distortions during the crisis which may have disrupted the normal relationship between labour market flows and economic activity. The inclusion of these dummy variables follows similar approaches using aggregate macroeconomic data when investigating whether the employment-GDP elasticity (i.e., Okun's law) changed due to the introduction of structural reforms during the crisis.<sup>16</sup>

The model presents one caveat – relating to the correlation of the residuals across the units of observation – which should be acknowledged. In both equation (1) and (2), the outcome is observed at the individual level though the regressors of interest,  $GDP\ growth_{c,t-1}$  or  $I_{c,t}$ , vary only at a higher level of aggregation (see Moulton 1990; Bertrand, Duflo, and Mullainathan 2004). In particular, since we combine individual micro-level data with macro variables, the effective sample sizes are much closer to the number of clusters than to the number of individuals. When the number of clusters is small, the results may underestimate either the serial correlation in a random shock like  $u_{i,c,t}$  or the intra-class correlation as in the Moulton problem (Moulton 1986). This leads to downward biased standard errors because the within-group (intra-class) correlation across individual units is not accounted for. Although we use robust standard errors to account for heteroscedasticity problems, we cannot correct for clustering bias. Therefore, we apply a 'Moulton factor'<sup>17</sup> to correct the standard errors for first-order serial correlation at country level. Nevertheless, since this parametric approach does not allow for using weighted estimation, we did not manage to exactly replicate the same model presented in the main results using unweighted estimates, and hence we are not able to state whether the clustered standard error bias needs to be corrected. On the other hand, when estimating the same specification with unweighted regressions, we find that the standard errors are virtually unchanged when we apply the Moulton correction factor. This suggests that the standard errors in the weighted regressions reported later would also be unaffected by the "Moulton correction methodology".

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<sup>15</sup> Faced by the weakening of activity, firms have shown a widespread preference for forms of internal flexibility, such as cutting overtime and making use of short-time working (STW) schemes. STW schemes have been mostly used in Belgium, Germany and Italy, but also in other countries. For further details, please see the ECB's 2012 Structural Issues Report entitled "Euro area labour markets and the crisis", Occasional Paper Series, No 138, ECB, 2012.

<sup>16</sup> For example, see Box 3 'Recent employment dynamics and structural reforms' and other parameters' estimates in the article in the ECB Economic Bulletin Issue 6/2016 "The employment-GDP relationship since the crisis".

<sup>17</sup> We use Stata's *moulton* command. Alternatively, one could follow Angrist and Pischke (2009) and allow for more general correlation structure among individuals within countries using estimates of cluster-robust standard errors where the clusters are the countries.

Notwithstanding the limitations of the EU-LFS as regards conducting a longitudinal analysis of worker flows over a long period of time with anonymised<sup>18</sup> microdata, we believe the results presented in this paper are robust and broadly confirm the main findings in the literature.

In the regression results reported in Table 1 (based on specification (1) above), we examine whether a re-connection between output and employment, suggested by a change in the GDP responsiveness before and after the crisis, has occurred. Our hypothesis is that the expected higher responsiveness of euro area worker flows to GDP since the rebound may have been strongly influenced by structural reforms implemented during the post-crisis period. For this reason, in order to make the analysis consistent with the general euro area reform pattern, our sample excludes Germany because of the different timing of reform implementation. In Germany, by contrast, most of the reforms (Hartz reforms) were implemented in the pre-crisis period (i.e., the early 2000s). Meanwhile, as shown in Figure 1, the selected group of reforming countries (Greece, Portugal, and Spain) made a significant reform effort during the crisis<sup>19</sup>.

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<sup>18</sup> With the anonymised EU-LFS micro database, identifiers for each individual are consistent across the four quarters of a year, so individuals can be compared between waves. However, this applies only to the four quarters of one year (i.e. Q1 and Q4 of 2015). Identifiers of separate yearly files are not consistent, and thus it is not possible to combine data for multiple years (i.e. Q4 of 2014 and Q1 of 2015).

<sup>19</sup> While major reform efforts were also undertaken in Ireland, the latter is not included in the group of reforming countries due to data availability. See also footnote 13.

**Table 1**

Comparing responsiveness of worker flows to GDP growth in reforming period with pre-crisis period.

	EA countries				Reforming countries			
	2000-2007 (1) U-E	2008-2015 (2) U-E	2000-2007 (3) E-U	2008-2015 (4) E-U	2000-2007 (5) U-E	2008-2015 (6) U-E	2000-2007 (7) E-U	2008-2015 (8) E-U
<b>GDP growth (t-1)</b>	0.006807*** (0.0019)	0.009986*** (0.0012)	-0.001125*** (0.0002)	-0.002565*** (0.0002)	0.01010** (0.0039)	0.02841*** (0.0049)	-0.0007692* (0.0004)	-0.004961*** (0.0010)
<b>GDP growth (t-1)*crisis</b>		-0.002265 (0.0014)		0.0004677* (0.0002)		-0.01448*** (0.0036)		0.001752** (0.0007)
<b>crisis</b>		-0.02529*** (0.0073)		0.003339** (0.0011)		-0.05170*** (0.0132)		0.01444*** (0.0031)
<b>male</b>	0.06567*** (0.0044)	-0.006531 (0.0045)	-0.006470*** (0.0005)	0.001721** (0.0007)	0.09481*** (0.0079)	0.004308 (0.0071)	-0.01227*** (0.0011)	0.005306** (0.0018)
<b>education</b>								
<b>medium</b>	0.05147*** (0.0050)	0.05769*** (0.0051)	-0.008742*** (0.0006)	-0.01803*** (0.0009)	0.02581* (0.0102)	0.04643*** (0.0090)	-0.008361*** (0.0015)	-0.02347*** (0.0025)
<b>high</b>	0.1126*** (0.0075)	0.1077*** (0.0069)	-0.01758*** (0.0007)	-0.03381*** (0.0010)	0.08148*** (0.0111)	0.08051*** (0.0100)	-0.01980*** (0.0014)	-0.04842*** (0.0021)
<b>age</b>								
<b>25-34</b>	-0.01892** (0.0058)	0.02525*** (0.0070)	-0.02567*** (0.0015)	-0.03548*** (0.0022)	-0.04809*** (0.0100)	0.05328*** (0.0117)	-0.02885*** (0.0027)	-0.05220*** (0.0060)
<b>35-44</b>	-0.03892*** (0.0064)	-0.01351 (0.0071)	-0.03728*** (0.0014)	-0.05474*** (0.0021)	-0.1089*** (0.0112)	0.0002996 (0.0118)	-0.04378*** (0.0027)	-0.08003*** (0.0058)
<b>45-54</b>	-0.08144*** (0.0071)	-0.07341*** (0.0070)	-0.04317*** (0.0014)	-0.06371*** (0.0021)	-0.1862*** (0.0132)	-0.07452*** (0.0113)	-0.05474*** (0.0026)	-0.09386*** (0.0058)
<b>55-64</b>	-0.1848*** (0.0098)	-0.1422*** (0.0081)	-0.04745*** (0.0014)	-0.07222*** (0.0021)	-0.3490*** (0.0156)	-0.1408*** (0.0124)	-0.05885*** (0.0026)	-0.1137*** (0.0058)
<b>constant</b>	0.2513*** (0.0176)	0.2718*** (0.0114)	0.08706*** (0.0026)	0.1120*** (0.0026)	0.4745*** (0.0186)	0.3273*** (0.0146)	0.07287*** (0.0033)	0.1246*** (0.0060)
<b>N</b>	124999	165528	1290148	1514868	51608	65700	490094	383067
<b>R-sq</b>	0.0456	0.0665	0.0126	0.0214	0.0771	0.0615	0.0126	0.0244

