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The Effects of Regulations and Business Cycles on Temporary Contracts, the Organization of Firms and Productivity

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1. Introduction

In order to provide employers greater incentives for job creation, policymakers have considered a variety of incentives to reduce the costs of hiring workers. These include reducing the real minimum wage, reducing payroll taxes and reducing dismissal costs However, comprehensive labor market reform packages have proven elusive due to political economy constraints. Workers' privileges for formal sector jobs including high formal wages, generous benefits and job security have proven difficult to eliminate through changes in the labor codes. It is hard to sell to the electorate the notion that, by removing such privileges to incumbent workers, the inactive and informal workers will benefit through expanded formal job creation.

Therefore, many governments have resorted to second-best measures such as the introduction of greater flexibility for the use of fixed-term contracts, characterized by a fixed duration after which the employment relationship ceases without cost to the employer. The aim of these "reforms at the margin" is to enhance labor market flexibility and to stimulate job creation (see Kugler, Jimeno, and Hernanz, 2003, for a discussion of these issues). Greater flexibility should be also beneficial in terms of aggregate efficiency, both because it facilitates the allocation of workers to the occupations for which they are best matches, and

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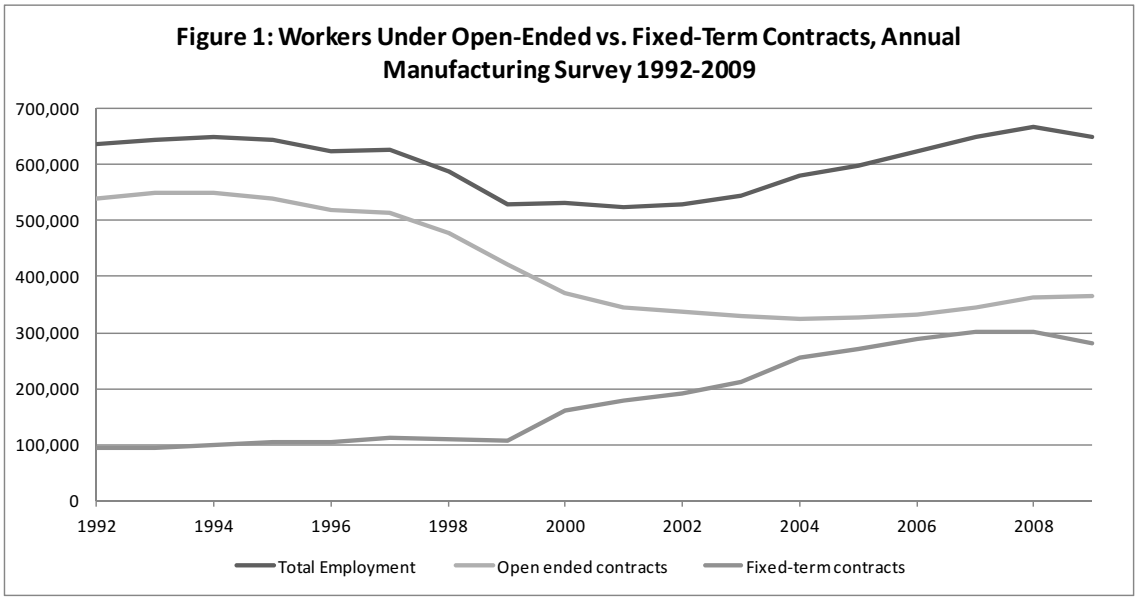
because it addresses one possible concern firms face when deciding to adopt new technologies: the possibility that they are unable to adjust their workforce to the needs of new technologies. Critics counter that the proliferation of temporary jobs lowers the quality of formal jobs, by making employment relationships unstable, and introduces to the formal sector the same kind of precarious conditions that prevail in the informal sector. Furthermore, high turnover leads to limited incentives for job-specific human capital accumulation, which in some sectors can be detrimental to productivity growth.

In this study, we assess the impact, on workforce contract composition, employment adjustment dynamics and productivity, of a combination of changes in the Colombian labor legislation which increased firm's ability of using contracts of a temporary nature, and posterior changes that increased the costs associated with longer term contracts. Until 1990, labor regulations in Colombia practically banned the possibility of using fixed-term contracts for horizons of less than one year (see, e.g. Kugler, 2004). The labor market component of a broad package of market reforms adopted at the beginning of the nineties opened the possibility of hiring under fixed term contracts of different types. Some of these contracts not only free employers of potential dismissal costs, but are also subject to reduced, or even zero, non-wage costs. Regulatory changes occurred in the decade that followed further increased incentives to use fixed term contracts.

Fixed-term employment started to increase right after the 1991 reform (Figure 1 depicts the trends for the manufacturing sector for 1992-2009). Though a more intensive use of fixed term contracts after this reform was to be expected, the dynamics of the contract composition displays several striking features. First, the magnitude of the shift towards fixed term contracts is so large that all net job creation over the 17 year period that followed occurred in the fixed-term category. In fact, the number of open-ended jobs over this period decreased dramatically, at least in the manufacturing sector—which is the one for which we have data. By 2009, the number of workers under open-ended contracts was less than 70% its 1992 level. It is also the case that both the substitution of open-ended contracts for fixed-term ones and the contraction of permanent jobs in absolute terms were particularly strong after a severe crisis hit the economy in 1998-1999. Interestingly, the permanent contracts category fully absorbed the contraction occurred during the crisis period, while it reflected none of the expansion in total employment observed during the recovery.

