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Employment protection legislation, adjustment costs and cross-country differences in cost behavior

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ABSTRACT

Central to the economic theory of sticky costs is the proposition that managers consider adjustment costs when changing resource levels. We test this proposition using employment protection legislation (EPL) provisions in different countries as a proxy for labor adjustment costs. Using a large sample of firms in 19 OECD countries during 1990–2008, we find that the degree of cost stickiness at the firm level varies with the strictness of the country-level EPL provisions. This finding supports the theory that cost stickiness reflects the deliberate resource commitment decisions of managers in the presence of adjustment costs.

1. Introduction

Recent studies have documented strong evidence of asymmetric cost behavior. Costs are "sticky" when they respond less to decreases in activity than to increases in activity (Anderson et al., 2003). The prevalence of cost stickiness calls into question the validity of the traditional cost model, which implies a mechanical, symmetric relation between changes in activity and changes in costs. Considering this potential source of asymmetry in cost behavior (and, thus, in earnings) has also been shown to be informative in forecasting earnings and understanding earnings management in financial accounting research (e.g., Banker and Chen, 2006; Weiss, 2010).

Prior research suggests that the key to understanding sticky cost behavior is to view many costs as arising from managers' deliberate resource commitment decisions and speculates that adjustment costs play a central role in these decisions (e.g., Anderson et al., 2003). When activity levels decrease, managers can choose to retain some unutilized resources to reduce the adjustment costs associated with cutting resources. By contrast, when activity levels increase, managers must acquire the required additional resources. Therefore, to the extent that managers recognize the tradeoffs that arise because of adjustment costs, they will cut resources to a lesser extent when activity decreases than they will expand resources when activity increases, generating cost stickiness (Anderson et al., 2003).

Prior studies of sticky costs have relied on informal arguments about tradeoffs associated with adjustment costs. However, such tradeoffs have been explored in much greater depth in the literature on dynamic factor demand in

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economics (e.g., Bentolila and Bertola, 1990; Caballero, 1991; Abel and Eberly, 1994), which formally derives optimal decision rules given adjustment costs. We leverage this literature in developing our predictions.

The dynamic factor demand literature shows that the optimal resource commitment decisions are generally asymmetric. For example, Caballero (1991) points out that "in general, for the asymmetric case, the stock of capital responds more to 'good' than to 'bad' realizations" (p. 284). Bentolila and Bertola (1990) obtain similar predictions for labor. Therefore, this economics literature derives the cost accounting notion of cost stickiness as a direct consequence of optimal decisions with adjustment costs.[1]

The economic theory of optimal decisions with adjustment costs provides a theoretically sound potential explanation for the widely documented empirical patterns of cost stickiness. We will refer to this potential explanation as the "economic theory of sticky costs." However, this is not the only plausible explanation. For example, stickiness may also arise due to managers' empire-building behavior (Anderson et al., 2003; Chen et al., 2012). Different explanations for stickiness have different practical implications (Section 2), and therefore, it is important to directly examine *why* costs are sticky (and not just whether they are sticky).[2]

In this paper, we test the central empirical implication of the economic theory of sticky costs. As we show in Section 2, if cost stickiness reflects deliberate resource commitment decisions by managers who face adjustment costs, then the degree of cost stickiness should reflect the magnitude of these adjustment costs. This prediction is specific to the economic theory of sticky costs, and it allows us to conduct a rigorous empirical test of the theory.

Despite the importance of adjustment costs in this theory, the relation between adjustment costs and cost stickiness has yet to be tested empirically because of the difficulty of identifying broad, reliable proxies for adjustment cost.[3] In this study, we exploit the provisions of employment protection legislation (EPL) as a source of considerable labor adjustment costs. As previous studies in labor economics have demonstrated, EPL imposes substantial firing costs on employers (e.g., Long and Siebert, 1983; Pissarides, 1999). Thus, we can use indexes of EPL strictness, which are compiled and reported for most OECD countries, as reliable empirical proxies for the adjustment costs associated with firing workers.

Because stricter EPL reflects greater downward adjustment costs for labor, the economic theory of sticky costs predicts that firms in a country with stricter EPL provisions will exhibit greater cost stickiness (i.e., a greater degree of asymmetry in their cost responses to increases versus decreases in sales). Therefore, we hypothesize that a positive relation exists between country-level EPL strictness and firm-level cost stickiness.

We conduct empirical tests of this hypothesis using a large sample of publicly listed companies from 19 OECD countries. The empirical results support our predictions and are consistent with the economic theory of sticky costs (i.e., the theory that cost stickiness reflects deliberate resource commitment decisions by managers who recognize the tradeoffs associated with adjustment costs).

Our study contributes to the growing body of literature on cost behavior by demonstrating that the degree of cost stickiness varies across countries as a function of EPL strictness—a readily available empirical proxy for labor adjustment costs that has been widely used (and has been shown to be reliable) in prior economics research (e.g., Long and Siebert, 1983; Lazear, 1990; Pissarides, 1999; Blanchard and Portugal, 2001). Our results show that a full understanding of cost behavior in general and of cost stickiness in particular requires careful analysis not only of the firm-specific factors analyzed in the prior literature but also of the economy-wide structural forces.

The paper is structured as follows. In Section 2, we describe the economic theory of sticky costs and employment protection legislation and then derive our hypotheses. In Section 3, we describe the data and the empirical models. Section 4 presents the empirical results and Section 5 concludes the paper.

2. Cost stickiness, adjustment costs and employment protection legislation

2.1. The economic explanation for sticky costs

The traditional textbook view of cost behavior implies a symmetric mechanical relation between changes in activity and changes in costs. However, recent research on sticky costs (e.g., Anderson et al., 2003; Balakrishnan et al., 2004; Banker et al., 2010; Weiss, 2010; Dierynck et al., 2012) documents pervasive asymmetries in cost behavior (stickiness and anti-stickiness[4]) that are inconsistent with the traditional view.

The sticky costs literature speculates that such asymmetries arise because of deliberate resource commitment decisions made by managers who face adjustment costs, such as hiring and firing costs for labor or installation and disposal costs for

[1] This literature focuses on the implications of adjustment costs for macro outcomes such as unemployment levels. However, we are able to leverage similar insights to generate our predictions for firm-level cost behavior.

[2] Some recent studies have claimed that the findings of cost stickiness in the literature may be spurious and may not reflect actual asymmetries in cost behavior. However, Banker et al. (2010) identify methodological errors in these studies and thus show that their claims are unfounded.

[3] Unlike costs incurred to provide productive capacity, adjustment costs are typically opportunity costs that are not recorded in the accounting system. Therefore, direct measurement is infeasible for researchers.

[4] Formally, costs are said to be "sticky" if they increase more for a 1% increase in activity than they decrease for an equivalent decrease in activity; correspondingly, they are said to be "anti-sticky" (Weiss, 2010) if they increase less for a 1% increase in activity than they decrease for an equivalent decrease in activity.

equipment. When activity decreases, managers retain some unutilized resources to avoid the adjustment costs associated with cutting resources. However, when activity expands beyond the available resource capacity, managers must add the required resources. Due to this asymmetry, managerial discretion in the case of activity decreases can generate cost stickiness (e.g., Anderson et al., 2003). Banker et al. (2012) note that the resource expansion associated with activity increases is also subject to managerial discretion and argue that this discretion can lead to anti-stickiness when managers are pessimistic about future sales.

Prior studies of sticky costs have relied on informal verbal arguments regarding managerial decisions and adjustment costs. However, similar decisions have been modeled formally in the literature on dynamic factor demand in economics (e.g., Hamermesh, 1989; Bentolila and Bertola, 1990; Caballero, 1991; Abel and Eberly, 1994; Hamermesh and Pfann, 1996; Dixit, 1997; Eberly and Van Mieghem, 1997; Palm and Pfann, 1997; Goux et al., 2001). This literature examines the dynamic optimization problem that managers face with regard to adjustment costs and derives the optimal decision rules. For the sake of clarity, we describe these decision rules as they relate to labor resources, where the adjustment costs are the hiring and firing costs per worker; however, the corresponding logic for other capacity resources is similar. Optimal manager decisions regarding labor trade off the adjustment costs associated with hiring or firing a marginal worker against the net present value of cash flows that this worker is expected to generate during her tenure with the firm (Bentolila and Bertola, 1990; Abel and Eberly, 1994).[5] When activity increases, managers will hire additional workers as long as the NPV of the marginal worker exceeds the hiring cost. Conversely, when activity decreases, managers will fire workers as long as the NPV of the marginal worker is negative and is sufficiently large (in absolute value) to exceed the firing cost (i.e., as long as it is more costly for the firm to keep this marginal worker than it is to fire her).[6]

One key insight from the dynamic factor demand literature is that the optimal decision rules are generally asymmetric (e.g., Bentolila and Bertola, 1990; Caballero, 1991). For example, if the firing cost per worker exceeds the hiring cost, then managers will be more reluctant to incur firing costs to lay off workers when activity decreases than to incur hiring costs to recruit new workers when activity increases.[7] Therefore, the number of workers will increase to a greater extent in response to activity increases than it will decrease in response to activity decreases of the same magnitude. Hence, the cost accounting notion of cost stickiness arises directly from optimal managerial behavior with adjustment costs.[8]

We draw on this economic theory of optimal resource commitment decisions with adjustment costs to provide a theoretically sound explanation for the widely documented empirical findings of cost stickiness. We will term this potential explanation the "economic theory of sticky costs." However, this explanation is not the only plausible one. For example, if managers engage in empire-building (Anderson et al., 2003; Chen et al., 2012), they will be eager to expand the resources under their control when activity increases but will be reluctant to eliminate unused resources when activity decreases. This inclination can generate cost stickiness, even in the absence of adjustment costs. The various explanations for stickiness have different practical implications,[9] and therefore, our goal is to examine not only whether costs are sticky but also *why* they are sticky.

Accordingly, we derive and test the central empirical implication of the economic theory of sticky costs. As we show next, the theory predicts that the degree of cost stickiness will be higher when the firing costs for labor (or downward adjustment costs more generally) are higher. By combining this theoretical prediction with reliable empirical proxies for firing costs, we are able to rigorously test the theory, shedding light on *why* costs are sticky.

Firing costs have both direct and indirect effects on the degree of cost stickiness. First, higher firing costs directly increase cost stickiness. In firing decisions associated with activity decreases, managers trade off the NPV of the marginal worker against the (increased) firing costs. Therefore, for the same decrease in activity, they will lay off fewer workers, as it will now be costlier to do so.[10] By contrast, in hiring decisions associated with activity increases, managers will trade off the NPV of the marginal worker against the unchanged hiring costs, and therefore, increased firing costs will have no direct

[5] The marginal worker's cash flows consist of her marginal revenue product net of wages and net of firing costs at the (random) future end of her tenure.