Notes: Linear Probability Model pooled over different groups of countries. The dependent variable is, depending on the model, the worker flows from unemployment to employment (U-E) or from employment to unemployment (E-U). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. The specification also includes dummies for individual characteristics (i.e.: male, education, age) , plus an intercept dummy variable where GDP growth is negative during the crisis as well as an interaction of this dummy with GDP growth. Time and country FE are included. The group of euro area countries excludes Germany because of the different timing pattern of reforms compared to the other reforming euro area countries. The group of reforming countries includes Spain, Greece and Portugal. GDP growth (t-1) is measured in percentage points. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

By comparing the various estimates of the GDP parameter for the period 2000-2007 with the period 2008-2015, we see that the responsiveness of both worker flows to GDP in the euro area countries has increased after the crisis (see first row in Table 1 corresponding to the parameter for “GDP growth (t-1)”):<sup>20</sup> for individuals flowing from unemployment to employment (U-E) by 0.3 p.p., while for individuals flowing from employment to unemployment (E-U) the expected negative GDP parameter increased by 0.1 p.p. When the sample is restricted to the group of reforming countries,

<sup>20</sup> Given the sharp downturns in GDP during the crisis, and the associated somewhat volatile responses of employment and unemployment, we include an intercept dummy variable when GDP growth is negative during the crisis as well as an interaction of this dummy with GDP growth.

the change in the responsiveness is more evident and seems larger, increasing by 1.9 p.p. for the U-E and by 0.4 p.p. for the E-U flows<sup>21</sup>. Although the change in responsiveness might be driven by various factors, the structural reforms implemented during the crisis may be one factor underlying the strengthening of the reaction of employment and unemployment dynamics to GDP growth. The larger increase in responsiveness for the group of reforming countries, compared with the euro area, is not observed when including other euro area countries in the group of reforming countries which implemented reforms later (such as Italy).

Turning to the more general results for gender, age and education variables<sup>22</sup>, we find that the probability of losing a job and becoming unemployed seems to be higher for young, female, low-skilled workers. On the other hand, the results suggest that the increase in the probability of finding a job, conditional on being unemployed, is mainly been driven by young, male and educated workforce (i.e., medium- and high-skill). In the reforming countries under analysis, age plays a stronger role in determining the flow from unemployment into employment.

In the next section, we carry out some robustness checks on the previous results by checking whether the results also hold for: (a) permanent contracts; and (b) a balanced panel. Further robustness checks on whether there is an increase in the responsiveness of worker flows to GDP are carried out by using different sample periods and dummy variables.

### **3.1 Robustness checks and additional results**

During the period of the recovery in euro area employment after the crisis, a significant number of workers in some countries were employed under temporary contracts (e.g., Spain). An important question is whether our finding of increased worker flows from unemployment to employment after the crisis is only due to temporary contracts. Therefore, in Table 2 we estimate the same specification (1) as in Table 1 but only focus on observations for individuals flowing from unemployment to employment under a permanent contract. In this way, we check whether our previous finding of an increase in the responsiveness of the flows to a change in GDP in the post-crisis period is only driven by a higher share of individuals hired under temporary contracts after the crisis. The results of this specification on the restricted sample of permanent contracts are in line

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<sup>21</sup> The change between the two periods is statistically different from zero.

<sup>22</sup> The control groups are female, low –skilled and 15-24, respectively.

with the previous ones shown in Table 1. Specifically, when only looking at unemployed workers flowing to employment and hired under a permanent contract, we still observe an increase in the GDP-employment elasticity after 2008, both for the euro area and the group of reforming countries. By comparing the different parameter estimates for the period 2000-2007 with the period 2008-2015 for the “GDP growth (t-1)” parameter, we see that the responsiveness of worker flows to GDP in the euro area countries has increased by 0.2 p.p. after the crisis, while in the reforming countries by 0.8 p.p. Therefore, our conclusion is that the general increased responsiveness of flows to output, which may be associated with the implementation of structural reforms, is not driven by those hired on temporary contracts.

As an additional robustness check, Table 3 presents the results of specification (1), restricting the country sample in order to have a balanced panel. In particular, we remove from the euro area country group Germany, Malta, Austria, France and the Netherlands as data for Austria, France and the Netherlands were only available as of 2006 while for Malta as of 2009. As before, Germany is excluded given the different timing of their reform implementation, and not for data availability. Since the results are overall very similar and in line with those of Table 1, they suggest that the increased GDP-employment elasticity after the crisis is not driven by the missing observations for some countries in the first period (2000-2007).

In Tables 4 and 5 we investigate whether the results of Table 1 are robust to an alternative way of checking if the parameters of GDP growth change between the pre- and post-crisis periods. In more detail, Table 4 first estimates specification (1) for the pre-crisis period 2000-2007 (i.e., columns 1, 3, 5 and 7) and then for the whole sample period 2000-2015 (i.e., columns 2, 4, 6 and 8): the hypothesis is that if the latter period shows larger parameters for the output variable than the pre-crisis period then we again have evidence of structural change in the post-crisis period. After controlling for the downturn and the asymmetric response of the flows during the recession as before, the results in Table 4 show that “GDP growth (t-1)” parameters are indeed larger for the whole sample period (2000-2015) relative to the pre-crisis period, indicating that the responses of labour market flows to changes in GDP are indeed higher in the post-crisis period. Again the increase in parameters is higher for the reforming countries, indicating that structural reforms implemented during the crisis may, at least, partly explain this increased flexibility of labour market flows. Again our micro data results are consistent with results using macroeconomic data based on a similar methodology which finds that

the employment-GDP elasticity has increased for reforming countries during the post-crisis period.<sup>23</sup> Moreover, the hypothesis that the employment-GDP elasticity increases in the post-crisis period is further tested in Table 5 by estimating specification (1) over the whole sample period 2000-2015 and introducing an intercept dummy variable for the period 2000-2007 as well as an interaction of this dummy with GDP growth (t-1). Accordingly, the sign of the parameter and statistical significance of the latter interaction term will indicate whether the employment-GDP elasticity over the period 2000-2007 is higher, lower or the same as in the 2008-2015 period associated with reforms. After also including the usual dummies as in equation (1) which control for the distortions and asymmetries during the crisis period (i.e., the  $\text{crisis}_{c,t}$  intercept dummy and an interaction term between the  $\text{crisis}_{c,t}$  dummy and  $\text{GDP growth}_{c,t-1}$ ), the significance of the interaction term between GDP growth and the time dummy variable for the period 2000-2007 again confirms that the job flows-GDP elasticities after the crisis are higher compared to the pre-crisis period (i.e., by comparing the two parameters in the first two rows of Table 5)<sup>24</sup>. Furthermore, the difference in the responsiveness of worker flows to GDP dynamics between the two periods is higher for the reforming countries, providing further evidence that reforms were associated with an increase in the job flows-GDP elasticity.

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<sup>23</sup> For example, see Box 3 'Recent employment dynamics and structural reforms' and other parameters' estimates in the article in the ECB Economic Bulletin Issue 6/2016 'The employment-GDP relationship since the crisis', as well as Jimeno et al. (2015).