Figure 1



With these striking patterns as a motivation, we study the dynamics of the workforce contract mix in the manufacturing sector over the period 1992-2009 in response to different changes to labor regulations. We first characterize the use of fixed term contracts in the Colombian manufacturing industry: how generalized is the shift towards using fixed-term workers; is there evidence that fixed-term contracts have become the way in which establishments accommodate shocks; what characteristics of manufacturing establishments are associated of a more intensive use of fixed-term contracts. Next, we study how the use of fixed-term contracts has been affected by changes in labor regulation, and how this response depends on features such as establishment/sector characteristics. Second, we analyze how the increased intensity in the use of fixed-term contracts affects productivity. Given that not much prior research has been dedicated to these issues, an important part of the work we undertake here is descriptive.

We use data on all manufacturing establishments of 10 or more employees in Colombia, recorded in the Annual Manufacturing Survey, to shed light on the reasons and consequences of the use of contracts of a temporary nature to hire a business' workforce. We want to ultimately understand what factors make temporary contracts so attractive to businesses that in Colombia the manufacturing sector did not have a single year with positive net job creation for open-ended jobs over more than 10 years after the 1991 reform reduced barriers for the use of these contracts. Though fixed term contracts provide a degree

of flexibility that is obviously convenient to employers in need of adjusting the size of their labor force, they also present disadvantages for firms with a need/preference for workers with longer term attachments. To shed light on this issue, we ask a series of specific questions. How pervasive is the shift towards fixed-term jobs across sectors or across establishments, given their observable characteristics? What role have post 1990 reforms, occurred in 1993, 2001 and 2007, played in altering incentives to use fixed-term contracts? What costs or benefits, if any, does the use of fixed term contracts generate in terms of firm productivity and performance, both at the micro level and the aggregate level? Does the answer to this question depend on observable firm characteristics?

Our study contributes, first and foremost, to the understanding of the implications of reforms at the margin in terms of the actual contract mix of workers. It also sheds light on the benefits and costs of types of contracts aimed at providing greater flexibility in the labor market. In particular, our findings illustrate the effectiveness of openly permitting the use of fixed term contracts in terms of fostering formal job creation and boosting aggregate productivity through a better allocation of resources and greater within-business productivity growth. Furthermore, we explore how regulations that make flexible contracts possible interact with others than may create "noisy" reasons for firms to choose these types of contracts, such as labor taxes that affect permanent contracts more than fixed term ones. This types of taxes are high and pervasive in Colombia. We explore these issues with the aim to provide analysis that is useful for the formulation of labor market policy, not only in Colombia but also in other countries faced with the same problems regarding the scarcity of well-paid high-quality jobs.

Our paper is most related to the literature that explores the effect of the introduction of fixed term contracts in France, Italy and Spain (e.g. Blanchard and Landier, 2002; Boeri and Garibaldi, 2007; Dolado et al. 2002). Findings in that literature have been mostly negative about the convenience of allowing for these more flexible types of contracts. Results suggest that flexible contracts led to high costs to workers in the form of high turnover, and in some cases even less employment due to difficulties to be re-hired after a fixed-term contract ends. Studies also tend to find a negative effect of fixed term contracts on productivity. As we will see, these results are at odds with much of what we find in the case of Colombia. The contrast may be due to the fact that fixed term contracts in these European countries are quite restrictive, with rules aimed at impeding the renewal of these contracts except in the form of more permanent arrangements.

This paper is divided into seven sections, including this introduction. Section 2 discusses the institutional background, explaining the types of labor contracts the Law permits in Colombia and the relevant changes to labor regulations over the last two decades. Section 3 presents our conceptual framework for understanding the choice of a workforce contract mix. Section 4 describes the data and provides an in-depth descriptive analysis of the relative use of fixed-term contracts vis-à-vis open-ended contracts in Colombia's manufacturing industry since 1992. Section 5 provides results of an econometric analysis of the firm and sector characteristics associated with a more intensive use of fixed term workers, and the effects of different regulatory changes affecting mandatory non-wage costs. Section 6 examines the relationship between the use of fixed term workers and productivity. Finally, section 7 concludes and discusses policy implications.

2. Institutional background

This section discusses the different types of work contracts currently permitted by Law in Colombia, and describes the main differences between them over several dimensions. Of course, the duration of contracts is a crucial dimension given our focus on the length of employment relationships but, as will become clear later, fixed-term and open-ended contracts also differ in our data in terms of the degree to which they are subject to mandatory non-wage labor costs. Our description refers first to the rules currently in place. A description of regulatory changes of relevance is provided in a second subsection. A table at the end of the section summarizes relevant changes to the regulation after the 1991 wave of reforms.