[6] With linear hiring and firing costs, there is also a region of inaction: if the NPV of the marginal worker is less than the hiring cost and greater than the negative of the firing cost, then the firm will neither hire nor fire workers.

[7] Technically, activity decreases (increases) lead to layoffs (new hires) if they reduce (increase) the NPV of the marginal worker to below the negative of the firing cost (above the hiring cost). Therefore, if the firing cost is disproportionately larger, layoffs will occur only for disproportionately low levels of the NPV (which reflect large activity decreases), whereas new hires will occur even for moderately high levels of the NPV (which reflect moderate activity increases). Additionally, if activity expands beyond the available resource capacity, managers will need to hire additional workers simply to be able to accommodate the increased demand (when available capacity is insufficient, the NPV of the marginal worker is high, making it optimal to add capacity by hiring new workers).

[8] This argument pertains to stickiness with regard to physical resource levels (e.g., the number of employees). However, empirical studies often use broad cost categories, such as SG&A costs or operating costs, which include not only the costs of these physical resources but also the explicit adjustment costs incurred when resource levels change (e.g., the cost of severance pay). The latter provides another source of stickiness because the firm incurs adjustment costs in both cutting resources and expanding resources. This will limit cost reduction for activity decreases and amplify cost expansion for activity increases, generating additional cost stickiness. This mechanism generates additional stickiness regardless of whether the firing cost is greater than, equal to or less than the hiring cost.

[9] For example, if stickiness arises due to empire-building, it reflects wasteful managerial behavior that reduces firm value (and therefore should be discouraged in designing managers' incentives). By contrast, under the economic theory of sticky costs, the same stickiness reflects desirable managerial behavior that increases firm value (and therefore should be encouraged).

[10] Technically, after the firm has laid off the optimal number of workers, the NPV of the marginal retained worker is equal to the negative of the firing cost per worker. When the firing cost is higher, the NPV of the marginal retained worker is therefore lower (more negative), which implies that the firm retains more unutilized workers with negative NPV.

effect on the number of new hires. By limiting layoffs in the case of activity decreases but not limiting new hires in the case of activity increases, higher firing costs directly increase the degree of cost stickiness.[11]

Second, firing costs have an additional indirect effect via the NPV of the marginal worker, which affects both firing and hiring decisions. By making future layoffs costlier, higher firing costs reduce the NPV of the marginal worker and thus make her less valuable for the firm (e.g., Bentolila and Bertola, 1990). Therefore, managers will be reluctant both to hire additional workers when activity increases and to retain existing workers when activity decreases. This indirect effect will reduce the number of new hires under activity increases and increase the number of layoffs under activity decreases, partially counteracting the positive direct effect of firing costs on stickiness as described in the previous paragraph. However, the direct effect will dominate because it is driven by the firing costs that will be incurred immediately and are certain to occur, whereas the indirect effect via the NPV reflects only the anticipated costs of future layoffs, which are both discounted and weighted by the probability of future layoffs and which thus will play a far smaller role in managers' decisions.

Finally, firing costs affect the amount of slack labor carried over from the prior period, which also affects cost stickiness (e.g., Balakrishnan et al., 2004). By limiting the layoffs associated with activity decreases, higher firing costs increase slack. However, by limiting the new hires associated with activity increases, higher firing costs reduce slack. On average, the latter effect is likely to dominate because activity increases are much more common in the data than are activity decreases (at 64.1% and 35.9%, respectively, in our sample). Therefore, higher firing costs are likely to reduce the average amount of slack, which leads to fewer layoffs in the case of activity decreases and more new hires in the case of activity increases, further amplifying cost stickiness.

In summary, under the economic theory of sticky costs, higher firing costs increase the degree of cost stickiness of labor. This is a central testable implication of the economic theory of sticky costs.[12] Furthermore, adjustment costs play a central (and quantitatively large) role in cost behavior if this theory is valid.

2.2. Employment protection legislation (EPL) as a proxy for labor adjustment costs

Despite the central role of adjustment costs in the economic theory of sticky costs, few studies have been able to empirically examine the relation between adjustment costs and cost stickiness. The primary challenge is that adjustment costs are difficult to measure directly. As Hamermesh and Pfann (1996) point out, many adjustment costs are implicit costs of lost output rather than explicit monetary costs recorded in the accounting system.[13] Nevertheless, a few studies have been able to examine this relation using firm-level proxies for adjustment costs, such as asset and employee intensity (e.g., Anderson et al., 2003). By contrast, in this paper, we exploit *country-level* proxies for labor adjustment costs, which are based on the strictness of the employment protection legislation in each country, and we link these proxies to cross-country variation in cost stickiness. (We also control for firm-level determinants of cost stickiness following prior literature.) Compared to firm-level proxies used in the prior literature, employment protection measures present an advantage in that they are exogenous with respect to managers' resource commitment decisions.[14]

Our empirical proxy for labor adjustment costs, employment protection legislation (EPL), is central to a firm's institutional environment. EPL is the body of rules regarding the dismissal of employees, including procedural restrictions on layoffs and regulations regarding severance pay levels. Employment protection imposes substantial firing costs on employers (Long and Siebert, 1983; Pissarides, 1999; OECD, 2004). As we document in Section 3, there are substantial differences in the strictness of EPL across the countries in our data, which thus provides a rich source of exogenous cross-country variation in firing costs.[15]

Prior research in labor economics (e.g., Lazear, 1990; Bentolila and Bertola, 1990; Hopenhayn and Rogerson, 1993; Mortensen and Pissarides, 1999; Heckman et al., 2000; Botero et al., 2004) documents that EPL is a major source of firing costs and that it has important effects on various macroeconomic outcomes, such as unemployment rates and long-term productivity growth. We exploit the same cross-country variation in EPL, but our main focus is different: we are interested in the role of EPL in firm-level cost behavior (which is of interest to managers planning resource levels and costs) rather than its role in macroeconomic outcomes (which is of interest to policy-makers formulating broad macroeconomic policy). Despite the different focus of our study, in developing our empirical predictions, we are able to leverage the insights from these prior studies regarding the link between EPL and labor adjustment costs.

[11] For cost categories that directly capture the explicit monetary adjustment costs incurred (such as severance pay or training costs recorded in operating costs), increased firing costs have an additional direct effect. When the firing cost per worker is higher, managers will incur higher total firing costs for the same number of layoffs. This will limit cost savings from layoffs in the case of activity decreases, further amplifying stickiness.

[12] The parallel prediction for hiring decisions (i.e., the slope for activity increases) is ambiguous. Conditional on the amount of slack, higher firing costs directly limit the number of new hires. However, by lowering the average amount of slack, higher firing costs increase the number of new hires needed to accommodate activity increases.

[13] For example, following layoffs, some of the remaining workers may have to be reassigned to new tasks, which may temporarily reduce productivity. Likewise, after new workers are hired, more experienced workers may have to spend time training them, which may also reduce productivity.

[14] By contrast, measures such as asset intensity are partially outcomes of prior managerial decisions made in response to past shocks, which may still have a persistent direct effect on costs in the current period.

[15] Because EPL includes only the restrictions and costs associated with firing workers, we expect it to affect firing costs but not hiring costs.

As we show in Section 2.1, the economic theory of sticky costs implies that higher downward adjustment costs should lead to greater stickiness in resource adjustment. Because stricter EPL increases the magnitude of firing costs (the downward adjustment costs for labor), we expect stricter EPL to increase the stickiness of labor costs, and because direct and indirect labor costs account for a large fraction of operating costs, we expect stricter EPL to increase the stickiness of operating costs.[16] This prediction yields our main hypothesis:

Hypothesis 1. Stricter employment protection legislation (EPL) is associated with a greater degree of stickiness of operating costs.

3. Research methodology

We empirically examine the relation between EPL and cost stickiness for firms in the OECD member countries. We choose this research setting because the OECD includes all of the major developed economies and because measures of EPL and other labor market characteristics for the OECD countries are reliably and systematically reported. In addition, as discussed in Section 2.2, a rich body of literature within labor economics has examined various aspects of EPL and other labor market characteristics for OECD countries (e.g., Lazear, 1990; Bentolila and Bertola, 1990; Hopenhayn and Rogerson, 1993; Mortensen and Pissarides, 1999; Heckman et al., 2000; Botero et al., 2004; and many others). We can leverage these studies both in formulating our empirical predictions and in identifying the appropriate empirical measures of EPL and additional labor market control variables.

3.1. Empirical measures of employment protection legislation

We use the EPL strictness indexes defined and reported in OECD (2004). These indexes reflect the legislative provisions governing the firing of regular employees, which address issues such as the length of notice period before dismissal and severance pay levels. They also reflect the regulations governing temporary forms of employment, such as the maximum duration of employment on fixed-term contracts. For each country, OECD (2004) characterizes employment protection in terms of 14 basic items, described in panels A and B of Table 2, and combines them into indexes of EPL strictness for regular employees *REGEPL* and temporary employees *TEMPEPL*, as well as an aggregate index of overall EPL strictness. The weighting scheme for the indexes is described in panel C of Table 2 and illustrated using the examples in Table 3. The indexes range from 0 to 6, and higher scores represent stricter EPL.

For example, in Table 3, we present the composition of the EPL indexes for the US and Portugal, which have the lowest and highest levels of EPL strictness, respectively, in our sample. Panel A describes the EPL provisions for regular employees. The explicit monetary firing cost, mandated severance pay (item 4), is equal to zero in the US, whereas in Portugal, it ranges from 3 to 20 months of regular pay depending on the worker's tenure. Portugal also imposes a number of significant (and costly) procedural restrictions. For example, the notice period prior to dismissal (item 3) in Portugal is 2 months, whereas it is zero in the US. Panel B describes the EPL provisions for temporary forms of employment. Employers in the US face no restrictions on the use of fixed-term contracts (items 9–11), whereas employers in Portugal can use no more than three consecutive fixed-term contracts, and these contracts can last no longer than 30 months in total. Likewise, US employers face no constraints in their use of temp agencies (items 12–14), whereas Portuguese employers face restrictions on the number of renewals and the total duration of their contracts through temp agencies. OECD (2004) converts each basic item into a numerical score from 0 to 6 using the conversion rules described in panels A and B of Table 2. We present these scores for the US and Portugal in the right two columns in Table 3. Most of the scores for the US are equal to zero, indicating minimal regulation, whereas most of the scores for Portugal range from 4 to 6, indicating strict regulations. OECD (2004) combines these scores into relatively detailed "level 2" indicators of EPL strictness, aggregates them further to "level 3" indexes of employment protection for regular and temporary employees (*REGEPL* and *TEMPEPL*), and then combines these indexes into a single "level 4" index of overall EPL strictness using the weights presented in panel C of Table 2. We illustrate this aggregation process for the US and Portugal in panel C of Table 3.