<sup>24</sup> For instance, the sum of the GDP growth (t-1) and GDP growth (t-1)\*pre-crisis coefficients in column 1 (which are both statistically significant) are smaller than the GDP growth (t-1) coefficient. This indicates that the responsiveness of workers flowing from unemployment to employment (and vice-versa) in response to GDP growth in the pre-crisis period is lower compared to the post-crisis period.

**Table 2****Permanent contracts: changes in responsiveness of worker flows to GDP growth**

	EA countries		Reforming countries	
	2000-2007 (1) U-E	2008-2015 (2) U-E	2000-2007 (3) U-E	2008-2015 (4) U-E
<b>GDP growth (t-1)</b>	0.006600*** (0.0019)	0.008443*** (0.0011)	0.009966** (0.0044)	0.01716*** (0.0040)
<b>GDP growth (t-1)*crisis</b>		-0.001401 (0.0013)		-0.008504** (0.0030)
<b>crisis</b>		-0.01724** (0.0066)		-0.02369** (0.0104)
<b>male</b>	0.07192*** (0.0045)	0.004468 (0.0037)	0.09171*** (0.0085)	0.0004576 (0.0051)
<b>education</b>				
<b>medium</b>	0.05416*** (0.0049)	0.04549*** (0.0042)	0.04154*** (0.0104)	0.02655*** (0.0064)
<b>high</b>	0.1195*** (0.0084)	0.09241*** (0.0062)	0.1043*** (0.0134)	0.05401*** (0.0081)
<b>age</b>				
<b>25-34</b>	0.01444* (0.0060)	0.05035*** (0.0057)	0.001443 (0.0110)	0.04862*** (0.0082)
<b>35-44</b>	0.01474* (0.0064)	0.02928*** (0.0056)	-0.03012** (0.0115)	0.02109** (0.0076)
<b>45-54</b>	-0.0007015 (0.0073)	-0.006353 (0.0054)	-0.04394** (0.0147)	-0.006926 (0.0073)
<b>55-64</b>	-0.06271*** (0.0086)	-0.03765*** (0.0063)	-0.1427*** (0.0124)	-0.02227** (0.0078)
<b>constant</b>	0.1433*** (0.0170)	0.08891*** (0.0098)	0.1626*** (0.0201)	0.08794*** (0.0104)
<b>N</b>	97547	137510	36072	55735
<b>R-sq</b>	0.0518	0.0840	0.0330	0.0311

Notes: Linear probability model pooled over different countries. Same specification (1) as in Table 1, except that the sample is restricted to those individuals flowing to employment under a permanent contract. The dependent variable is the worker flows from unemployment to employment (U-E). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. All euro area countries included (columns 1 to 2). Time and country FE are included. Columns 3 and 4 refer to the following group of reforming countries: Greece, Spain and Portugal. The estimation is conducted over the period 2000-2015. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

**Table 3**

Balanced panel: changes in responsiveness of worker flows to GDP growth

		EA countries			
		2000-2007 (1) U-E	2008-2015 (2) U-E	2000-2007 (3) E-U	2008-2015 (4) E-U
<b>GDP growth</b>		0.006811*** (0.0019)	0.007461*** (0.0009)	-0.001098*** (0.0002)	-0.002729*** (0.0002)
<b>GDP growth (t-1)*crisis</b>			-0.0001804 (0.0011)		0.0004204* (0.0002)
<b>crisis</b>			-0.03168*** (0.0066)		0.004185*** (0.0012)
<b>male</b>		0.06796*** (0.0043)	0.003814 (0.0046)	-0.006979*** (0.0005)	0.002366** (0.0008)
<b>education</b>					
	<b>medium</b>	0.04393*** (0.0049)	0.04776*** (0.0053)	-0.008810*** (0.0006)	-0.01819*** (0.0011)
	<b>high</b>	0.1102*** (0.0073)	0.09733*** (0.0073)	-0.01836*** (0.0008)	-0.03685*** (0.0012)
<b>age</b>					
	<b>25-34</b>	-0.02153*** (0.0057)	0.03908*** (0.0070)	-0.02543*** (0.0015)	-0.04038*** (0.0029)
	<b>35-44</b>	-0.04178*** (0.0062)	0.002038 (0.0071)	-0.03725*** (0.0014)	-0.06056*** (0.0028)
	<b>45-54</b>	-0.08000*** (0.0068)	-0.05652*** (0.0069)	-0.04363*** (0.0014)	-0.06945*** (0.0028)
	<b>55-64</b>	-0.1893*** (0.0095)	-0.1178*** (0.0080)	-0.04787*** (0.0014)	-0.08094*** (0.0028)
<b>constant</b>		0.2569*** (0.0175)	0.2662*** (0.0109)	0.08775*** (0.0027)	0.1161*** (0.0032)
<b>N</b>		123662	150964	1234156	1169917
<b>R-sq</b>		0.0462	0.0603	0.0128	0.0252

Notes: Linear probability model pooled over different countries. Same specification (1) as in Table 1, except that the sample is restricted in order to have a balanced panel. The dependent variable is the worker flows from unemployment to employment (U-E). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. Time and country FE are included. Euro area countries for which data coverage is similar are included. The estimation is conducted over the period 2000-2015. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

**Table 4**

Alternative method of capturing change in responsiveness of worker flows to GDP growth by comparing pre-crisis period with whole sample period (the latter includes reforming period).

	EA countries				Reforming countries			
	2000-2007 (1) U-E	2000-2015 (2) U-E	2000-2007 (3) E-U	2000-2015 (4) E-U	2000-2007 (5) U-E	2000-2015 (6) U-E	2000-2007 (7) E-U	2000-2015 (8) E-U
<b>GDP growth</b>	0.007367*** (0.0017)	0.01256*** (0.0009)	-0.002027*** (0.0002)	-0.002736*** (0.0001)	0.01010*** (0.0039)	0.01664*** (0.0020)	-0.0007692* (0.0004)	-0.001624*** (0.0003)
<b>GDP growth (t-1)*crisis</b>		-0.004219*** (0.0012)		0.0005723** (0.0002)		-0.01784*** (0.0023)		0.001805*** (0.0004)
<b>crisis</b>		-0.04178*** (0.0066)		0.003531*** (0.0010)		0.03263*** (0.0087)		-0.002563* (0.0015)
<b>male</b>	0.05852*** (0.0045)	0.01332*** (0.0034)	-0.005847*** (0.0005)	-0.001040* (0.0005)	0.09481*** (0.0079)	0.02778*** (0.0057)	-0.01227*** (0.0011)	-0.001788 (0.0012)
<b>education</b>								
<b>medium</b>	0.05561*** (0.0051)	0.05645*** (0.0039)	-0.009733*** (0.0006)	-0.01433*** (0.0006)	0.02581* (0.0102)	0.04393*** (0.0072)	-0.008361*** (0.0015)	-0.01706*** (0.0016)
<b>high</b>	0.1190*** (0.0075)	0.1127*** (0.0055)	-0.01830*** (0.0007)	-0.02818*** (0.0007)	0.08148*** (0.0111)	0.08451*** (0.0079)	-0.01980*** (0.0014)	-0.03737*** (0.0014)
<b>age</b>								
<b>25-34</b>	-0.01668** (0.0060)	0.009300 (0.0050)	-0.02685*** (0.0015)	-0.03116*** (0.0015)	-0.04809*** (0.0100)	0.01696* (0.0085)	-0.02885*** (0.0027)	-0.03790*** (0.0032)
<b>35-44</b>	-0.03783*** (0.0065)	-0.02539*** (0.0053)	-0.03825*** (0.0014)	-0.04755*** (0.0014)	-0.1089*** (0.0112)	-0.03680*** (0.0089)	-0.04378*** (0.0027)	-0.06045*** (0.0031)
<b>45-54</b>	-0.08860*** (0.0072)	-0.08124*** (0.0053)	-0.04361*** (0.0014)	-0.05555*** (0.0014)	-0.1862*** (0.0132)	-0.1109*** (0.0088)	-0.05474*** (0.0026)	-0.07319*** (0.0031)
<b>55-64</b>	-0.1883*** (0.0098)	-0.1554*** (0.0064)	-0.04814*** (0.0015)	-0.06315*** (0.0014)	-0.3490*** (0.0156)	-0.1940*** (0.0100)	-0.05885*** (0.0026)	-0.08720*** (0.0031)
<b>constant</b>	0.2371*** (0.0172)	0.1875*** (0.0093)	0.09873*** (0.0027)	0.1114*** (0.0019)	0.4745*** (0.0186)	0.3411*** (0.0125)	0.07287*** (0.0033)	0.1040*** (0.0037)
<b>N</b>	138887	290527	1495849	2805016	51608	117308	490094	873161
<b>R-sq</b>	0.0452	0.0635	0.0131	0.0192	0.0771	0.0972	0.0126	0.0225