2.1. Current rules

In terms of time limits, labor contracts can be either open-ended or fixed term. Open ended contracts have no time limit. If the employer decides to terminate the contract, the employer must pay dismissal compensation, unless "fair cause" (other than permanent illness) is demonstrated. "Fair cause" reasons are listed by the labor code, and refer to the occurrence criminal or violent acts by the worker, or repeated failure to effectively execute the assigned tasks or follow instructions. The last set of reasons, however, are frequently disputed by workers, so many employers apparently simply pay the dismissal compensation

to avoid entering a legal dispute. Even in the absence of dispute, a 15 day advance notice is necessary when dismissing a worker due to "fair cause". Dismissal compensation is set at 30 wage days for the first work year and 20 wage days for each year of work after the first, for workers with earnings under 10 legal minimum wages. For those with higher wages, the costs are of 20 wage days for the first year and 15 wage days for each of the years that followed. Severance payments in Colombia are not paid when the worker leaves his job, but are rather paid annually by the employer as a deposit to a severance savings account. Thus, they do not constitute dismissal costs in the sense of being paid when dismissal occurs.

In turn, fixed term contracts have a predetermined termination date, but their duration that cannot exceed three years. There is no dismissal cost if the relationship is effectively terminated by the end of the contract's term limit (with 30 day advanced notice by the employer that the contract will not be renewed). However, if there is early termination the employer must pay the salaries that remain until the term initially agreed. The maximum number of times that the contract can be renewed depends on its duration: while there is no renewal limit for one-year or longer contracts, contracts of a shorter duration can only be renewed up to three times, after which the employment relationship can only continue under a contract that is at least a year long.

Firms can also hire workers for fixed terms through private employment agencies. When workers are hired under this system, the agency becomes the employer for all legal purposes (it is in charge of paying payroll taxes, pension and health contribution, etc). The firm hiring the services pays a flat rate, calculated as a markup over the labor costs. The markup charged by the employment agency cannot exceed 20%. The use of agencies to hire workers is limited by Law. In particular, workers hired under this system can only be assigned to tasks of a temporary nature, including to fill-in for a firm employee temporarily absent, or to respond to a temporary increase in production for a period of up to six months renewable for only other six months. Anecdotal evidence suggests, however, that in practice workers are hired through employment agencies for tasks of a more permanent nature, and for terms that exceed the maximum one-year period. Many firms find the system convenient to the extent that they are not themselves engaging in an employment relationship that could end up generating dismissal costs, either when they want to terminate an open-ended contract, or when they want to terminate a fixed term contract before the term initially agreed is reached.

All of the above-mentioned types of contracts are labor contracts—between the employee and either the firm or an employment agency—and, to that extent, they are all equal in terms of generating mandatory non-wage costs (detailed below). However, work relationships are also frequently covered under other types of contracts, which we denominate non-labor contracts, and which do not generate mandatory non-wage labor costs. This is the case of contractual workers and workers hired through "associative employment cooperatives", a particular type of agency described below. Employment figures in our data, as should become clear later, also cover workforce under contracts of these types, which is why it is important for us to discuss how they differ from the labor contracts described above.

What is agreed upon in a non-labor contract is a product to be delivered by the provider, and a compensation for that product. While legally these contracts are not meant to be ways for employers to hire workers for their day-to-day operation, many regular labor relationships are covered by these contracts. This practice allows both workers and employers to circumvent payroll taxes and other mandatory non-wage labor costs. Just to give a flavor of the extensive use of these types of contracts, even in government activities, a recent report by the Labor Ministry indicates that for each 100 government employees under labor contracts, there are 170 contractual workers.[3] Anecdotal evidence clearly shows that many of these contractual workers actually execute day-to-day activities of governmental agencies, with contracts that are renovated over and over again, even to the point that labor relationships lasting for over a decade are formalized under these types of contracts.

By their very nature, non-labor contracts (in this context) are fixed term. However, they differ from the fixed-term labor contracts discussed above in the payment of mandatory labor costs. Non-labor contracts, to begin with, are not subject to minimum wage limits—the minimum wage is mandatory in Colombia, at a flat and binding rate.— They are also not subject to many mandatory non-wage labor costs, which in Colombia are high and varied. Over our period of study, mandatory non-wage labor costs include:

- Pension and health contributions: currently a 20.875% contribution by the employer, and a 7.875% contribution by the worker.

[3] The study is not publicly available, but this particular finding was made public by the government in February 2012: http://mintrabajo.gov.co/index.php/febrero-2012/95-gobierno-presento-informe-sobre-reporte-de-contratos-de-prestacion-de-servicios-en-entidades-del-estado.html.

- Payroll taxes (other than pension and health): a series of contributions by the employer for different governmental institutions or government-supported activities. They add up to 9% of wage costs.
- Non-wage payments to the worker: severance payments, vacations, vacation bonus and "legal" bonus. These additional non-wage costs amount to close to a margin over the wage of close to 21%.

A particular type of non-labor contract is that between the firm and an "associative employment cooperative". These cooperatives provide manpower, but differ from employment agencies in that the workers are partners, and thus their compensation is not considered to be wage. The cooperative model is permitted and regulated by the Law starting in 1988, but it was seldom used up until the mid-nineties. According to the Colombian Federation of Cooperatives (Confecoop, 2009), up until 1996 only a handful of these cooperatives existed, but starting that year more than 100 of them were created annually, with a peak of almost 700 created in 2003. By 2008, almost 4,000 employment cooperatives existed, with over 500,000 workers associated to them. The stark increase in the use of associative employment has been attributed to the attempt by employers to recover from the 2008 downturn by cutting labor costs. They seem to have taken time to learn that, by hiring workers through these cooperatives, they could circumvent labor costs imposed by the regulation.