Notably, although EPL provisions impose substantial explicit and implicit firing costs on employers, they do not impose any hiring costs. Therefore, EPL indexes serve as a proxy for firing costs only.[17]

Table 4 presents the EPL indexes for the 19 OECD countries in our sample (Australia, Austria, Belgium, Canada, Denmark, Finland, Germany, Ireland, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, the UK and the US).[18] There is substantial variation in overall EPL strictness. The US and the UK have the lowest scores (0.2 and 0.6, respectively), whereas Portugal and France have the highest scores (3.7 and 3.0, respectively). Countries with stricter EPL for regular workers typically have stricter EPL for temporary workers (the correlation between *REGEPL* and *TEMPEPL* is 0.789). However, there is also some meaningful independent variation. For example, France has moderate EPL for regular

[16] We focus on operating costs rather than labor costs due to the data limitations of Compustat. The data on labor costs have a high proportion of missing observations (69% is missing in our sample), and even when data are available, they are less reliable than are data on operating costs. Among firms that report labor costs, these costs account for 28% of total operating costs on average.

[17] Cross-country differences in hiring costs are an omitted variable that may also affect cost stickiness. However, as long as this omitted variable is unrelated to EPL, it will not distort the estimates of the effect of EPL. We also conduct several robustness checks to ensure that our results are not driven by omitted hiring costs.

[18] We do not include countries that joined the OECD after the beginning of our sample period, as most of them are transition economies in Eastern Europe. We also discard OECD countries with missing data on labor market characteristics (Iceland, Luxembourg, Mexico, New Zealand and Turkey).

Table 1
Variable definitions.

n	country index
i	firm index
t	year index
$XOPR_{n,i,t}$	operating costs for firm i in country n in year t, deflated to control for inflation
$SALE_{n,i,t}$	sales revenue for firm i in country n in year t, deflated to control for inflation
$GDPGROWTH_{n,t}$	real GDP growth in country n in year t
$DEC_{n,i,t}$	dummy variable equal to one for sales decreases
$AINT_{n,i,t}$	asset intensity for firm i in country n in year t, computed as the log ratio of assets to sales, ln(AT/SALE)
LAW_n	dummy variable equal to one for common-law countries (Australia, Canada, Ireland, UK and US), zero otherwise
$REGEPL_n$	index of employment protection legislation (EPL) for regular employees in country n in late 1990s, from Table 2.A2.4 in OECD (2004). $REGEPL_n$ ranges from 0 to 6, and higher values correspond to stricter EPL. The computation of $REGEPL_n$ is described in Table 2
$TEMPEPL_n$	index of employment protection legislation (EPL) for temporary employees in country n in late 1990s, from Table 2.A2.4 in OECD (2004). $TEMPEPL_n$ ranges from 0 to 6, and higher values correspond to stricter EPL. The computation of $TEMPEPL_n$ is described in Table 2
EPL_n	aggregate index of employment protection legislation (EPL) in country n in late 1990s, computed as $(REGEPL_n + TEMPEPL_n)/2$ following OECD (2004)
TUD_n	trade union density in country n in 2000, from OECD (2004).
BCC_n	bargaining coordination and centralization index for country n in late 1990s, from OECD (2004)
$BNFT_n$	unemployment benefits index for country n in late 1990s, from Nickell et al. (2005)

Table 2
Calculation of the summary indexes of EPL strictness reported in OECD (2004).

For each country, OECD (2004) characterizes employment protection along 14 basic items described in Panels A and B below, and then aggregates these basic items into summary indexes of employment protection for regular employees ($REGEPL_n$), temporary employees ($TEMPEPL_n$) and an overall index of employment protection (EPL_n). As a first step in computing the indexes, OECD (2004) renormalizes each basic item into a numerical score ranging from 0 to 6, where higher values represent stricter regulation (the renormalization rules are presented in the third column in Panels A and B below). After that, it computes the summary indexes of EPL as a weighted average of the numerical scores for individual items, with weights described in Panel C below. We provide a specific example of these computations in Section 3.1 and in Table 3.

Panel A. Basic items of EPL for regular employees (*Source*: Table 2.A1.1 in OECD, 2004)

Basic item	Short description		Assignment of numerical scores of strictness						
			0	1	2	3	4	5	6
Item 1 Dismissal notification procedures	**Scale 0–3** 0 when an oral statement is enough 1 when a written statement of the reasons for dismissal must be supplied to the employee 2 when a third party (such as works council or the competent labor authority) must be notified 3 when the employer cannot proceed to dismissal without authorization from a third party		Scale × 2[a]						
Item 2 Delay involved before dismissal notice can start	**Delay in days** Estimated time includes, where relevant, the following assumptions: 6 days are counted in case of required warning procedure, 1 day when dismissal can be notified orally or the notice can be directly handed to the employee, 2 days when a letter needs to be sent by mail and 3 days when this must be a registered letter		≤ 2	< 10	< 18	< 26	< 35	< 45	≥ 45[b]
Item 3 Length of the notice period at	9 months tenure	**Notice period in months**	0	≤ 0.4	≤ 0.8	≤ 1.2	< 1.6	< 2	≥ 2
	4 years tenure	**Notice period in months**	0	≤ 0.75	≤ 1.25	< 2	< 2.5	< 3.5	≥ 3.5
	20 years tenure	**Notice period in months**	< 1	≤ 2.75	< 5	< 7	< 9	< 11	≥ 11
Item 4 Severance pay at	9 months tenure	**Months pay**	0	≤ 0.5	≤ 1	≤ 1.75	≤ 2.5	< 3	≥ 3
	4 years tenure	**Months pay**	0	≤ 0.5	≤ 1	≤ 2	≤ 3	< 4	≥ 4
	20 years tenure	**Months pay**	0	≤ 3	≤ 6	≤ 10	≤ 12	≤ 18	> 18
Item 5 Definition of justified or unfair dismissal	**Scale 0–3** 0 when worker capability or redundancy of the job are adequate and sufficient ground for dismissal 1 when social considerations, age or job tenure must when possible influence the choice of which worker(s) to dismiss 2 when a transfer and/or a retraining to adapt the worker to different work must be attempted prior to dismissal 3 when worker capability cannot be a ground for dismissal		Scale × 2						
Item 6 Length of trial period	**Trial period length in months** Period within which, regular contracts are not fully covered by employment protection provisions and unfair dismissal claims can usually not be made		≥ 24	> 12	> 9	> 5	> 2.5	≥ 1.5	< 1.5

Table 2 (*continued*)

Panel A. Basic items of EPL for regular employees (*Source*: Table 2.A1.1 in OECD, 2004)

Basic item	Short description	Assignment of numerical scores of strictness						
		0	1	2	3	4	5	6
Item 7 Compensation following unfair dismissal	**Compensation measured in terms of months pay**	≤3	≤8	≤12	≤18	≤24	≤30	>30
Item 8 Possibility of reinstatement following unfair dismissal	**Scale 0–3** The extend of reinstatement is based upon whether, after finding of unfair dismissal, the employee has the option of reinstatement into his/her previous job, even if this is against the wishes of the employer	Scale × 2						

[a]For example, if a written statement is required (scale=1), the numerical score on item 1 will be 1 × 2=2 points out of 6.
[b]For example, if the delay exceeds 45 days, the numerical score on item 2 will be 6 points out of 6.

Panel B. Basic items of EPL for temporary employees (*Source:* Table 2.A1.1 in OECD, 2004)

Basic item	Short description	Assignment of numerical scores of strictness						
		0	1	2	3	4	5	6
Item 9 Valid cases for use of fixed-term contracts (FTC)	**Scale 0–3** 0 fixed-term contracts are permitted only for "objective" or "material situation", i.e., to perform a task which itself is of fixed duration; 1 if specific exemptions apply to situations of employer need (e.g., launching a new activity) or employee need (e.g., workers in search of their first job) 2 when exemption exist on both the employer and employee sides 3 when there are no restrictions on the use of fixed-term contracts	6 − Scale × 2[a]						
Item 10 Maximum number of successive FTC	**Maximum number of contracts**	No limit	≥5	≥4	≥3	≥2	≥1.5	<1.5[b]
Item 11 Maximum cumulated duration of successive FTC	**Maximum cumulated duration in months**	No limit	≥36	≥30	≥24	≥18	≥12	<12
Item 12 Types of work for which temporary work agency (TWA) employment is legal	**Scale 0–4** 0 when TWA employment is illegal 1–3 depending upon the degree of restrictions; 4 when no restrictions apply	6 − Scale × 6/4						
Item 13 Restrictions on number of renewals	**Yes/no**	–	–	No	–	Yes	–	–
Item 14 Maximum cumulated duration of TWA contracts	**Maximum cumulated duration in months**	No limit	≥36	≥24	≥18	≥12	≥6	<6

[a]For example, if there are no restrictions on the use of fixed-term contracts (scale=3), the numerical score on item 9 will be 6–3 × 2=0 points out of 6.
[b]For example, if the maximum allowed number of successive fixed-term contracts is less than 1.5, the numerical score on item 10 will be 6 points out of 6.

Panel C. EPL summary indexes at different levels of aggregation and the weighting scheme (*Source:* Table 2.A1.2 in OECD, 2004)

Level 4 index	**Level 3 indexes**	**Level 2 indexes**	**Level 1 variables (basic items)**		
Scale 0-6	Scale 0–6	Scale 0–6	Scale 0–6		
Overall summary index of employment protection EPL_n	Regular employment protection index $REGEPL_n$ (1/2)	Index of procedural inconveniences (1/3)	1. Notification procedures		(1/2)
			2. Delay to start a notice		(1/2)
		Index of notice and severance pay for no-fault individual dismissals (1/3)	3. Notice period after	9 months	(1/7)
				4 years	(1/7)
				20 years	(1/7)
			4. Severance pay after	9 months	(4/21)
				4 years	(4/21)
				20 years	(4/21)

Table 2 (*continued*)

Panel C. EPL summary indexes at different levels of aggregation and the weighting scheme (*Source:* Table 2.A1.2 in OECD, 2004)

Level 4 index	Level 3 indexes	Level 2 indexes	Level 1 variables (basic items)	
		Index of difficulty of dismissal (1/3)	5. Definition of unfair dismissal	(1/4)
			6. Trial period	(1/4)
			7. Compensation	(1/4)
			8. Reinstatement	(1/4)
	Temporary employment regulation index $TEMPEPL_n$ (1/2)	Index of fixed term contracts (1/2)	9. Valid cases for use of fixed-term contracts	(1/2)
			10. Maximum number of successive contracts	(1/4)
			11. Maximum cumulated duration	(1/4)
		Index of temporary work agency employment (1/2)	12. Types of work for which is legal	(1/2)
			13. Restrictions on number of renewals	(1/4)
			14. Maximum cumulated duration	(1/4)

The numbers in parentheses are the weights used in constructing the higher-level index. For example, the level-2 index of procedural inconveniences in the third column is computed as $(1/2)\times$ item1 $+(1/2)\times$ item2 from the fourth column. Likewise, the level-3 index of regular employment protection (*REGEPL*) in the second column is computed as a weighted average of the first three level-2 indexes in the third column with weights of 1/3 each.

workers (at 1.8, which is lower than the median of 2.3) but features stricter EPL for temporary workers than does any other country in the sample (at 3.3, which is far above the median of 1.6). By contrast, the Netherlands has strict EPL for regular workers (3.1) but below-median EPL for temporary workers (1.2).