Notes: Linear Probability Model pooled over different groups of countries. Same specification (1) as in Table 1, except that the sample periods differ. The dependent variable is, depending on the model, the worker flows from unemployment to employment (U-E) or from employment to unemployment (E-U). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. The specification also includes dummies for individual characteristics (i.e.: male, education, age), plus an intercept dummy variable where GDP growth is negative during the crisis as well as an interaction of this dummy with GDP growth. Time and country FE are included. Group of euro area countries excludes Germany because of the different pattern of reforms. The group of reforming countries includes Spain, Greece and Portugal. GDP growth (t-1) is measured in percentage points. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

**Table 5**

Alternative method of capturing change in responsiveness of worker flows to GDP growth by dummifying pre-crisis period and GDP parameter.

	EA countries		Reforming countries	
	2000-2015 (1) U-E	2000-2015 (2) E-U	2000-2015 (3) U-E	2000-2015 (4) E-U
<b>GDP growth (t-1)</b>	0.0167*** (0.0013)	-0.0031*** (0.0002)	0.0145*** (0.0026)	-0.0044*** (0.0004)
<b>GDP growth (t-1)*pre-crisis</b>	-0.0084*** (0.0015)	0.0007*** (0.0002)	-0.0090*** (0.0021)	0.0023*** (0.0003)
<b>pre-crisis</b>	0.1501*** (0.0112)	-0.01097*** (0.0014)	0.1827*** (0.0101)	-0.0202*** (0.0013)
<b>GDP growth (t-1)*crisis</b>	-0.0075*** (0.0014)	0.0008*** (0.0002)	-0.0093** (0.0030)	0.0028*** (0.0005)
<b>crisis</b>	-0.0375*** (0.0067)	0.0032** (0.0010)	-0.0499*** (0.0073)	0.0026* (0.0010)
<b>male</b>	0.0116*** (-0.0031)	0.0005 (-0.0004)	0.0366*** (-0.0035)	-0.0030*** (-0.0006)
<b>education</b>				
<b>medium</b>	0.0561*** (-0.0035)	-0.0113*** (-0.0005)	0.0419*** (-0.0041)	-0.0131*** (-0.0007)
<b>high</b>	0.1174*** (-0.0048)	-0.0243*** (-0.0006)	0.1034*** (-0.0056)	-0.0272*** (-0.0008)
<b>age</b>				
<b>25-34</b>	-0.0050 (-0.0046)	-0.0228*** (-0.0011)	0.0173*** (-0.0048)	-0.0313*** (-0.0017)
<b>35-44</b>	-0.0490*** (-0.0048)	-0.0361*** (-0.0011)	-0.0050 (-0.0052)	-0.0487*** (-0.0017)
<b>45-54</b>	-0.1033*** (-0.005)	-0.0422*** (-0.0011)	-0.0582*** (-0.0054)	-0.0574*** (-0.0017)
<b>55-64</b>	-0.1927*** (-0.0059)	-0.0459*** (-0.0011)	-0.1328*** (-0.0066)	-0.0665*** (-0.0017)
<b>constant</b>	0.2422*** (-0.0062)	0.0940*** (-0.0013)	0.3423*** (-0.0058)	0.0975*** (-0.0017)
<b>N</b>	291047	2857299	123230	1031656
<b>R-sq</b>	0.0637	0.0194	0.0992	0.0232

Notes: Linear Probability Model pooled over different groups of countries. The dependent variable is, depending on the model, the worker flows from unemployment to employment (U-E) or from employment to unemployment (E-U). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. The specification also includes dummies for individual characteristics (i.e.: male, education, age), plus an intercept dummy variable for the period 2000-2007 as well as an interaction of this dummy with GDP growth (t-1). Time and country FE are included. All euro area countries included, except Germany (columns 1 to 2). The group of reforming countries includes Spain, Greece, and Portugal. GDP growth (t-1) is measured in percentage points. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

## 3.2 Labour and product market institutions, reforms and worker flows

In the previous section, we tried to gauge the impact of reforms by seeing if the responsiveness of worker flows to GDP growth in the euro increased in the period of reforms. By contrast, in this section we attempt to more directly relate changes in worker flows to reforms by estimating the direct impacts of some key policy indicators – which are designed to capture institutional rigidities in labour and product markets – on worker flows for both the euro area and reforming countries.

In Table 6 (a, b), we estimate the linear probability specification (2) over the whole sample period (2000-2015) by including, one at a time, the following indicators (which vary at country-time level) of labour and product market regulation: EPL (t-1) refers to Employment Protection Legislation (OECD) for regular contracts; PMR (t-1) refers to the OECD indicator of regulation in energy, transport and communications (ETCR)<sup>25</sup>; the degree of centralisation of collective bargaining index is developed by the Fraser Institute and it has been flipped in order to be consistent with the direction of the other policy variables (i.e. the higher the index the lower the flexibility in wage setting, while higher values for EPL and PMR indicate greater rigidities in employment adjustment and product market regulation respectively). Accordingly, many structural reforms will be captured by changes in these institutional indicators. All euro area countries in the data sample are included in Table 6a, while Table 6b results only include the reforming countries (Greece, Spain and Portugal). The econometric results in Tables 6a,b show that the vast majority of the institutional variables are statistically significant and negatively signed indicating that higher employment protection, higher product market regulation and a higher degree of centralisation of wage bargaining tend to reduce worker flows.<sup>26</sup> Therefore, reducing these rigidities via structural reforms can increase worker flows in euro area countries and make the labour market more flexible. These results are consistent with Haltiwanger et al. (2014) who also found that stricter regulations reduce the pace of job creation and destruction using firm-level data for several countries.<sup>27</sup>

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<sup>25</sup> The PMR ETCR index is commonly used as a good proxy of product market regulation in the whole economy (as in several OECD papers and Anderton, R. et al (2017)) as it is highly positively correlated with the PMR indicator. The advantage of using the PMR ETCR indicator is that it provides annual observations over a long sample period (available on an annual basis) and is therefore well suited for time-series analysis, whereas the PMR indicator is limited to the years 1998, 2003, 2008 and 2013.