These cooperatives were originally conceived as ways to allow individual self-employed workers to improve their work perspectives. The idea was that, by teaming-up, these individuals could take over tasks of a larger magnitude. There was thus a deliberate attempt to boost associative employment. Consistent with this view and the non-labor nature of the associated contracts, these cooperatives have not only been exempt from paying mandatory labor costs, but have also received other tax benefits. However, there is by now consensus that there has been abuse of this mode of employment relative to its original intent. There is anecdotal evidence that many employers have encouraged their workers (some apparently even forced them) to quit and form one of these cooperatives, to then hire those same workers by underwriting a contract with the cooperative.[4] Much debate has

[4] It has been suggested that the government itself used this strategy intensively around 2002 to cut labor costs in the health sector. Some authors even argue that it was this use of the associative employment model by the government that made it popular, being partly responsible for the stark increase in the use of this type of work around that time.

emerged around this issue. As a result, two recent reforms to the model were adopted, in 2006 and 2008, that partially subject associative employment cooperatives to the payment of payroll taxes.

2.2. Relevant regulatory changes

2.2.1 Regulations regarding duration of contracts:

Until 1990, labor regulations in Colombia practically banned the possibility of using fixed-term contracts (see, e.g. Kugler, 2004), i.e., contracts with pre-determined duration. By Law, contracts were supposed to be open-ended. The use of fixed-term contracts was limited to very specific circumstances, in which a temporary task was clearly designated or a person was replacing someone on leave (e.g., maternity or health leave). Even then, the minimum permitted length of a temporary or fixed-term contract was of one year, banning renewal. Stringent limits on the use of fixed-term contracts, implied workers could only be separated from their jobs for causes deemed "fair," and even in those cases employers had to pay very high severance costs and dismissal compensations. The wave of market reforms that took place at the beginning of the 1990s had a labor market component that, among many other things, allowed employers to hire under fixed-term contracts under the rules outlined above. The reform was expected to boost employment by making it profitable for firms to hire workers even in circumstances that did not make it worthwhile for them to engage in a long term relationship with the worker: tasks of temporary or seasonal nature, jobs for which the likelihood of a good match is low or highly uncertain, etc.

Though our data start in 1992—prior to this year fixed-term employment was not reported in the Annual Manufacturing Survey—the contract mix at the beginning of our sample is likely to reflect, partially but still significantly, the pre-reform contract mix. This is both because by 1992 firms still had little time to adjust, and because the reform is most likely to affect the contract mix only after the firms have experienced shocks significant enough to want to adjust their labor force. To this extent, the response of businesses to the 1990 changes to limits on fixed term contracts is likely to partially show up in our data.

The 2002 labor reform (Law 789 of 2002) modified dismissal compensations. A crucial motivation for the reform was the fact that a previous discontinuity in dismissal costs at five-year tenures generated frequent dismissals once workers completed their first five years on the job. To address this concern, a flat scheme was adopted that increased

compensation for workers dismissed before reaching five years on the job and reduced them for others. Likely, it is the increase in costs of dismissing low tenure workers that is more relevant for the choice of fixed-term vs. open-ended contracts, mainly because the five-year horizon had become a frequent binding term.

2.2.2 Regulations relating to costs that apply only to labor contracts

Given our discussion of labor vs. non-labor contracts, the evolution of non-wage labor costs, to which only the first type of contracts is subject, is a key determinant of the contract modes preferred by both workers and employers. Increases in mandatory non-wage labor costs create incentives to use non-labor contracts to hire workers. In our data, non-labor contracts show up in the fixed-term employment category, so our measures of the contract mix will reflect changes in the contract mix in response to changes in non-wage labor costs.

There were several changes to mandatory labor costs during our period of study. While they occurred at different points in time, the most important changes concentrated in 1993 and 2002-2003, the latter group coinciding with the 2002 labor reform. Both groups of changes in general increased labor costs. Table 1 presents the main changes to the regulation. Figure 2 plots mandatory non-labor costs as a fraction of wages implied by regulations; it is constructed by adding up the different items paid by the employer in Table 1.[5] The Figure makes it clear that labor contracts have become increasingly expensive, with an especially large increase occurring as a result of the 2002 reform, after a period of relative stability.

The main message from Table 1 and Figure 2 is that non-labor contracts have become increasingly attractive as ways to circumvent these costs, especially since 2002. It is also important to point that the increases in these costs observed in 2004-2006 were dictated by the 2002 reform and known from the time of its approval. Since we expect workers under non-labor contracts to be included as fixed-term workers in our data, our expectation is that these regulatory changes are going to be reflected in increases in fixed-term employment in our empirical analysis. Notice also that labor contracts imply costs to workers as well, to the extent that they have to pay contributions to health and pension that have also increased over

[5] Severance payments (one monthly wage per year) are calculated as 1/12 of the wage, dismissal compensation is calculated for a five-year tenure worker, assuming a 5% dismissal probability.

time (bottom panel of Table 1). While contractual workers are supposed to contribute for pension and health, as self-employed, they find it easier to circumvent these payments and in practice many of them do not make them. On the other hand, labor contracts provide some degree of protection to workers by making them eligible for pension down the road (self-employed workers that do contribute also enjoy this benefit);[6] vacation times and bonuses; severance payments; some degree of employment stability; and protection by the labor code.[7] There is, obviously, not a unified view on whether workers are damaged or benefitted by being under non-labor contracts rather than the more stable labor contracts; there is obvious heterogeneity in the way workers themselves see these possibilities. What seems clear, at the very least, is that non-labor contracts have short-term benefits to workers—who avoid having to contribute part of their salaries—while bringing longer-term costs in terms of employment security and savings for the elderly age and unemployment spells.