3.2. Sample selection and descriptive statistics

We use data from Compustat (Global and North America) for publicly listed non-financial firms in the 19 OECD countries for the years 1988–2008.[19] We control for inflation using country-specific GDP deflators. We discard firm-years if (1) sales or operating costs are missing or negative for the current year or the two prior years, (2) operating costs are less than 50% or greater than 200% of sales for the current or two prior years, or (3) assets are missing or negative for the current year. We also discard firms for which data are reported in a non-native currency (as when European firms report their figures in US dollars).[20] We then discard 1% outliers in each tail for the dependent variable (the log-change in operating costs) and for the continuous firm-level explanatory variables (the log-change in sales and asset intensity). We also discard firm-years if sales increased by more than 50% or decreased by more than 33% in the current or prior year,[21] as extreme year-on-year changes in sales mostly reflect mergers or divestitures. The final sample includes 128,333 observations for 15,833 firms in 19 OECD countries for the period 1990–2008.[22] We merge this sample with the previously described EPL data and with additional country-level control variables from several sources.[23] The variable definitions are summarized in Table 1.

The descriptive statistics are presented in Table 4. In addition to the substantial differences in EPL strictness discussed above, there are important cross-country differences in other variables. For example, the average annual GDP growth ranges from 1.1% in Italy to 6.2% in Ireland, and the average annual sales growth ranges from 2.2% for Japanese firms to 5.3% for Irish firms. We control for such differences in the estimation.

3.3. Empirical models

We use a hierarchical linear model in which the behavior of a level-1 outcome (firm-level cost behavior) is formulated as a function of level-2 explanatory variables (country-level characteristics) and firm-level control variables.

We begin with the following level-1 (firm-level) model of cost behavior that links annual changes in operating costs (*XOPR*) to contemporaneous changes in sales revenue (*SALE*) following the sticky costs model of Noreen and Soderstrom

[19] For most countries in Global Compustat, data are available only for 1988 onwards.

[20] The results are similar when we do not discard such firms.

[21] These percentage cutoffs (-33% and $+50\%$) are symmetric when transformed into the log-change form (ln(2/3) and ln(3/2), respectively), which we use in the estimation.

[22] The first two lags in the data are used up in computing the first differences and preparing the control variables, so the final sample in estimation starts in 1990 rather than in 1988.

[23] The annual GDP growth rates and GDP deflators are taken from the World Bank Databank (databank.worldbank.org/ddp/home.do). The labor market control variables (union density, bargaining coordination and centralization index and unemployment benefits index) are taken from OECD (2004) and Nickell et al. (2005).

Table 3
Example: Calculation of EPL indexes for the US and Portugal.

Panel A. Basic items of EPL provisions for regular employees in the US and Portugal (*Source:* Table 2.A2.1 in OECD, 2004)

Basic item	Brief description of EPL provisions		Numerical score (out of 6 points)[a]	
	US	Portugal	US	Portugal
Item 1 Dismissal notification procedures	Oral statement is enough	A third party (such as works council or the competent labor authority) must be notified	0	4
Item 2 Delay involved before dismissal notice can start	1 day	21 days	0	3
Item 3 Length of the notice period	0 months at 9 months tenure 0 months at 4 years tenure 0 months at 20 years tenure	2 months at 9 months tenure 2 months at 4 years tenure 2 months at 20 years tenure	0 0 0	6 4 1
Item 4 Severance pay	0 months pay at 9 months tenure 0 months pay at 4 years tenure 0 months pay at 20 years tenure	3 months pay at 9 months tenure 4 months pay at 4 years tenure 20 months pay at 20 years tenure	0 0 0	6 6 6
Item 5 Definition of justified or unfair dismissal	Worker capability or redundancy of the job are adequate and sufficient ground for dismissal	A transfer and/or a retraining to adapt the worker to different work must be attempted prior to dismissal	0	4
Item 6 Length of trial period	Data not available	2 months	–	5
Item 7 Compensation following unfair dismissal	Data not available	20 months pay	–	4
Item 8 Possibility of reinstatement following unfair dismissal	0.5 on a scale from 0 to 3	2.5 on a scale from 0 to 3	1	5

[a]EPL provisions are converted into numerical scores following the rules outlined in panel A of Table 2.

Panel B. Basic items of EPL provisions for temporary employees in the US and Portugal (*Source:* Table 2.A2.2 in OECD, 2004)

Basic item	Brief description of EPL provisions		Numerical score (out of 6 points)[a]	
	US	Portugal	US	Portugal
Item 9 Valid cases for use of fixed-term contracts (FTC)	there are no restrictions on the use of fixed-term contracts	exemptions exist on both the employer and employee sides	0	2
Item 10 Maximum number of successive FTC	no limit	3	0	3
Item 11 Maximum cumulated duration of successive FTC	no limit	30 months	0	2
Item 12 Types of work for which temporary work agency (TWA) employment is legal	no restrictions	medium degree of restrictions	0	3
Item 13 Restrictions on number of renewals	no	yes	2	4
Item 14 Maximum cumulated duration of TWA contracts	no limit	9 months	0	5

[a]EPL provisions are converted into numerical scores following the rules outlined in panel B of Table 2.

Panel C. Computation of EPL summary indexes at different levels of detail for the US and Portugal

Level 2 indexes (based on the weighting scheme from the fourth column of Table 2 panel C, and numerical scores on items 1–14 from panels A and B above):

- Procedural inconveniences (items 1–2): US$=(1/2)\times 0+(1/2)\times 0=0$; Portugal$=(1/2)\times 4+(1/2)\times 3=3.5$
- Notice and severance pay for no-fault individual dismissals (items 3–4, each weighted at three different levels of tenure): US$=(1/7)\times 0+(1/7)\times 0+(1/7)\times 0+(4/21)\times 0+(4/21)\times 0+(4/21)\times 0=0$; Portugal$=(1/7)\times 6+(1/7)\times 4+(1/7)\times 1+(4/21)\times 6+(4/21)\times 6+(4/21)\times 6=5.0$
- Difficulty of dismissal (items 5–8): US$=(1/2)\times 0+(1/2)\times 1=0.5$ (the data on items 6 and 7 is not available for the US, and the index is computed based on items 5 and 8 only, with weights rescaled to add up to 1); Portugal$=(1/4)\times 4+(1/4)\times 5+(1/4)\times 4+(1/4)\times 5=4.5$
- Fixed term contracts (items 9–11): US$=(1/2)\times 0+(1/4)\times 0+(1/4)\times 0=0$; Portugal$=(1/2)\times 2+(1/4)\times 3+(1/4)\times 2=2.25$
- Temporary work agency employment (items 12–14): US$=(1/2)\times 0+(1/4)\times 2+(1/4)\times 0=0.5$; Portugal$=(1/2)\times 3+(1/4)\times 4+(1/4)\times 5=3.75$

Level 3 indexes (based on the weighting scheme from the third column of Table 2 panel C, and level-2 indexes computed above):

- Regular employment protection $REGEPL_n$ (based on the first three level-2 indexes above): US$=(1/3)\times 0+(1/3)\times 0+(1/3)\times 0.5=0.17$; Portugal$=(1/3)\times 3.5+(1/3)\times 5.0+(1/3)\times 4.5=4.33$
- temporary employment regulation $TEMPEPL_n$ (based on the last two level-2 indexes above): US$=(1/2)\times 0+(1/2)\times 0.5=0.25$; Portugal$=(1/2)\times 2.25+(1/2)\times 3.75=3.0$

Level 4 index (based on the weighting scheme from the second column of Table 2 panel C, and level-3 indexes computed above):

- Overall summary index EPL_n: US$=(1/2)\times 0.17+(1/2)\times 0.25=0.21$; Portugal$=(1/2)\times 4.33+(1/2)\times 3.0=3.67$

Table 4
Descriptive statistics.

Country	Number of observations	Average $\Delta\ln XOPR$	Average $\Delta\ln SALE$	Average GDP growth	Overall EPL strictness	Regular EPL (*REGEPL*)	Temp. EPL (*TEMPEPL*)
Australia	3,798	0.045	0.041	3.5	1.2	1.5	0.9
Austria	755	0.051	0.048	2.4	2.2	2.9	1.5
Belgium	894	0.031	0.029	2.1	2.2	1.7	2.6
Canada	4,651	0.046	0.042	2.7	0.8	1.3	0.3
Denmark	1,254	0.038	0.036	2.0	1.4	1.5	1.4
Finland	1,192	0.050	0.049	2.9	2.1	2.3	1.9
France	5,941	0.042	0.040	1.9	3.0	2.3	3.6
Germany	5,613	0.030	0.029	1.6	2.5	2.7	2.3
Ireland	478	0.053	0.053	6.2	0.9	1.6	0.3
Italy	1,743	0.035	0.031	1.1	2.7	1.8	3.6
Japan	37,094	0.022	0.022	1.3	2.0	2.4	1.6
Netherlands	1,516	0.035	0.035	2.7	2.1	3.1	1.2
Norway	960	0.040	0.042	2.8	2.7	2.3	3.1
Portugal	414	0.027	0.029	1.9	3.7	4.3	3.0
Spain	1,187	0.043	0.042	3.2	2.9	2.6	3.3
Sweden	2,096	0.050	0.051	2.5	2.2	2.9	1.6
Switzerland	1,898	0.031	0.030	1.7	1.1	1.2	1.1
UK	12,286	0.035	0.032	2.5	0.6	0.9	0.3
US	44,563	0.041	0.039	2.8	0.2	0.2	0.3

The variable definitions are described in Table 1.