<sup>26</sup> The results are a bit weaker for the centralisation of wage bargaining as the parameters for this variable are both positively and negatively signed.

<sup>27</sup> For further analysis of worker flows and regulation, see, for example, Kugler and Pica (2008), Gomez Salvador et al (2004), Bassanini and Garnero (2013) and Courne de et al (2016), Vansteenkiste (2019).

**Table 6a****Impacts of institutional rigidities on worker flows (euro area countries)**

	EA countries					
	2000-2015	2000-2015	2000-2015	2000-2015	2000-2015	2000-2015
	(1) U-E	(2) E-U	(3) U-E	(4) E-U	(5) U-E	(6) E-U
<b>GDP growth (t-1)</b>	0.03151*** (0.0025)	-0.004731*** (0.0003)	0.01782*** (0.0014)	-0.003213*** (0.0002)	0.01218*** (0.0014)	-0.002812*** (0.0002)
<b>GDP growth (t-1)*crisis</b>	-0.04433*** (0.0074)	0.004871*** (0.0009)	-0.07570*** (0.0057)	0.006861*** (0.0007)	-0.04488*** (0.0062)	0.004913*** (0.0008)
<b>crisis</b>	-0.04433*** (0.0074)	0.004871*** (0.0009)	-0.07570*** (0.0057)	0.006861*** (0.0007)	-0.04488*** (0.0062)	0.004913*** (0.0008)
<b>EPL (t-1)</b>	-0.1263** (0.0519)	-0.08276*** (0.0075)				
<b>PMR (t-1)</b>			-0.01866*** (0.0044)	-0.001651*** (0.0005)		
<b>CCB (t-1)</b>					-0.07741*** (0.0057)	0.006126*** (0.0006)
<b>male</b>	0.01541*** (0.0038)	0.0002213 (0.0004)	0.01854*** (0.0035)	0.0004118 (0.0005)	0.01858*** (0.0035)	-0.0001378 (0.0004)
<b>education</b>						
<b>medium</b>	0.05647*** (0.0043)	-0.01178*** (0.0006)	0.05721*** (0.0040)	-0.01137*** (0.0006)	0.05749*** (0.0040)	-0.01137*** (0.0006)
<b>high</b>	0.1189*** (0.0057)	-0.02438*** (0.0006)	0.1205*** (0.0054)	-0.02411*** (0.0006)	0.1207*** (0.0054)	-0.02410*** (0.0006)
<b>age</b>						
<b>25-34</b>	-0.005666 (0.0050)	-0.02323*** (0.0012)	-0.002127 (0.0058)	-0.02357*** (0.0014)	-0.005430 (0.0050)	-0.02324*** (0.0012)
<b>35-44</b>	-0.04780*** (0.0054)	-0.03657*** (0.0012)	-0.04650*** (0.0061)	-0.03757*** (0.0013)	-0.04696*** (0.0053)	-0.03662*** (0.0012)
<b>45-54</b>	-0.09891*** (0.0056)	-0.04238*** (0.0012)	-0.09729*** (0.0064)	-0.04364*** (0.0013)	-0.09825*** (0.0056)	-0.04244*** (0.0012)
<b>55-64</b>	-0.1946*** (0.0068)	-0.04563*** (0.0012)	-0.1887*** (0.0077)	-0.04738*** (0.0014)	-0.1942*** (0.0068)	-0.04568*** (0.0012)
<b>constant</b>	0.2364*** (0.0182)	0.1161*** (0.0027)	0.4135*** (0.0179)	0.07397*** (0.0025)	0.3171*** (0.0176)	0.08036*** (0.0024)
<b>N</b>	203072	2088705	272002	2667854	272002	2667854
<b>R-sq</b>	0.0517	0.0213	0.0598	0.0202	0.0604	0.0203

Notes: Linear probability model pooled over different countries. The dependent variable is, depending on the model, the worker flows from unemployment to employment (U-E) or from employment to unemployment (E-U). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. EPL (t-1) refers to Employment Protection Legislation for regular contracts from the OECD. PMR (t-1) refers to the OECD indicator of regulation in energy, transport and communications (ETCR). The degree of centralisation of collective bargaining index was developed by the Fraser Institute and has been flipped to make it consistent with the other policy variables (i.e. the higher the index the lower the flexibility in wage setting). The specification is the same as in Table 1, namely: GDP growth (t-1), GDP growth (t-1)\*crisis, crisis, male, education, age, time fixed effects and country fixed effects. All euro area countries included, except Germany. The policy variables are estimated one at a time in the respective equation (i.e., not included all together). The estimation is conducted over the period 2000-2015. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

**Table 6b****Impacts of institutional rigidities on worker flows (reforming countries)**

	Reforming countries					
	2000-2015 (1) U-E	2000-2015 (2) E-U	2000-2015 (3) U-E	2000-2015 (4) E-U	2000-2015 (5) U-E	2000-2015 (6) E-U
<b>GDP growth (t-1)</b>	0.04306*** (0.0048)	-0.007311*** (0.0007)	0.02414*** (0.0025)	-0.002375*** (0.0004)	0.01666*** (0.0021)	-0.002450*** (0.0003)
<b>GDP growth (t-1)*crisis</b>	-0.04169*** (0.0089)	0.01242*** (0.0018)	-0.01459*** (0.0027)	0.001961*** (0.0005)	-0.01503*** (0.0023)	0.002145*** (0.0004)
<b>crisis</b>	-0.08001*** (0.0070)	0.01109*** (0.0009)	-0.03824*** (0.0062)	0.005045*** (0.0008)	-0.05549*** (0.0072)	0.008033*** (0.0009)
<b>EPL (t-1)</b>	-0.1619*** (0.0228)	-0.07117*** (0.0121)				
<b>PMR (t-1)</b>			-0.03219*** (0.0062)	-0.007779*** (0.0009)		
<b>CCB (t-1)</b>					-0.06402*** (0.0061)	0.008161*** (0.0008)
<b>male</b>	0.03663*** (0.0066)	-0.002524* (0.0013)	0.04346*** (0.0057)	0.003359** (0.0011)	0.04316*** (0.0057)	0.003361** (0.0011)
<b>education</b>						
<b>medium</b>	0.04347*** (0.0089)	-0.01828*** (0.0019)	0.03886*** (0.0073)	-0.01598*** (0.0015)	0.03834*** (0.0073)	-0.01596*** (0.0015)
<b>high</b>	0.08291*** (0.0091)	-0.03771*** (0.0015)	0.08385*** (0.0080)	-0.03473*** (0.0013)	0.08378*** (0.0080)	-0.03472*** (0.0013)
<b>age</b>						
<b>25-34</b>	0.0001674 (0.0064)	-0.02364*** (0.0015)	-0.003725 (0.0055)	-0.02337*** (0.0013)	-0.002310 (0.0058)	-0.02352*** (0.0014)
<b>35-44</b>	-0.04535*** (0.0067)	-0.03757*** (0.0014)	-0.04514*** (0.0058)	-0.03661*** (0.0012)	-0.04775*** (0.0061)	-0.03746*** (0.0013)
<b>45-54</b>	-0.09789*** (0.0070)	-0.04368*** (0.0014)	-0.09830*** (0.0061)	-0.04248*** (0.0012)	-0.09830*** (0.0064)	-0.04352*** (0.0013)
<b>55-64</b>	-0.1921*** (0.0083)	-0.04715*** (0.0015)	-0.1966*** (0.0073)	-0.04545*** (0.0013)	-0.1893*** (0.0078)	-0.04729*** (0.0014)
<b>constant</b>	0.2918*** (0.0845)	0.2146*** (0.0150)	0.6500*** (0.0586)	0.1080*** (0.0095)	0.5151*** (0.0341)	0.1189*** (0.0054)
<b>N</b>	79970	647934	123230	1031656	123230	1031656
<b>R-sq</b>	0.0960	0.0247	0.1042	0.0238	0.1045	0.0238