[6] We do not similarly consider health coverage as a benefit from labor contracts. This is because the Courts in Colombia have ruled that the government is responsible for ensuring that all Colombians have identical health coverage, even if they do not contribute to the system.

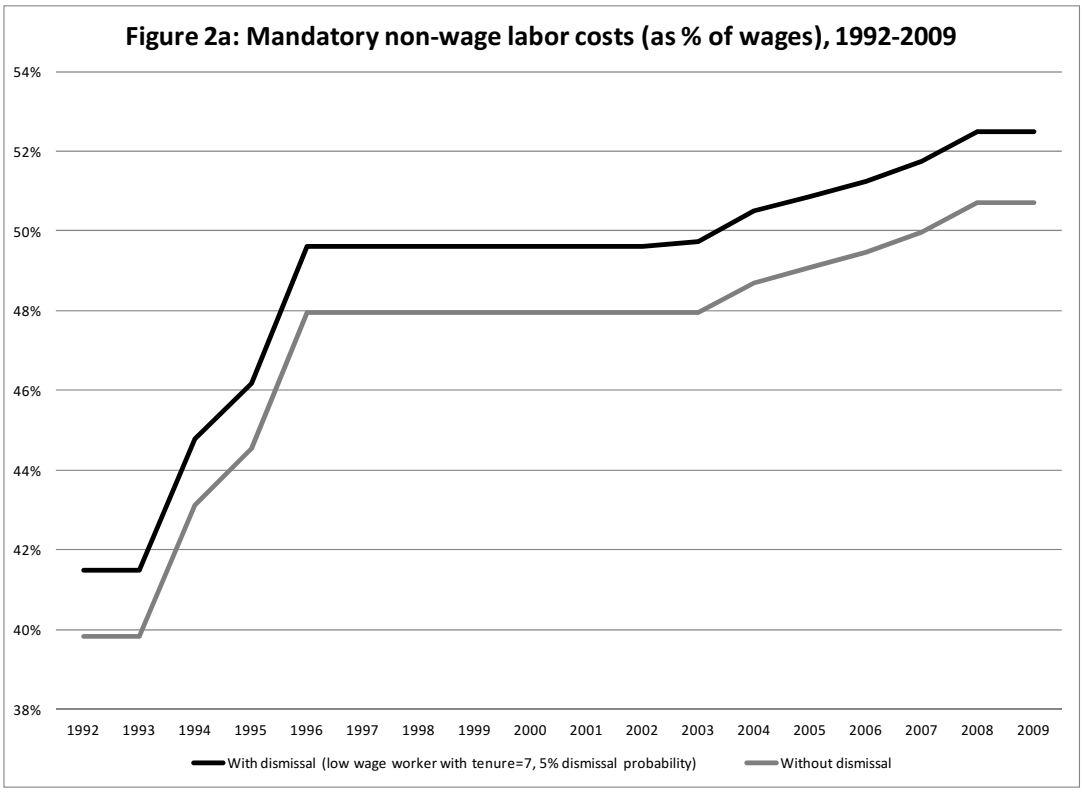
[7] Workers under non-labor contracts, for instance, are not covered by regulations against harassment in the workplace, as they are not supposed to be employees.

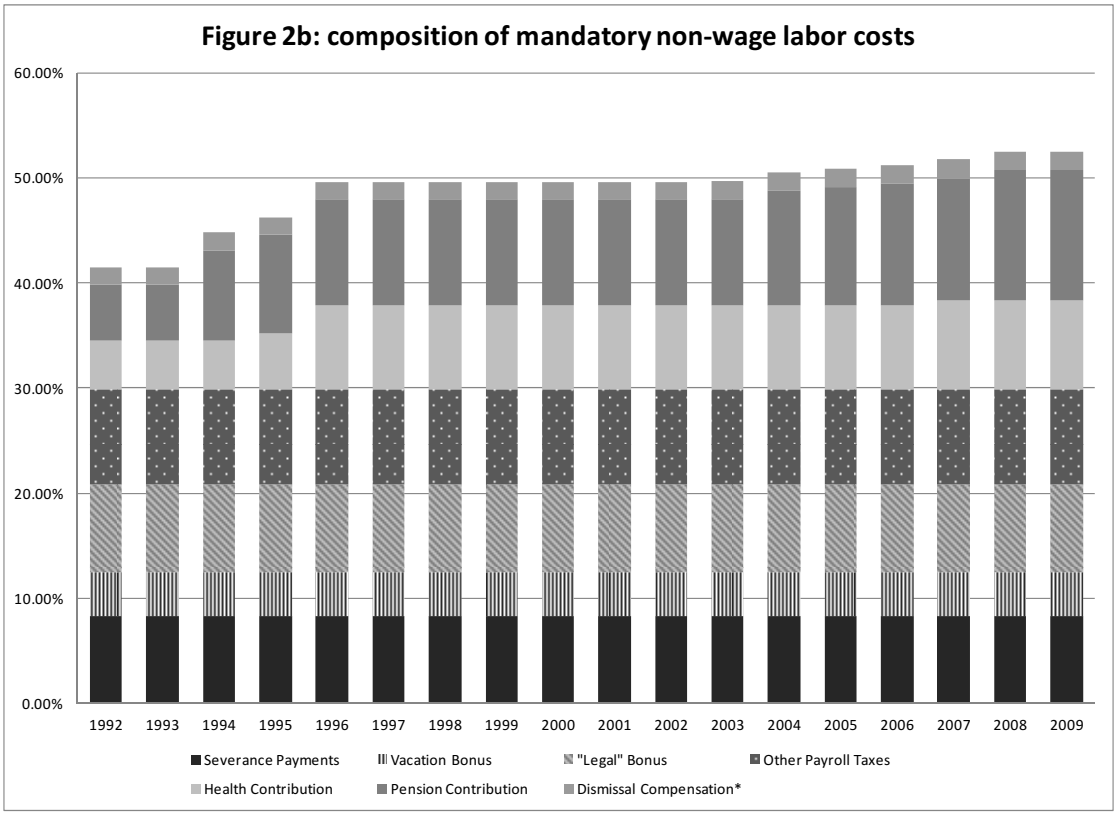
Table 1. Regulatory changes affecting mandatory non-wage labor costs