(1997) and Anderson et al. (2003)

$$\Delta\ln XOPR_{n,i,t} = \alpha_0 + \alpha_{1,n,i,t}\Delta\ln SALE_{n,i,t} + \alpha_{2,n,i,t} DEC_{n,i,t}\Delta\ln SALE_{n,i,t} + u_{n,i,t} \quad (1)$$

where $\Delta\ln XOPR_{n,i,t}$ represents the log-change in operating costs for firm i in country n in year t, $\Delta\ln SALE_{n,i,t}$ represents the log-change in sales, $DEC_{n,i,t}$ is a dummy variable that is equal to one if sales decrease in year t and zero otherwise, $u_{n,i,t}$ is an error term that has a zero mean and is independent of the explanatory variables, and the slopes $\alpha_{1,n,i,t}$ and $\alpha_{2,n,i,t}$ are specified in detail below. In this specification, the slope $\alpha_{1,n,i,t}$ ($\alpha_{1,n,i,t}+\alpha_{2,n,i,t}$) approximates the percentage change in costs for a 1% increase (decrease) in sales, and the cost stickiness coefficient $\alpha_{2,n,i,t}$ captures the degree of asymmetry in cost behavior (stickiness if $\alpha_{2,n,i,t}$ is negative and anti-stickiness if $\alpha_{2,n,i,t}$ is positive).

We introduce the level-2 model by specifying the firm-level slopes $\alpha_{1,n,i,t}$ and $\alpha_{2,n,i,t}$ in model (1) as a function of: *country-level* explanatory variables, firm-level control variables following prior studies (e.g., Anderson et al., 2003), and additional country-level random effects. In our main model (Model A), we specify the slope coefficients as

$$\alpha_{1,n,i,t} = \beta_1 + \gamma_1 EPL_n + \lambda_1 GDPGROWTH_{n,t} + \lambda_2 AINT_{n,i,t} + \lambda_3 LAW_n + \nu_{1,n} \quad (2a)$$

$$\alpha_{2,n,i,t} = \beta_2 + \gamma_2 EPL_n + \lambda_4 DEC_{n,i,t-1} + \lambda_5 GDPGROWTH_{n,t} + \lambda_6 AINT_{n,i,t} + \lambda_7 LAW_n + \nu_{2,n} \quad (2b)$$

where EPL_n is the employment protection legislation index for country n, $GDPGROWTH_{n,t}$ is real GDP growth rate for country n in year t, $AINT_{n,i,t}$ is the asset intensity (the log ratio of total assets to sales) of firm i in year t, LAW_n is a dummy variable that is equal to one for common-law countries, $DEC_{n,i,t-1}$ is a dummy variable that is equal to one if sales decreased in the prior period $t-1$, and $\nu_{1,n}$, $\nu_{2,n}$ are country-level random effects. Following Anderson et al. (2003), we use GDP growth ($GDPGROWTH_{n,t}$) and successive decreases in sales (captured by $DEC_{n,i,t-1}$) as empirical proxies for manager optimism or pessimism regarding future sales, and we use asset intensity ($AINT_{n,i,t}$) as an additional firm-level proxy for the magnitude of the adjustment costs facing the firm.[24] We include the common-law dummy LAW_n (equal to one for Australia, Canada, Ireland, the UK and the US) because prior economics research (e.g., LaPorta et al., 1997, 1998, 2000; Djankov et al., 2007) has found that the legal origin of a country (common versus code law) is one of the primary drivers of cross-country differences in corporate governance, access to external financing, business regulation and other outcomes that are likely to play an important role in firm-level cost behavior.[25] The country-level random effects $\nu_{1,n}$, $\nu_{2,n}$ capture the cross-country differences in cost behavior that are not accounted for by the explanatory variables in the model. By construction, $\nu_{1,n}$, $\nu_{2,n}$ have mean zero and are independent of the explanatory variables.

We extend the standard cost stickiness model of Anderson et al. (2003) by allowing EPL strictness and additional control variables to affect not only the degree of cost stickiness ($\alpha_{2,n,i,t}$) but also the slope for sales increases ($\alpha_{1,n,i,t}$). As we discuss in Section 2, managers may exercise discretion not only in decreasing resources but also in expanding resources in response to sales increases. Based on the economics of sticky costs, firing costs may affect not only firing decisions but also hiring decisions (Section 2.1). Therefore, EPL strictness may affect not only the stickiness coefficient $\alpha_{2,n,i,t}$ but also the slope for sales increases

[24] We do not include employee intensity as a control variable in our main specification because the number of employees is often not reported in Global Compustat. In untabled robustness checks, we obtain similar results after controlling for employee intensity.

[25] Using a limited sample of four countries, Calleja et al. (2006) also find that legal origin affects cost behavior.

$\alpha_{1,n,i,t}$. According to similar logic, we expect the variables $AINT_{n,i,t}$, $GDPGROWTH_{n,t}$ and $LAW_{n,t}$ to influence manager decisions both in the case of sales decreases and in the case of sales increases. Thus, we control for these variables in both $\alpha_{1,n,i,t}$ and $\alpha_{2,n,i,t}$.[26]

The main parameter of interest in the estimation is γ_2, which captures the relation between EPL strictness and the degree of cost stickiness. Hypothesis 1 implies $\gamma_2 < 0$, i.e., that stricter EPL should be associated with a more negative $\alpha_{2,n,i,t}$, which will indicate greater cost stickiness.[27]

By combining Eq. (1) with (2a) and (2b), we obtain our main estimation model.

Model A

$$\begin{aligned}\Delta\ln XOPR_{n,i,t} = {} & \beta_0 + (\beta_1 + \gamma_1 EPL_n + \lambda_1 GDPGROWTH_{n,t} + \lambda_2 AINT_{n,i,t} + \lambda_3 LAW_n)\Delta\ln SALE_{n,i,t} \\ & + (\beta_2 + \gamma_2 EPL_n + \lambda_4 DEC_{n,i,t-1} + \lambda_5 GDPGROWTH_{n,t} + \lambda_6 AINT_{n,i,t} + \lambda_7 LAW_n) DEC_{n,i,t}\Delta\ln SALE_{n,i,t} + \varepsilon_{n,i,t} \end{aligned} \quad (3)$$

where $\varepsilon_{n,i,t}$ is the error term, which combines the residuals from Eqs. (1), (2a) and (2b), and where the rest of the variables are as described above. The error term $\varepsilon_{n,i,t}$ can be rewritten as

$$\varepsilon_{n,i,t} = u_{n,i,t} + v_{1,n}\Delta\ln SALE_{n,i,t} + v_{2,n} DEC_{n,i,t}\Delta\ln SALE_{n,i,t} \quad (4)$$

where the original random shocks $u_{n,i,t}$, $v_{1,n}$, $v_{2,n}$ from Eqs. (1), (2a) and (2b) have zero means and are independent of the explanatory variables. Consequently, the combined error term $\varepsilon_{n,i,t}$ in Eq. (3) has a zero mean for any value of the explanatory variables,[28] and therefore, ordinary least squares (OLS) yields unbiased and consistent estimates. The inclusion of country-level random effects $v_{1,n}$, $v_{2,n}$ introduces cross-sectional correlation in $\varepsilon_{n,i,t}$ across firms within each country. It also generates heteroskedasticity because the random shocks $v_{1,n}$ and $v_{2,n}$ are multiplied by $\Delta\ln SALE$ and $DEC \times \Delta\ln SALE$, respectively. In addition to the within-country correlations across firms, the random shocks may also be correlated across countries because of global economic events. Therefore, we use two-way clustering by country and by year (Cameron et al., 2011), which is robust to an arbitrary pattern of within-country and cross-country correlations and an arbitrary pattern of serial correlation within each country.[29,30]

In robustness checks, we extend Model A by including additional control variables (such as union density and other labor market characteristics) in the slopes $\alpha_{1,n,i,t}$, $\alpha_{2,n,i,t}$ and by replacing the aggregate index of EPL strictness (EPL_n) with two more detailed measures of employment protection for regular employees ($REGEPL_n$) and temporary employees ($TEMPEPL_n$).

In another essential sensitivity analysis, we employ the extended cost stickiness framework developed by BBCM (Banker et al., 2012). BBCM show that the stickiness documented by Anderson et al. (2003) represents a combination of two distinct patterns: stickiness after prior sales increases and anti-stickiness after prior sales decreases. BBCM argue that this combined pattern of stickiness and anti-stickiness arises due to manager optimism (pessimism) following a prior sales increase (decrease). Optimism will lead managers to accelerate resource expansion for current sales increases and to limit resource cuts for current sales decreases, yielding greater stickiness. Conversely, pessimism will lead managers to limit resource expansion when sales rise and to accelerate resource cuts when sales fall, resulting in anti-stickiness. Following BBCM, we extend Model A by introducing interactions with manager optimism and pessimism in the slope for sales increases and in the degree of stickiness or anti-stickiness. We also introduce such interactions in the impact of EPL on both slopes. The estimation model is as follows:

Model B

$$\begin{aligned}\Delta\ln XOPR_{n,i,t} = {} & \beta_0 + (\beta_1^{OPT} INC_{n,i,t-1} + \beta_1^{PES} DEC_{n,i,t-1} + \gamma_1^{OPT} INC_{n,i,t-1} EPL_n + \gamma_1^{PES} DEC_{n,i,t-1} EPL_n \\ & + \lambda_1 GDPGROWTH_{n,t} + \lambda_2 AINT_{n,i,t} + \lambda_3 LAW_n)\Delta\ln SALE_{n,i,t} \\ & + (\beta_2^{OPT} INC_{n,i,t-1} + \beta_2^{PES} DEC_{n,i,t-1} + \gamma_2^{OPT} INC_{n,i,t-1} EPL_n + \gamma_2^{PES} DEC_{n,i,t-1} EPL_n \\ & + \lambda_4 GDPGROWTH_{n,t} + \lambda_5 AINT_{n,i,t} + \lambda_6 LAW_n) DEC_{n,i,t}\Delta\ln SALE_{n,i,t} + \varepsilon_{n,i,t} \end{aligned} \quad (5)$$

where $INC_{n,i,t-1}$ ($DEC_{n,i,t-1}$) is a dummy variable for prior sales increases (decreases), which proxies for manager optimism (pessimism), $GDPGROWTH_{n,t}$, $AINT_{n,i,t}$ and LAW_n are the control variables from Model A, and $\varepsilon_{n,i,t}$ is an error term. The parameters β_2^{OPT} (β_2^{PES}) capture the degree of stickiness or anti-stickiness under optimism (pessimism). The main parameters of interest are γ_2^{OPT} and γ_2^{PES}, which measure the impact of EPL strictness on the degree of cost stickiness. Hypothesis 1 implies that

[26] In contrast, Anderson et al. (2003) focused on managerial discretion only for sales decreases and assumed that mechanistic resource expansion would occur in the event of sales increases. Therefore, Anderson et al. did not include variables such as asset intensity or GDP growth in the slope for sales increases. Our empirical model nests this specification under the restriction $\lambda_1=\lambda_2=\lambda_3=\gamma_1=0$, which is rejected in our data at the 0.1% significance level.