Notes: Linear probability model pooled over different countries. The dependent variable is, depending on the model, the worker flows from unemployment to employment (U-E) or from employment to unemployment (E-U). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. EPL (t-1) refers to Employment Protection Legislation for regular contracts from the OECD. PMR (t-1) refers to the OECD indicator of regulation in energy, transport and communications (ETCR). The degree of centralisation of collective bargaining index was developed by the Fraser Institute and has been flipped to make it consistent with the other policy variables (i.e. the higher the index the lower the flexibility in wage setting). The specification is the same as in Table 1, namely: GDP growth (t-1), GDP growth (t-1)\*crisis, crisis, male, education, age, time fixed effects and country fixed effects. The group of reforming countries includes Spain, Greece, and Portugal. The policy variables are estimated one at a time in the respective equation (i.e., not included all together). The estimation is conducted over the period 2000-2015. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

Furthermore, the hypothesis that the increase in the worker flows' responsiveness to GDP after the crisis is directly related to the implementation of reforms is further refined and tested in Tables 7 and

8 by including additional control variables in specification (2). Accordingly, in Table 7 (a, b), we estimate the linear probability specification (2) over the whole sample period (2000-2015) and include, one at a time, the previous indicators of labour and product market regulation: EPL (t-1), PMR (t-1) and CCB (t-1). After controlling for the downturn during the recession with the usual “crisis” and “GDP growth (t-1)\*crisis” variables, we also add interaction terms between GDP growth and the various policy variables to the specification, as well as the policy variables separately after inverting them<sup>28</sup>. The new econometric results confirm the statistical significance of the institutional variables, while the positive parameters of these inverted policy variables indicate that higher employment protection, higher product market regulation and a higher degree of centralisation of wage bargaining – indicated by a fall in the policy variables - tend to reduce worker flows (confirming the results of Table 6). In addition, the interaction terms between GDP growth and the various inverted policy variables are statistically significant and provide a direct indication that reforms (indicated by an increase in the inverted policy variables) increase the responsiveness of worker flows to GDP growth. Similar statistically significant results for the relationship between employment-GDP elasticities and the policy variables are shown for the reforming countries (Table 7b).

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<sup>28</sup> In view of the inclusion of the interaction term of GDP with the policy variables, the policy indicators have been inverted (i.e., the higher the value of the indicator, the less stringent the regulation), making it easier to interpret the parameter.

**Table 7a**

Alternative method of capturing change in responsiveness of worker flows to GDP growth by including inverted indicators of institutional rigidities (euro area countries)

	EA countries					
	2000-2015	2000-2015	2000-2015	2000-2015	2000-2015	2000-2015
	(1) U-E	(2) E-U	(3) U-E	(4) E-U	(5) U-E	(6) E-U
<b>GDP growth (t-1)</b>	0.2751*** (0.0221)	-0.06695*** (0.0037)	0.05220*** (0.0034)	-0.009028*** (0.0005)	0.02084*** (0.0040)	-0.001362* (0.0005)
<b>crisis</b>	-0.08302*** (0.0094)	0.004174*** (0.0012)	-0.03037*** (0.0084)	0.001194 (0.0011)	-0.08652*** (0.0070)	0.007525*** (0.0010)
<b>GDP growth (t-1)*crisis</b>	-0.02477*** (0.0035)	0.0006862 (0.0005)	-0.02233*** (0.0022)	0.002181*** (0.0003)	-0.01941*** (0.0023)	0.002003*** (0.0003)
<b>EPL (t-1)</b>	0.1674*** (0.0200)	0.009789*** (0.0028)				
<b>GDP growth (t-1)*EPL (t-1)</b>	0.04914*** (0.0044)	-0.01228*** (0.0007)				
<b>PMR (t-1)</b>			0.05522*** (0.0039)	0.01430*** (0.0006)		
<b>GDP growth (t-1)*PMR (t-1)</b>			0.02189*** (0.0012)	-0.003684*** (0.0002)		
<b>CCB (t-1)</b>					0.05107*** (0.0070)	-0.001786* (0.0009)
<b>GDP growth (t-1)*CCB (t-1)</b>					0.0007487 (0.0006)	-0.0008675*** (0.0001)
<b>constant</b>	-0.3948*** (0.0969)	0.03854** (0.0135)	0.3990*** (0.0152)	0.06025*** (0.0023)	-0.1758** (0.0537)	0.1050*** (0.0071)
<b>N</b>	203072	2088705	272002	2667854	272002	2667854
<b>R-sq</b>	0.0461	0.0210	0.0574	0.0201	0.0542	0.0192

Notes: Linear probability model pooled over different countries. The dependent variable is, depending on the model, the worker flows from unemployment to employment (U-E) or from employment to unemployment (E-U). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. EPL (t-1) refers to Employment Protection Legislation for regular contracts from the OECD. PMR (t-1) refers to the OECD indicator of regulation in energy, transport and communications (ETCR). The degree of centralisation of collective bargaining index (CCB) was developed by the Fraser Institute and has been flipped to make it consistent with the other policy variables (i.e. the higher the index the greater the flexibility in wage setting). The policy variables in this estimation have been inverted: the higher the index the greater the flexibility in wage setting. The specification includes: GDP growth (t-1), an intercept dummy variable where GDP growth is negative during the crisis as well as an interaction of this dummy with GDP growth (t-1), reform indicator, as well as an interaction of this reform indicator with GDP growth (t-1), male, education, age. Time and Country FE are included. All euro area countries included (except Germany). The estimation is conducted over the period 2000-2015. GDP growth (t-1) is measured in percentage points. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

**Table 7b**

Alternative method of capturing change in responsiveness of worker flows to GDP growth by including inverted indicators of institutional rigidities (reforming countries)