		Reform			
Type of payment	1990 benchmark (including Law 100 of 1990 and prior regulations)	Agreement 56 of 1992	Law 100 of 1993	Law 789 of 2002	Decree 4982 of 2007 and Law 1122 of 2007
Panel 1: Paid by employer					
Dismissal compensation	45 days of pay for first year (even if not full year) plus X days for each year after first (X=15, 20, 40 for tenures of 1-5,5-10, 10+ years, respectively			**Wage< 10 minimum wages:** 30 days for first year (even if not full year) plus 20 days for each additional year. **Wage>10 minimum wages: 2**0 days for first year (even if not full year) plus 15 days for each additional year.	
Severance payments	1 monthly wage each year of work, deposited annually in a severance payment savings account, plus 12% interest on that payment, handed directly to the employee.				
Pension contribution	4.33% (= 2/3 * 6.5%)	5.33% (= 2/3 * 8%)	8.625% in 1994 9.375% in 1995 10.125% from1996	10.875% in 2004 11.25% in 2005 11.625% from 2006	12.375 % from 2008
Health contribution	4.67% (=2/3*7)		5.33% in 1995 8% in 1996		8.50%
Vacation bonus	4.20%				
"Legal" bonus	8.30%				
Other payroll taxes	9%				
Panel 2: Paid by employee					
Pensions employee	2.17%	2.67%	2.875% in 1994 3.125% in 1995 3.375% from 1996	3.625% in 2004 3.75% in 2005 3.875% in 2006	
Health employee	2.33%		2.67% in 1995 4% in 1996		

Source: Santamaría et al. (2009), Kugler (2004, 2005), Kugler and Kugler (2009)

Figure 2: Mandatory non-wage labor costs as a % of wages: 1992-2009





Own calculations. *Dismissal compensation for five-year tenure, assuming 5% probability of dismissal.

3. Conceptual framework

Before proceeding with the discussion of our empirical work, it is useful to have some discussion of the underlying conceptual framework we have in mind. From the perspective of the firm, employees with fixed-term contracts are potentially imperfect substitutes for employees with open-ended contracts in the production of goods.

Consider the following stylized framework to provide some structure for thinking about these issues. Treating the workers with different contract types as imperfect substitutes, the optimal "contract mix" can be determined by short-run cost minimization for given output and a given set of quasi-fixed factors (that may be endogenous inputs subject to adjustment costs or exogenous characteristics of the firm). That is, a producer minimizes $w_{Ft}L^j_{Ft} + w_{Ot}L^j_{Ot}$ subject to $y^j_t = F(Z^j_t, L^j_{Ft}, L^j_{Ot})$ where y^j_t is output, L^j_{Ft} is the number of fixed term contract workers, L^j_{Ot} is the number of open term contract workers, w_{Ft} is the per worker cost of fixed term contract workers, w_{Ot} is the per worker cost of open term contract workers, Z^j_t is a vector of quasi-fixed factors which may include tangible inputs like physical capital, intangible capital like organizational capital, choice of technology, and other business practices, and exogenous factors like the nature of the shock processes impacting the firm. Output is assumed to be an increasing function of all three types of factors. Moreover, the different type of contract workers may be complements or substitutes with respect to the components of Z^j_t.

According to Shepherd's lemma, the optimal "contract mix" would be given by some function like:

$$S^j_t = L^j_{Ft} / (L^j_{Ft} + L^j_{Ot}) = S(\frac{w_{Ft}}{w_{Ot}}, y^j_t, Z^j_t)$$

That is, the optimal contract mix will depend upon the relative cost of the two types of workers (an increase in w_F/w_O leading to less demand for fixed-term contracts), the scale of operations (affecting positively the demand of the least costly type of contracts), and nature of the substitutabilities and complementarities between the components of Z^i_t and the types of workers.