[27] As we discuss in Section 2, the parallel effect of EPL strictness on the slope for sales increases ($\alpha_{1,n,i,t}$) is a priori ambiguous; therefore, we do not make any analogous predictions for sales increases.

[28] Formally, the expectation of the error term $\varepsilon_{n,i,t}$ conditional on the explanatory variables $X=\{\Delta\ln SALE_{n,i,t}, DEC_{n,i,t}, \ldots\}$ can be rewritten as $E(\varepsilon_{n,i,t}|X) = E(u_{n,i,t}|X) + E(v_{1,n}\Delta\ln SALE_{n,i,t}|X) + E(v_{2,n}DEC_{n,i,t}\Delta\ln SALE_{n,i,t}|X) = E(u_{n,i,t}|X) + \Delta\ln SALE_{n,i,t}E(v_{1,n}|X) + DEC_{n,i,t}\Delta\ln SALE_{n,i,t}E(v_{2,n}|X)$ where we can take $\Delta\ln SALE_{n,i,t}$ and $DEC_{n,i,t}\Delta\ln SALE_{n,i,t}$ out of the conditional expectation because they are part of the vector of conditioning variables X. Because $E(u_{n,i,t}|X) = E(v_{1,n}|X) = E(v_{2,n}|X) = 0$, based on the standard OLS assumptions for the original random shocks $u_{n,i,t}$, $v_{1,n}$, $v_{2,n}$, we obtain $E(\varepsilon_{n,i,t}|X) = 0$.

[29] The results are robust to alternative clustering schemes, such as two-way clustering by firm and year or one-way clustering by country or by firm combined with year effects to account for possible cross-country correlations driven by global shocks. However, (one-way or two-way) clustering by firm is less appropriate because macroeconomic shocks are likely to lead to correlated residuals across the firms within each country; thus, clustering by firm may yield inconsistent standard errors. Therefore, we use clustering by firm only as a robustness check.

[30] Alternatively, we could estimate Model A as a random-coefficients model using maximum likelihood estimation. However, this approach would be less robust because it would require additional distributional assumptions on the error terms in Eqs. (1), (2a) and (2b), yielding consistent estimates only if these additional assumptions hold in the data. When we use this random-coefficients approach, the main results are similar.

both γ_2^{OPT} and γ_2^{PES} should be negative (i.e., stricter EPL should increase stickiness in the optimistic case and reduce anti-stickiness in the pessimistic case).[31]

4. Empirical results

We present the estimates for Model A in column (a) of Table 5. The coefficients of the control variables (asset intensity, GDP growth and a dummy for successive sales decreases) have the expected signs and are consistent with the findings in the prior literature for the US data (e.g., Anderson et al., 2003). The main parameter of interest is γ_2, which captures the association between the strictness of employment protection legislation EPL_n and the degree of cost stickiness. The estimate of γ_2 is negative and significant at the 1% level ($\gamma_2 = -0.044$, $t = -8.43$). Therefore, stricter EPL in our data is associated with a greater degree of cost stickiness (i.e., a more negative stickiness coefficient $\alpha_{2,n,i,t}$), which supports Hypothesis 1.

In addition to being statistically significant, the association between EPL strictness and cost stickiness is also economically significant. For example, if we compare Switzerland and Portugal (the countries with the least strict and the most strict EPL in continental Europe, respectively), we find that the predicted cost stickiness coefficient for a firm in Portugal is 0.11 higher (in absolute value) than that of an equivalent firm in Switzerland. In comparison, the average degree of cost stickiness in the full sample is −0.081 (i.e., the extent of the cross-country variation in the cost stickiness driven by EPL is comparable to the average degree of cost stickiness).

In our first robustness check, we split the full sample period (1990–2008) into two shorter time periods, 1990–2000 and 2001–2008,[32] and re-estimate Model A separately for each subsample (columns (b) and (c) in Table 5). The estimates of γ_2 are negative and significant at the 5% level in both subsamples ($\gamma_2 = -0.046$, $t = -2.57$ between 1990 and 2000, and $\gamma_2 = -0.056$, $t = -2.69$ between 2001 and 2008), which lends additional support to Hypothesis 1. We also re-estimate the model after discarding the data for the US firms (column (d) in Table 5). US data account for 35% of the full sample and could thus have a disproportionate impact on the estimates. The estimates after we discard the US data ($\gamma_2 = -0.048$, $t = -11.46$) are very similar to our main estimates for the full sample. In another robustness check, we control for additional country-level labor market characteristics (trade union density, the unemployment benefits index and the collective bargaining coordination and centralization index), which may also affect cost stickiness. The estimates in this specification (Table 6) are similar to our main estimates in Table 5, indicating that stricter EPL is associated with significantly higher cost stickiness, even after we control for the main labor market characteristics in each country. The results (untabled) are also similar when we control for the unemployment rate in each country.[33]

Because cost stickiness may be influenced by the quality of corporate governance (e.g., Chen et al., 2012), we also control for indexes of creditor rights and shareholder protection from Djankov et al. (2007). The results (untabled) are similar to our main estimates, both with and without labor market controls. The results are also similar when we use an alternative shareholder protection index developed by LaPorta et al. (2006). Because the typical firm size varies across countries, we also control for size, which we proxy for using market value following Kama and Weiss (2011). The (untabled) results of this robustness check are similar, both when we split the data into subsamples of small versus large firms and when we add size as a continuous control variable in the slopes $\alpha_{1,n,i,t}$ and $\alpha_{2,n,i,t}$.

The cost structures of firms may also vary across countries for reasons unrelated to EPL, such as structural differences or geographical conditions. To control for such variation, we use two alternative proxies for operating leverage. In one specification, we add the log-ratio of net PP&E to sales as an additional explanatory variable to control for the fixed costs associated with property, plant and equipment.[34] In another specification, we follow Weiss (2010) in using the gross margin ratio as a proxy for operating leverage. The main results of these robustness checks are similar (untabled). We also examine the behavior of operating costs including depreciation.[35] The inclusion of depreciation reduces the proportion of labor costs in the dependent variable, which should weaken the relation between EPL strictness and stickiness because EPL determines adjustment costs only for the labor component of operating costs. As expected, the relation between EPL strictness and stickiness in this sensitivity

[31] The predicted increase in stickiness and reduction in anti-stickiness are changes in the same direction. In both cases, the stickiness coefficient ($\alpha_{2,n,i,t}$ in Eq. (1)) is predicted to decrease, becoming more negative (greater stickiness) under optimism and less positive (less anti-stickiness) under pessimism.

[32] The end of 2000 is a natural break point for this analysis because several major economic events occurred around that time, such as the introduction of the Euro in early 1999, the bursting of the dot-com bubble in 2000, and the collapse of Enron and related scandals, which significantly increased the scrutiny of corporate governance beginning in 2001. Another important factor was the spike in IT investment in late 1990s, which (in addition to fixing the Y2K bug) allowed companies to redefine their business processes and relationships with customers and suppliers (e.g., Anderson et al., 2006).

[33] Unlike EPL strictness, labor market characteristics and unemployment may affect both firing costs and hiring costs. For example, high unemployment may reduce hiring costs because firms can choose from a larger pool of qualified and interested candidates. Conversely, generous unemployment benefits may increase hiring costs because job seekers will be under less pressure to find new jobs. It is essential to use these control variables in the robustness checks because cross-country differences in cost stickiness may partially reflect differences in hiring costs.

[34] Our main Model A incorporates asset intensity (based on total assets following Anderson et al., 2003) as a control variable, which also captures some differences in cost structure.

[35] Our main measure of operating costs (mnemonic XOPR) excludes depreciation.

Table 5
Estimates of the relation between EPL and cost stickiness.

The estimation model is

$$\Delta\ln XOPR_{n,i,t} = \beta_0 + (\beta_1 + \gamma_1 EPL_n + \lambda_1 GDPGROWTH_{n,t} + \lambda_2 AINT_{n,i,t} + \lambda_3 LAW_n)\Delta\ln\ SALE_{n,i,t} + (\beta_2 + \gamma_2 EPL_n + \lambda_4 DEC_{n,i,t-1} + \lambda_5 GDPGROWTH_{n,t} + \lambda_6 AINT_{n,i,t} + \lambda_7 LAW_n)DEC_{n,i,t}\Delta\ln SALE_{n,i,t} + \varepsilon_{n,i,t}$$

where $\Delta\ln XOPR_{n,i,t}$ is the log-change in operating costs for firm i in country n in year t, $\Delta\ln SALE_{n,i,t}$ is the log-change in sales, $GDPGROWTH_{n,t}$ is the real GDP growth rate in country n in year t, $AINT_{n,i,t}$ is asset intensity (log ratio of assets to sales), LAW_n is a dummy variable equal to one for common-law countries, EPL_n is the aggregate employment protection legislation index for country n, $DEC_{n,i,t}$ is a dummy variable equal to one if sales decreased in year t, and $\varepsilon_{n,i,t}$ is an error term.

Coefficient	Expected sign	Main sample 1990–2008 (a)	Subsample 1990–2000 (b)	Subsample 2001–2008 (c)	Main sample excluding US (d)
β_0		0.001	0.000	0.002	0.000
		(0.65)	(0.05)	(1.18)	(−0.14)
β_1	+	0.913***	0.887***	0.913***	0.935***
		(71.15)	(31.71)	(63.32)	(114.89)
γ_1		0.019*	0.049**	0.010	0.004
		(1.65)	(2.50)	(0.86)	(0.30)
λ_1		0.004	0.005	−0.010	0.005
		(0.93)	(1.25)	(−1.08)	(0.89)
λ_2		−0.033***	−0.028***	−0.033**	−0.032**
		(−3.31)	(−2.62)	(−2.33)	(−2.06)
λ_3		0.021	0.095**	−0.013	0.007
		(0.80)	(2.06)	(−0.53)	(0.27)
β_2	−	−0.081***	−0.057**	−0.057	−0.103***
		(−11.46)	(−2.05)	(−1.46)	(−11.46)
γ_2 ***(EPL)***	−	**−0.044*** **	**−0.046** **	**−0.056*** **	**−0.048*** **
		(−8.43)	**(−2.57)**	**(−2.69)**	**(−11.46)**
λ_4	+	0.134***	0.124***	0.134***	0.111***
		(7.01)	(3.72)	(6.25)	(7.60)
λ_5	−	−0.001	−0.008*	0.025	0.001
		(−0.09)	(−1.96)	(1.36)	(0.13)
λ_6	−	−0.080***	−0.091***	−0.079***	−0.075***
		(−5.13)	(−3.93)	(−3.48)	(−3.46)
λ_7		−0.125***	−0.175***	−0.123**	−0.127***
		(−10.07)	(−5.30)	(−2.54)	(−9.75)
N		128,333	63,751	64,582	83,649
Adj. R^2		0.7925	0.8144	0.7722	0.7964

t-values in parentheses. The t-values are computed using two-way clustering by country and by year (Cameron et al., 2011). *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

analysis is weaker, but it remains significant. Because cost stickiness may depend on the long-term growth prospects of a firm, we also control for long-term growth rates.[36] The estimates in this robustness check (untabled) are similar to our main estimates. We also replace our main EPL index from OECD (2004) with an alternative EPL index from Botero et al. (2004) and obtain similar results (untabled). In another specification, we add country fixed effects and year effects to control for unobserved country-specific factors and time-varying unobserved global shocks.[37] The main results (untabled) are similar.