	Reforming countries					
	2000-2015	2000-2015	2000-2015	2000-2015	2000-2015	2000-2015
	(1) U-E	(2) E-U	(3) U-E	(4) E-U	(5) U-E	(6) E-U
<b>GDP growth (t-1)</b>	0.2682*** (0.0244)	-0.07264*** (0.0047)	0.04503*** (0.0033)	-0.009943*** (0.0006)	0.08027*** (0.0083)	-0.02232*** (0.0016)
<b>crisis</b>	-0.08756*** (0.0100)	0.004936** (0.0016)	-0.00002530 (0.0097)	0.006629*** (0.0015)	-0.05198*** (0.0080)	0.003520** (0.0012)
<b>GDP growth (t-1)*crisis</b>	-0.02675*** (0.0039)	-0.0003608 (0.0007)	-0.03710*** (0.0027)	0.004077*** (0.0005)	-0.01038*** (0.0027)	-0.0005363 (0.0005)
<b>EPL (t-1)</b>	0.2083*** (0.0199)	0.007332* (0.0030)				
<b>GDP growth (t-1)*EPL (t-1)</b>	0.04722*** (0.0049)	-0.01335*** (0.0009)				
<b>PMR (t-1)</b>			0.04473*** (0.0039)	0.01454*** (0.0005)		
<b>GDP growth (t-1)*PMR (t-1)</b>			0.02470*** (0.0013)	-0.004689*** (0.0002)		
<b>CCB (t-1)</b>					0.04017*** (0.0080)	-0.004570*** (0.0013)
<b>GDP growth (t-1)*CCB (t-1)</b>					0.01794*** (0.0014)	-0.004679*** (0.0003)
<b>constant</b>	-0.6060*** (0.0967)	0.1229*** (0.0147)	0.5241*** (0.0132)	0.04302*** (0.0021)	0.1553** (0.0527)	0.05459*** (0.0087)
<b>N</b>	79970	647934	123230	1031656	123230	1031656
<b>R-sq</b>	0.0860	0.0242	0.0986	0.0241	0.0943	0.0234

Notes: Linear probability model pooled over different countries. The dependent variable is, depending on the model, the worker flows from unemployment to employment (U-E) or from employment to unemployment (E-U). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. EPL (t-1) refers to Employment Protection Legislation for regular contracts from the OECD. PMR (t-1) refers to the OECD indicator of regulation in energy, transport and communications (ETCR). The degree of centralisation of collective bargaining index (CCB) was developed by the Fraser Institute and has been flipped to make it consistent with the other policy variables (i.e. the higher the index the greater the flexibility in wage setting). The policy variables in this estimation have been inverted: the higher the index the greater the flexibility in wage setting. The specification includes: GDP growth (t-1), an intercept dummy variable where GDP growth is negative during the crisis as well as an interaction of this dummy with GDP growth (t-1), reform indicator, as well as an interaction of this reform indicator with GDP growth (t-1), male, education, age, time fixed effects and country fixed effects. The group of reforming countries includes Spain, Greece, and Portugal. The estimation is conducted over the period 2000-2015. GDP growth (t-1) is measured in percentage points. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

Finally, in Table 8 (a, b), we test the robustness of the increase in the job flows' responses to output elasticity after the crisis by introducing an intercept dummy variable for the period 2000-2007 as well as an interaction of this dummy with GDP growth (t-1), as in Table 6. In addition, as a robustness check to make sure that any change in the GDP growth parameter in the reforming period is not simply due to non-linearities, we also include a squared term of GDP growth to capture possible non-linearities in the relationship between economic activity and worker flows. We also include the non-inverted policy variables (although we exclude the interaction terms between the policy variables and GDP growth as they would be capturing the same effect as the GDP growth and pre-crisis dummy interaction term). The results suggest that indeed the employment-GDP relationship is more accurately modelled by adding a squared GDP growth term<sup>29</sup>, while at the same time confirming that the response of worker flows to GDP growth in the euro area countries increased in the reforming period during the recovery from the crisis (Table 8a). In addition, the results also confirm a statistically significant association between the institutional variables and job transitions across employment and unemployment (with the negative parameter indicating that more stringent regulations tend to decrease worker flows). Finally, similar results are found for the reforming countries although the non-linearities for the U-E flows are less evident (Table 8b).

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<sup>29</sup> More specifically, the higher is the GDP growth, the higher (lower) is the probability for an individual to flow from unemployment (employment) to employment (unemployment).

**Table 8a**

Impacts of non-linear growth effects and institutional rigidities on worker flows (euro area countries) including pre-crisis dummy interacted with GDP

	EA countries					
	2000-2015	2000-2015	2000-2015	2000-2015	2000-2015	2000-2015
	(1) U-E	(2) E-U	(3) U-E	(4) E-U	(5) U-E	(6) E-U
<b>GDP growth (t-1)</b>	0.04783*** (0.0054)	-0.0015** -0.0003	0.05709*** (0.0038)	-0.003579*** (0.0005)	0.04833*** (0.0036)	-0.003268*** (0.0005)
<b>GDP growth (t-1)*crisis</b>	-0.05923*** (0.0103)	0.004379** (0.0014)	-0.08236*** (0.0061)	0.002683** (0.0009)	-0.06714*** (0.0057)	0.002377** (0.0008)
<b>crisis</b>	-0.06996*** (0.0100)	0.0001080 (0.0013)	-0.07451*** (0.0076)	0.003644*** (0.0010)	-0.06285*** (0.0074)	0.003394*** (0.0010)
<b>GDP growth (t-1)*pre-crisis</b>	-0.04166*** (0.0040)	0.001719*** (0.0004)	-0.03458*** (0.0029)	0.002229*** (0.0003)	-0.03772*** (0.0029)	0.002040*** (0.0003)
<b>pre-crisis</b>	0.1106*** (0.0063)	-0.01532*** (0.0008)	0.1180*** (0.0064)	-0.01591*** (0.0008)	0.1062*** (0.0058)	-0.01644*** (0.0007)
<b>GDP growth (t-1)<sup>2</sup></b>	0.001358 (0.0007)	-0.0008668*** (0.0001)	0.001891*** (0.0003)	-0.0001439*** (0.0000)	0.001131*** (0.0002)	-0.0001385*** (0.0000)
<b>EPL (t-1)</b>	-0.2005*** (0.0209)	-0.01200*** (0.0029)				
<b>PMR (t-1)</b>			-0.02863*** (0.0035)	-0.001623** (0.0006)		
<b>CCB (t-1)</b>					-0.04858*** (0.0068)	0.003285*** (0.0009)
<b>constant</b>	0.5760*** (0.0248)	0.09332*** (0.0035)	0.2137*** (0.0117)	0.1196*** (0.0020)	0.2761*** (0.0184)	0.1102*** (0.0027)
<b>N</b>	203072	2088705	272002	2667854	272002	2667854
<b>R-sq</b>	0.0484	0.0212	0.0579	0.0200	0.0581	0.0200

Notes: Linear probability model pooled over different countries. The dependent variable is, depending on the model, the worker flows from unemployment to employment (U-E) or from employment to unemployment (E-U). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. EPL (t-1) refers to Employment Protection Legislation for regular contracts from the OECD. PMR (t-1) refers to the OECD indicator of regulation in energy, transport and communications (ETCR). The degree of centralisation of collective bargaining index (CCB) was developed by the Fraser Institute and has been flipped to make it consistent with the other policy variables (i.e. the higher the index the lower the flexibility in wage setting). The specification includes: GDP growth (t-1), an intercept dummy variable where GDP growth is negative during the crisis as well as an interaction of this dummy with GDP growth (t-1), squared GDP growth (t-1), an intercept dummy variable for the period 2000-2007 as well as an interaction of this dummy with GDP growth (t-1), reform indicator, male, education, age. Time and Country FE are included. All euro area countries included (except Germany). The estimation is conducted over the period 2000-2015. GDP growth (t-1) is measured in percentage points. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

**Table 8b**

Impacts of non-linear growth effects and institutional rigidities on worker flows (reforming countries) including pre-crisis dummy interacted with GDP.