The actual choices of a firm in fact embed the static problem just discussed into a dynamic framework, where businesses face shocks to which they respond by adjusting their relative use of different factors. Adjustment costs will also play a role in the firm's choice of input mix and scale in such dynamic context. The existing literature suggests that the costs of adjusting at the firm level involve both convex and non-convex (e.g. fixed) costs.[8] Convex adjustment costs in a given input tend to dampen the response of businesses to shocks in that specific margin. In our context, differential dismissal costs make it natural to assume that the costs of adjusting via fixed-term contracts are lower than the costs of adjusting via open-ended contracts, in a way that makes the open-ended category less responsive to shocks. On the other hand, open-ended contracts offer potential advantages in terms of the quality of workers that can be attracted, and the possibility of building match-specific capital. The implication should be that, despite differential adjustment costs, not all adjustment will concentrate solely in fixed-term contracts.

This framework has implications in terms of the propensity to use fixed-term and open ended-contracts across producers. For example, producers facing more volatile profit shocks should use more fixed term contracts. Also, businesses or sectors where the accumulation of firm-specific knowledge by workers is more important may rely more widely on open ended contracts, even if the costs are higher, since longer job tenure may boost productivity. The presence of fixed costs in changing the scale or other quasi-fixed factor that interacts with the contract mix implies we may observe lumpy adjustment in the changes of contractual mix at the establishment level. Changes in the aggregate contract mix might reflect both changes at the intensive margin (producers with both types of contracts changing their share) and extensive margin (a producer changing from having only one type of contract to having both). Moreover, the characterization of fixed-term employment as a natural shock absorber may explain why the share of workers under fixed term contracts did not go up immediately after the 1990 reform, but rather only when businesses experienced the large negative shock associated with the 1998 economic crisis. It also implies that job creation and destruction should be reflected in parallel fluctuations of fixed-term

[8] There is a large literature on lumpy adjustment of capital and choice of technology (broadly defined). For applications closely related to the framework we have in mind see Dunne, Haltiwanger and Troske (1997) and Cooper, Haltiwanger and Power (1999) and references therein, as well as Eslava, Haltiwanger, Kugler, Kugler (2010) for consideration of multi-factor adjustments.

employment, with changes in the contract mix potentially asymmetrically related to creation and destruction.

4. The use of fixed term contracts in Colombia's manufacturing industry

4.1. Data

We use a longitudinal database of manufacturing establishments constructed from the Colombian Annual Manufacturing Survey (AMS). The AMS covers all manufacturing establishments with 10 or more workers, or with sales above a threshold—it is the employment threshold that binds for the overwhelming majority of plants included in the survey. The data include information, for each establishment on: employment, use of fixed assets, production, use of materials, and use of energy. The data also records the 4-digit sector to which the establishment belongs, as well as is its location. The longitudinal database we use covers 1992-2009; it simply takes the original EAM cross-sections and creates a unified panel, using plant IDs (kept constant over this period) to make longitudinal linkages.[9] Data for earlier years is available, but it does not report workers under open-ended and fixed-term contracts separately.

Starting in 1992, surveyed establishments report separately workers under open-ended and fixed-term contracts. The questionnaire further asks them to separate their fixed-term workforce into workers directly hired by the establishment, and those hired "through agencies". There is, unfortunately, no one-to-one correspondence between these categories of "fixed-term employment" and the different types of non-open-ended contracts discussed in section 2. However, both intuition and general wisdom—including the perception of AMS staff members—suggest that the category of fixed-term workers hired "through agencies" includes both workers provided by employment agencies, and by associative employment cooperatives. It is similarly the case that the category of fixed-term workers directly hired by the firm should cover both contractual workers as well as workers under fixed-term labor contracts. Notice that, under this interpretation, both categories correspond to employment

[9] Specific questions to AMS respondents have changed over time. Fortunately for our purposes, open-ended and fixed-term contracts have been asked for in ways that are consistent over time for the period covered in our analysis. The longitudinally linked database we use makes some modifications to the original data to make other variables, especially capital, compatible over time.

modes that become more attractive for businesses when labor costs increase; the direct fixed term category is likely most affected by regulations about apprentices; and the category of workers hired through agencies is likely affected by shocks affecting the use of associative employment cooperatives.

The unit of observation is the establishment (and not the firm) which we think is preferable for this analysis. Though we have used the term "firm" to describe the employer in previous sections, especially when discussing our conceptual framework and motivation, the empirical analysis will in fact be conducted at the establishment level.

4.2. Within Firm vs. Between Firm Changes in the Contract Mix

Figure 3 shows dramatic changes in the overall mix of contractual types. It adds to Figure 1 by showing the dynamics of the different categories of fixed-term workers: hired directly or hired through an agency. The overall message is that there has been a shift in the aggregate composition of employment in the sector, from open-ended to fixed-term workers. The change started back in the beginning of the 90s, but only deepened at the time of the 1998 crisis. The increase in the use of fixed-term workers at this time concentrated on directly-hired workers. A second phase of concentration on fixed-term workers is apparent starting in 2002, this time mostly in the category of workers hired through agencies. The use of workers under open-ended contracts has only recently started to show some recovery, at the time of the 2008 global crisis (which did hit Colombia, but mildly). While the change is modest, and there is no sign of return to the times when open-ended contracts completely dominated, it is still interesting to see that it occurred at the time where associative employment cooperatives started to be subject to payroll taxes (see Section 2.1.)