In an additional analysis, we replace our main index of EPL strictness (EPL_n) with two more detailed indexes of employment protection for regular and temporary employees ($REGEPL_n$ and $TEMPEPL_n$, respectively). Hypothesis 1 implies that stricter EPL for both regular and temporary employees should increase the degree of cost stickiness (i.e., the coefficients of both variables in $\alpha_{2,n,i,t}$ should be negative). As expected, the coefficients of $REGEPL_n$ and $TEMPEPL_n$ are negative and are jointly significant at the 1% level (both with and without the additional labor market controls), and the coefficient of $TEMPEPL_n$ is also individually significant at the 1% level (untabled).[38] The results are similar when we re-estimate the same model for shorter subsamples and when we discard the US data from the sample.

[36] We compute the growth rate for firm i as the average log-change in its deflated sales over the entire sample period in one specification and as the average in years $t-4,\ldots,t$ in another specification.

[37] The combination of clustered standard errors and year and country fixed effects provides incremental information relative to our main specification, which relies on clustering alone. Fixed effects allow for an arbitrary correlation pattern between the explanatory variables and the country-level and year-level unobservables. By contrast, regression without fixed effects assumes a zero correlation between the unobservables and the explanatory variables, which is more restrictive. Even after we add fixed effects, clustering is important, as fixed effects do not fully capture serial correlation in residuals (e.g., they cannot properly capture autoregressive shocks). As Stock and Watson (2008) demonstrate, clustered standard errors are reliable in fixed effects models, even when clustering and fixed effects are based on the same variables.

[38] The correlation between $REGEPL_n$ and $TEMPEPL_n$ is 0.789, which reduces the precision of the inferences regarding the relative impact of these variables because of multicollinearity. When we redefine the EPL variables to separate common variation in both forms of EPL from independent variation in temporary EPL, the coefficients of both variables are negative and individually significant at the 1% level, as expected.

Table 6
Estimates of the relation between EPL and cost stickiness, after controlling for additional labor market characteristics.
The estimation model is

$$\Delta\ln XOPR_{n,i,t} = \beta_0 + (\beta_1 + \gamma_1 EPL_n + \lambda_1 GDPGROWTH_{n,t} + \lambda_2 AINT_{n,i,t} + \lambda_3 LAW_n + \lambda_4 TUD_n + \lambda_5 BCC_n + \lambda_6 BNFT_n)\Delta\ln SALE_{n,i,t} + (\beta_2 + \gamma_2 EPL_n + \lambda_7 DEC_{n,i,t-1} + \lambda_8 GDPGROWTH_{n,t} + \lambda_9 AINT_{n,i,t} + \lambda_{10} LAW_n + \lambda_{11} TUD_n + \lambda_{12} BCC_n + \lambda_{13} BNFT_n)DEC_{n,i,t}\Delta\ln SALE_{n,i,t} + \varepsilon_{n,i,t}$$

where $\Delta\ln XOPR_{n,i,t}$ is the log-change in operating costs for firm i in country n in year t, $\Delta\ln SALE_{n,i,t}$ is the log-change in sales, $GDPGROWTH_{n,t}$ is the real GDP growth rate in country n in year t, $AINT_{n,i,t}$ is asset intensity (log ratio of assets to sales), LAW_n is a dummy variable equal to one for common-law countries, TUD_n is trade union density in country n, BCC_n is the bargaining centralization and coordination index for country n, $BNFT_n$ is the unemployment benefits index for country n, EPL_n is the aggregate employment protection legislation index for country n, $DEC_{n,i,t}$ is a dummy variable equal to one if sales decreased in year t, and $\varepsilon_{n,i,t}$ is an error term.

Coefficient	Expected sign	Main sample 1990–2008 (a)	Subsample 1990–2000 (b)	Subsample 2001–2008 (c)	Main sample excluding US (d)
β_0		0.001	0.000	0.002	0.000
		(0.73)	(0.11)	(1.03)	(−0.08)
β_1	+	0.912***	0.885***	0.891***	0.939***
		(65.20)	(50.59)	(42.55)	(67.39)
γ_1		0.013	0.033**	0.011	−0.004
		(1.19)	(2.30)	(1.04)	(−0.35)
λ_1		0.004	0.005	−0.011	0.005
		(0.88)	(1.42)	(−1.00)	(0.81)
λ_2		−0.033***	−0.026***	−0.033**	−0.032**
		(−3.01)	(−2.70)	(−2.13)	(−1.97)
λ_3		0.009	0.060**	0.004	−0.010
		(0.39)	(2.19)	(0.18)	(−0.38)
λ_4		0.025	0.132**	−0.045	−0.010
		(0.51)	(2.56)	(−1.18)	(−0.28)
λ_5		−0.007	−0.026**	0.014***	−0.008
		(−1.11)	(−2.49)	(2.85)	(−1.11)
λ_6		0.029	0.068*	−0.002	0.035**
		(1.28)	(1.67)	(−0.08)	(2.12)
β_2	−	−0.062***	−0.063**	0.017	−0.074***
		(−4.45)	(−2.00)	(0.36)	(−4.59)
γ_2 *(EPL)*	−	**−0.036*** **	**−0.028**	**−0.060*** **	**−0.046*** **
		(−3.84)	**(−1.34)**	**(−2.99)**	**(−7.62)**
λ_7	+	0.134***	0.123***	0.134***	0.111***
		(7.14)	(3.69)	(6.09)	(8.21)
λ_8	−	0.000	−0.007	0.029	0.003
		(−0.02)	(−1.38)	(1.44)	(0.23)
λ_9	−	−0.080***	−0.093***	−0.079***	−0.075***
		(−4.44)	(−3.92)	(−2.64)	(−3.32)
λ_{10}		−0.121***	−0.132***	−0.171***	−0.129***
		(−7.10)	(−4.06)	(−4.34)	(−6.87)
λ_{11}		−0.006	−0.064	0.008	−0.035
		(−0.19)	(−1.13)	(0.22)	(−1.33)
λ_{12}		0.001	0.030***	−0.029***	0.000
		(0.15)	(3.56)	(−2.54)	(0.05)
λ_{13}		−0.043**	−0.107***	0.008	−0.032*
		(−2.34)	(−3.87)	(0.27)	(−1.86)
N		128,333	63,751	64,582	83,649
adj. R^2		0.7926	0.8147	0.7723	0.7965

t-values in parentheses. The *t*-values are computed using two-way clustering by country and by year (Cameron et al., 2011). *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

In another robustness check, we examine the relation between EPL strictness and cost stickiness using the BBCM framework (Banker et al., 2012), which proxies for manager optimism and pessimism using dummies for prior sales increases and decreases. We estimate the average degree of cost stickiness or anti-stickiness and its relation with EPL strictness separately for optimism and pessimism (Model B). These estimates are presented in Table 7. Consistent with the BBCM findings for SG&A costs in the US, we find that, on average, operating costs are sticky in the optimistic case and anti-sticky in the pessimistic case ($\beta_2^{OPT} = -0.101$, $t = -16.80$; $\beta_2^{PES} = 0.147$, $t = 8.85$).[39] The main parameters of interest are γ_2^{OPT} and γ_2^{PES}, which capture the relation between EPL strictness and the degree of stickiness or anti-stickiness. As expected,

[39] To facilitate the interpretation of the estimates, in all regressions, we rescale the continuous control variables and EPL index to have mean zero. Consequently, the coefficients β_1, β_2 in models A and B are directly interpretable as slopes computed at the mean values for the control variables and EPL. By construction, this rescaling does not affect the estimates of the relation between EPL and cost stickiness.

Table 7
Estimates of the relation between EPL and cost stickiness after controlling for managers' optimism and pessimism following Banker et al. (2012).
The estimation model is

$$\Delta\ln XOPR_{n,i,t} = \beta_0 + (\beta_1^{OPT} INC_{n,i,t-1} + \beta_1^{PES} DEC_{n,i,t-1} + \gamma_1^{OPT} INC_{n,i,t-1} EPL_n + \gamma_1^{PES} DEC_{n,i,t-1} EPL_n + \lambda_1 GDPGROWTH_{n,t} + \lambda_2 AINT_{n,i,t} + \lambda_3 LAW_n)\Delta\ln SALE_{n,i,t}$$
$$+ (\beta_2^{OPT} INC_{n,i,t-1} + \beta_2^{PES} DEC_{n,i,t-1} + \gamma_2^{OPT} INC_{n,i,t-1} EPL_n + \gamma_2^{PES} DEC_{n,i,t-1} EPL_n + \lambda_4 GDPGROWTH_{n,t} + \lambda_5 AINT_{n,i,t} + \lambda_6 LAW_n) DEC_{n,i,t} \Delta\ln SALE_{n,i,t} + \varepsilon_{n,i,t}$$

where $\Delta\ln XOPR_{n,i,t}$ is the log-change in operating costs for firm i in country n in year t, $\Delta\ln SALE_{n,i,t}$ is the log-change in sales, $GDPGROWTH_{n,t}$ is the real GDP growth rate in country n in year t, $AINT_{n,i,t}$ is asset intensity (log ratio of assets to sales), LAW_n is a dummy variable equal to one for common-law countries, EPL_n is the aggregate employment protection legislation index for country n, $DEC_{n,i,t}$ is a dummy variable equal to one if sales decreased in year t, $INC_{n,i,t-1}$ ($DEC_{n,i,t-1}$) is a dummy variable equal to one if sales increased (decreased) in prior year t−1, and $\varepsilon_{n,i,t}$ is an error term.