	Reforming countries					
	2000-2015 (1) U-E	2000-2015 (2) E-U	2000-2015 (3) U-E	2000-2015 (4) E-U	2000-2015 (5) U-E	2000-2015 (6) E-U
<b>GDP growth (t-1)</b>	0.1029*** (0.0143)	-0.01235*** (0.0025)	0.09302*** (0.0128)	-0.007475*** (0.0021)	0.07135*** (0.0122)	-0.005211** (0.0020)
<b>GDP growth (t-1)*crisis</b>	-0.1355*** (0.0197)	0.006056 (0.0038)	-0.1065*** (0.0160)	0.0002206 (0.0030)	-0.07444*** (0.0154)	-0.002726 (0.0028)
<b>crisis</b>	-0.06302*** (0.0133)	0.005341** (0.0020)	-0.04671*** (0.0127)	0.002858 (0.0019)	-0.03774** (0.0127)	0.004049* (0.0019)
<b>GDP growth (t-1)*pre-crisis</b>	-0.02857*** (0.0080)	0.003119** (0.0010)	-0.02876*** (0.0081)	0.002362* (0.0011)	-0.02431** (0.0079)	0.00246** -0.0006
<b>pre-crisis</b>	0.06673*** (0.0095)	-0.01287*** (0.0013)	0.08544*** (0.0101)	-0.01279*** (0.0014)	0.05986*** (0.0096)	-0.01195*** (0.0013)
<b>GDP growth (t-1)^2</b>	-0.00005789 (0.0008)	-0.001570*** (0.0001)	-0.0005911 (0.0005)	-0.0006763*** (0.0001)	0.0005806 (0.0005)	-0.0007993*** (0.0001)
<b>EPL (t-1)</b>	-0.2409*** (0.0214)	-0.05219*** (0.0126)				
<b>PMR (t-1)</b>			-0.03441*** (0.0045)	-0.00156** (0.0003)		
<b>CCB (t-1)</b>					-0.06521*** (0.0085)	0.007166*** (0.0012)
<b>constant</b>	0.6302*** (0.0261)	0.08043*** (0.0040)	0.4381*** (0.0159)	0.09007*** (0.0028)	0.5977*** (0.0324)	0.06454*** (0.0049)
<b>N</b>	79970	647934	123230	1031656	123230	1031656
<b>R-sq</b>	0.0886	0.0242	0.0956	0.0228	0.0966	0.0229

Notes: Linear probability model pooled over different countries. The dependent variable is, depending on the model, the worker flows from unemployment to employment (U-E) or from employment to unemployment (E-U). It is a dummy variable which is equal to 1 if the individual flows in the specific year and 0 if she remains in the origin group. EPL (t-1) refers to Employment Protection Legislation for regular contracts from the OECD. PMR (t-1) refers to the OECD indicator of regulation in energy, transport and communications (ETCR). The degree of centralisation of collective bargaining index (CCB) was developed by the Fraser Institute and has been flipped to make it consistent with the other policy variables (i.e. the higher the index the lower the flexibility in wage setting). The specification includes: GDP growth (t-1), an intercept dummy variable where GDP growth is negative during the crisis as well as an interaction of this dummy with GDP growth (t-1), squared GDP growth (t-1), an intercept dummy variable for the period 2000-2007 as well as an interaction of this dummy with GDP growth (t-1), reform indicator, male, education, age. Time and Country FE are included. The group of reforming countries includes Spain, Greece, and Portugal. The estimation is conducted over the period 2000-2015. GDP growth (t-1) is measured in percentage points. Robust standard errors are shown in parentheses: \* p<0.1, \*\* p<0.05, \*\*\* p<0.01.

## 4. Conclusions

Previous work using macroeconomic data shows that employment-output elasticities increased for some reforming euro area countries during the recovery from the crisis, while many firms in comprehensive and large surveys in some of these countries also state that it became easier to adjust employment due to reforms implemented during the crisis. In this paper, we build on these previous findings by using micro (individual-level) data across euro area countries to investigate whether flows from employment to unemployment, and from unemployment to employment, also display a change in behaviour and flexibility after the crisis, and whether structural reforms are associated with any change in flexibility.

We econometrically estimate the determinants of worker flows across employment and unemployment in euro area countries during the period 2000-2015, using individual-level micro data from the Eurostat Labour Force Survey (EU-LFS), and use socio-demographic variables (such as gender, age, and education), as well as macroeconomic data as explanatory variables (e.g., changes in GDP dynamics) to capture Okun-style macroeconomic relationships within a micro data estimation framework. We find that the micro data-based worker flows show a higher responsiveness to changes in GDP after the crisis, particularly for a group of euro area countries which implemented significant reforms. Secondly, we empirically estimate whether institutional features of the labour market (such as employment protection legislation, product market regulation, and the degree of collective bargaining) have an impact on worker flows. We find that the institutional variables are statistically significant and their signs indicate that the higher the rigidities, or the higher the restrictiveness of the regulation, the lower the worker flows. Further interaction terms between the GDP growth variable and institutional variables also indicate that structural reforms seem to be behind the increased responsiveness of the flows to changes in GDP for reforming countries (as reducing these rigidities via structural reforms can increase worker flows in euro area countries and make the labour market more flexible). Another important question is whether our above finding of increased responsiveness of worker flows to the evolution of GDP is only due to the increase in temporary contracts in some (particularly reforming) countries after the crisis. We therefore re-estimate our specification but only use data for unemployed workers flowing to employment and hired under a permanent contract: the results confirm our findings of an increase in the worker flows-GDP elasticity in the post-crisis period, particularly for the selected group of euro area reforming countries. Accordingly, our conclusion is that the general increased responsiveness of

flows to output is not driven by those hired on temporary contracts but also applies to those hired on permanent contracts. Finally, we show that the above results still hold after various robustness checks are carried out.

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## Annex

### Further details on the European Union Labour Force Survey (EU LFS)<sup>30</sup>

The EU-LFS is conducted in the 28 Member States of the European Union, 4 candidate countries and 3 countries of the European Free Trade Association (EFTA) in accordance with Council Regulation (EEC) No. 577/98 of 9 March 1998. The surveys are conducted by the national statistical institutes across Europe (interviewing around 1.5 million people) and are centrally processed by Eurostat. The EU-LFS is a large sample survey among private households which provides detailed quarterly data on the employment status of all the individuals of the household aged 15 and over. It also collects information on many dimensions regarding the socio-demographic characteristics of the individuals, as well as some characteristics of the jobs filled, and the methods used by the unemployed to find a job. The data collection covers the years from 1983 onwards. Initially, its results covered one quarter per year only (usually in spring), but since 1998 it has undergone a transition to a continuous survey, with interviews distributed across all weeks of the year, in order to give reliable quarterly results. In general, data for individual countries are available depending on their accession date.

One advantage of the survey for our purpose is that the definition of labour status is similar across countries. As for socio-demographic characteristics, the age of the respondent refers to the difference between the date of the reference week and her date of birth. It is set out in 5-year age bands: 15-24; 25-34; 35-44; 45-54; 55-64. Educational attainment level refers to the highest level of education or training successfully completed by the individual, considering both general and vocational education/training, (ISCED 1997). We group them under three different categories: low (highest completed level of education is compulsory education, ISCED 0-2), medium (general and vocational studies from compulsory education to pre-college, ISCED 3-4), and highly educated individuals (college degree of a minimum duration of two years or a similar vocational degree, ISCED 5 and 6). This classification is sufficiently broad and delivers homogeneous groupings across countries, but there could still be some cross-country heterogeneity in this regard.

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<sup>30</sup> More can be found on <https://ec.europa.eu/eurostat/web/microdata/european-union-labour-force-survey>.