Coefficient	Expected sign	Main sample 1990–2008 (a)	Subsample 1990–2000 (b)	Subsample 2001–2008 (c)	Main sample excluding US (d)
β_0		0.001	0.000	0.002	0.000
		(0.84)	(0.21)	(1.31)	(−0.03)
β_1^{OPT}	+	0.934***	0.910***	0.933***	0.957***
		(67.05)	(32.21)	(60.80)	(94.73)
β_1^{PES}	+	0.819***	0.805***	0.812***	0.858***
		(50.08)	(27.09)	(38.50)	(104.05)
γ_1^{OPT}		0.019*	0.046**	0.011	0.004
		(1.67)	(2.41)	(0.86)	(0.26)
γ_1^{PES}		0.037**	0.068***	0.024	0.006
		(2.48)	(2.93)	(1.51)	(0.36)
λ_1		0.002	0.003	−0.010	0.003
		(0.53)	(0.66)	(−1.40)	(0.55)
λ_2		−0.028***	−0.024**	−0.028**	−0.027*
		(−3.02)	(−2.35)	(−2.00)	(−1.89)
λ_3		0.026	0.092**	−0.004	0.009
		(0.95)	(1.98)	(−0.14)	(0.35)
β_2^{OPT}	−	−0.101***	−0.067***	−0.077*	−0.124***
		(−16.80)	(−2.61)	(−1.92)	(−14.12)
β_2^{PES}	+	0.147***	0.149***	0.178***	0.086***
		(8.85)	(4.23)	(5.76)	(5.28)
γ_2^{OPT} ***(EPL)***	−	**−0.030****	**−0.011**	**−0.058****	**−0.045*****
		(−2.43)	**(−0.54)**	**(−2.31)**	**(−3.96)**
γ_2^{PES} ***(EPL)***	−	**−0.073*****	**−0.099*****	**−0.071*****	**−0.052*****
		(−8.98)	**(−5.74)**	**(−2.97)**	**(−4.48)**
λ_4	−	0.001	−0.006	0.026	0.003
		(0.10)	(−1.16)	(1.55)	(0.33)
λ_5	−	−0.084***	−0.092***	−0.083***	−0.079***
		(−5.25)	(−4.01)	(−3.66)	(−3.75)
λ_6		−0.130***	−0.179***	−0.132**	−0.129***
		(−9.53)	(−6.21)	(−2.53)	(−8.80)
N		128,333	63,751	64,582	83,649
Adj. R^2		0.7943	0.8162	0.7740	0.7976

t-values in parentheses. The *t*-values are computed using two-way clustering by country and by year (Cameron et al., 2011). *, ** and *** indicate significance at 10%, 5% and 1% levels, respectively.

both parameters are negative and significant at the 5% level ($\gamma_2^{OPT} = -0.030$, $t = -2.43$; $\gamma_2^{PES} = -0.073$, $t = -8.98$), i.e., stricter EPL is associated with significantly higher stickiness under optimism and significantly lower anti-stickiness under pessimism.[40] This finding lends further support to Hypothesis 1. The results are also similar when we use shorter subsamples or omit the US data from the sample (columns (b)–(d) in Table 7) and when we add the labor market controls (untabled).

In summary, our estimates indicate that stricter EPL is associated with a greater degree of cost stickiness, supporting our main empirical hypothesis. The association between EPL strictness and cost stickiness is significant both statistically and economically, and the results are robust to alternative specifications. These results support the central premise of the economic theory of sticky costs, that cost behavior reflects deliberate resource commitment decisions made by managers who recognize the dynamic tradeoffs associated with adjustment costs, in the empirical context of labor resources.

5. Conclusion

In this study, we investigated the relation between employment protection legislation (EPL) in different countries and sticky cost behavior. The basic premise of the economic theory of sticky costs is that many costs arise as a result of deliberate resource commitment decisions made by managers. Resource adjustment costs play a central role in this theory,

[40] The relation between EPL strictness and asymmetric cost behavior is stronger under pessimism. This finding is reasonable because for the same sales decrease, managers should be inclined to fire more workers in the pessimistic case, and thus, the firing costs per worker should have a greater impact on their decisions.

generating sticky cost behavior that is inconsistent with the standard textbook model of fixed and variable costs. A fundamental testable implication of this theory is that the degree of cost stickiness should be increasing in the magnitude of the (downward) adjustment costs for capacity resources. However, empirical tests of the theory have been hampered by the difficulty of directly measuring adjustment costs. We used country-level measures of EPL strictness as our empirical proxy for labor adjustment costs. Because EPL is the primary source of firing costs for employers (e.g., Long and Siebert, 1983; Pissarides, 1999), cross-country differences in EPL strictness provide a reliable source of variation in the adjustment costs for labor resources. Based on the economic theory of sticky costs, we hypothesized that firms in countries with stricter employment protection would exhibit a greater degree of cost stickiness.

We tested this prediction using a large sample of firms in 19 OECD countries. The empirical results strongly support our hypothesis, validating the proposition that observed cost behavior reflects deliberate resource commitment decisions by managers who face adjustment costs. The relation between EPL strictness and cost stickiness is also highly economically significant, and the estimation results are robust to many alternative model specifications.

Our study is the first in the literature to explicitly consider and test the link between economy-wide structural variables and sticky cost behavior. Prior research on cost behavior was conducted almost exclusively using samples of firms from a single country, and as such, it has largely ignored the impact of economy-wide structural variables on cost behavior.[41] Our results show that a full understanding of cost behavior in general and of cost stickiness in particular requires careful analysis not only of the firm-specific factors but also of the country-level structural characteristics that shape managers' decisions.

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References

Abel, A.B., Eberly, J.C., 1994. A unified model of investment under uncertainty. American Economic Review 84 (5), 1369–1384.
Anderson, M.C., Banker, R.D., Janakiraman, S.N., 2003. Are selling, general, and administrative costs "sticky"? Journal of Accounting Research 41 (1), 47–63.
Anderson, M.C., Banker, R.D., Ravindran, S., 2006. Value implications of investment in information technology. Management Science 52 (9), 1359–1376.
Balakrishnan, R., Peterson, M., Soderstrom, N., 2004. Does capacity utilization affect the "stickiness" of cost? Journal of Accounting Auditing and Finance 19 (3), 283–299.
Banker, R.D., Byzalov, D., Plehn-Dujowich, J.M., 2010. Sticky cost behavior: theory and evidence. Working paper.
Banker, R.D., Chen, L., 2006. Predicting earnings using a model based on cost variability and cost stickiness. Accounting Review 81 (2), 285–307.
Banker, R.D., Byzalov, D., Ciftci, M., Mashruwala, R., 2012. The moderating effect of prior sales changes on asymmetric cost behavior. Working Paper.
Bentolila, S., Bertola, G., 1990. Firing costs and labor demand: how bad is eurosclerosis? Review of Economic Studies 57, 381–402.
Blanchard, O., Portugal, P., 2001. What hides behind an unemployment rate: comparing Portuguese and U.S. labor markets. American Economic Review 91 (1), 187–207.
Botero, J., Djankov, S., La Porta, R., Lopez-de-Silanes, F., Shleifer, A., 2004. The regulation of labor. Quarterly Journal of Economics 119 (4), 1339–1382.
Caballero, R., 1991. On the sign of the investment-uncertainty relationship. American Economic Review 81 (1), 279–288.
Calleja, K., Steliaros, M., Thomas, D.C., 2006. A note on cost stickiness: some international comparisons. Management Accounting Research 17, 127–140.
Cameron, C., Gelbach, J., Miller, D., 2011. Robust Inference with Multi-way Clustering. Journal of Business and Economic Statistics 29 (2), 238–249.
Chen, C., Lu, H., Sougiannis, T., 2012. The agency problem, corporate governance, and the asymmetrical behavior of selling, general and administrative costs. Contemporary Accounting Research 29 (1), 252–282.
Dierynck, B., Landsman, W.R., Renders, A., 2012. Do managerial incentives drive cost behavior? Evidence about the role of the zero earnings benchmark for labor cost behavior in private Belgian firms. Accounting Review 87 (4), 1219–1246.
Dixit, A., 1997. Investment and employment dynamics in the short run and the long run. Oxford Economic Papers 49 (1), 1–20.
Djankov, S., McLiesh, C., Shleifer, A., 2007. Private credit in 129 countries. Journal of Financial Economics 84, 299–329.
Eberly, J.C., Van Mieghem, J.A., 1997. Multifactor dynamic investment under uncertainty. Journal of Economic Theory 75 (8), 345–387.
Goux, D., Maurin, E., Pauchet, M., 2001. Fixed-term contracts and the dynamics of labor demand. European Economic Review 45, 533–552.
Hamermesh, D., 1989. Labor demand and the structure of adjustment costs. American Economic Review 79 (4), 674–689.
Hamermesh, D., Pfann, G.A., 1996. Adjustment costs in factor demand. Journal of Economic Literature 34, 1264–1292.
Heckman, J., Pagés-Serra, C., Edwards, A., Guidotti, P., 2000. The cost of job security regulation: evidence from Latin American labor markets. Economia 1 (1), 109–154.
Hopenhayn, H., Rogerson, R., 1993. Job turnover and policy evaluation: a general equilibrium analysis. Journal of Political Economy 101 (5), 915–938.
Kama, I., Weiss, D., 2011. Do managers' deliberate decisions induce sticky costs? Working Paper.
LaPorta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 1997. Legal determinants of external finance. Journal of Finance 52 (3), 1131–1150.
LaPorta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 1998. Law and finance. Journal of Political Economy 106 (6), 1113–1155.
LaPorta, R., Lopez-de-Silanes, F., Shleifer, A., Vishny, R., 2000. Investor protection and corporate governance. Journal of Financial Economics 58, 3–27.
LaPorta, R., Lopez-de-Silanes, F., Shleifer, A., 2006. What works in securities laws? Journal of Finance 61, 1–32.
Lazear, E., 1990. Job security provisions and employment. Quarterly Journal of Economics 105 (3), 699–726.

[41] The only exception we are aware of is Calleja et al. (2006).

Long, V.N., Siebert, H., 1983. Layoff restraints and the demand for labor. Zeitschrift fur die gesamte Staatswissenschaft 139 (4), 612–624.
Mortensen, D.T., Pissarides, C.A., 1999. Unemployment Responses to 'Skill-biased' Technology Shocks: the Role of Labor Market Policy. The Economic Journal 109, 242–265.
Nickell, S., Nunziata, L., Ochel, W., 2005. Unemployment in the OECD since the 1960s: what do we know? The Economic Journal 115, 1–27.
Noreen, E., Soderstrom, N., 1997. The accuracy of proportional cost models: evidence from hospital service departments. Review of Accounting Studies 2, 89–114.
OECD, 2004. Employment Outlook. OECD, Paris.
Palm, F.C., Pfann, G.A., 1997. Sources of asymmetry in production factor dynamics. Journal of Econometrics 82, 361–392.
Pissarides, C.A., 1999. Policy influences on unemployment: the European experience. Scottish Journal of Political Economy 46 (4), 389–418.
Stock, J., Watson, M., 2008. Heteroskedasticity-robust standard errors for fixed effects regression. Econometrica 76, 155–174.
Weiss, D., 2010. Cost behavior and analysts' earnings forecasts. The Accounting Review 85 (4), 1441–1471.