These patterns in the use of fixed-term workers are also reflected in Table 2, which provides a set of basic descriptive statistics for the share of total employment at the firm level that is represented by fixed-term contracts, overall and in the "direct" and "through agency" categories. We denote these shares S_{fjt}, $S_{fjt\text{-}direct}$, and $S_{fjt\text{-}agency}$ respectively. We present statistics for the overall period, and separately for initial and final subperiods, split in 2002 when the most significant late reform took place. In the 1992-2001 period the average share of fixed term workers was 12.2%, and while establishments in the upper 90th percentile had 55% of their labor force represented by fixed term workers, the 75th percentile establishment only hired close to 5% of its labor force through fixed contracts, and the median establishment had no fixed term worker. For the 2002-2009 period there

was a marked increase to an average of 32.6% of the workforce in the fixed-term category. The 75th percentile of S_{fjt} increased from 5% to almost 70% in this period, and the median unit hired close to 8% of its labor force as fixed-term workers

A first question that comes to mind is the extent to which the increase in the use of fixed-term workers is a between-establishment vs. a within-establishment phenomenon. That is, is the overall change accounted for more by changes in the within establishment mix or by an increase in the market share of establishments that primarily use fixed term contracts, without much change in the within establishment contract mix itself (for instance, fixed term contracts are concentrated in the entering establishments). For the between-establishment component, we further quantify whether it is a between sector or within sector phenomenon. This analysis allows us to understand what the most relevant source of variation is: should we focus more on firm or sector characteristics that determine the relative use of different types of contracts, or on aggregate changes?

This initial analysis is based on a variety of shift-share decompositions. We first consider the following decomposition of manufacturing-wide changes in the fixed-term contract share:

$$\Delta S_{Ft} = \sum_k \overline{\omega_k} \Delta S_{Fkt} + \sum_k \overline{S_{Fk}} \Delta \omega_{kt} \qquad (1)$$

Where S_{Ft} is the fixed term contract share, out of total employment, for the manufacturing sector at time t; Δ denotes a change between t-1 and t; S_{Fst} is the fixed-term contract share for sector k; ω_{kt} is share of employment in sector k at time t; and a bar over a variable represents the time average between t-1 and t. The first term of this decomposition reflects within-sector changes, while the second corresponds to between-sector shifts. This simple decomposition will provide information as to the role of within vs. between sector shifts.

An analogous decomposition can be used to decompose the sectoral changes further:

$$\Delta S_{Fkt} = \sum_{j \in k, cont} \overline{\omega_j} \Delta S_{Fjt} + \sum_{j \in k, cont} (\overline{S_{Fj}} - \overline{S_{Fk}}) \Delta \omega_{jt} + \sum_{j \in k, entrants} \omega_{jt} (S_{Fjt} - \overline{S_{Fk}}) - \sum_{j \in k, exits} \omega_{jt-1} (S_{Fjt-1} - \overline{S_{Fk}}) \qquad (2)$$

where a subscript j reflects establishment level measures. This decomposition enables us to not only understand whether the changes at the sectoral level are within or between

establishment (first and second term, respectively), but also permits quantifying the role of establishment entry and exit.

Results for decompositions (1) and (2) are presented in Figures 4 and 5, respectively. The central message from these figures is that the move towards a more intensive use of fixed-term contracts is a within-sector and within-plant phenomenon: the within-sector and within-plant terms fully dominate these decompositions. The role of entry and exit is quite limited, which means that exiting and entering establishments do not differ importantly from continuers in terms of how intensively they hire fixed-term workers. These findings do not imply that there are no differences in the extent to which firms move towards fixed-term contracts. In fact, the distributions in Table 2 provide evidence of extensive differences in within firm changes. But they do mean that the increasing use of fixed term workers is not concentrated in specific sectors or only a few establishments.

A simple regression of establishment level shares on sector dummies is another way to quantify the role of sectoral effects in accounting for the variation in fixed-contract shares across establishments:

$$S_{Fjt} = \alpha + \sum\theta_j + \varepsilon_{jt}, \qquad (3)$$

where $S_{Fjt} = L_{Fjt,I} / (L_{Fjt} + L_{Ojt})$, $L_{Fjt,I}$ is the number of fixed-term workers, either in total ($=L_{Fjt}$) or hired through agency or directly, and θ_j are sector effects. The R2 for these regressions fall below 0.05 for all categories of fixed term contracts. Consistent with the previous discussion, it is clear from this exercise sector effects play a very modest role in explaining differences in the use of fixed-term workers. Overall, findings for equations (1) through (3) imply that the move towards a more intensive use of fixed term contract was widely spread across businesses, even though some businesses increased their share of fixed term workers more than others. It must then be the case that plant-level characteristics are the key determinants of the extent of use of fixed term contracts. This implication will be incorporated into our analysis of responses to labor reform and of the relationship between the use of fixed term contracts and productivity.

Another interesting set of basic issues has to do with the relationship between (gross) job creation and destruction (JC and JD, respectively) and the relative use of open-ended vs.

the different categories of fixed-term contracts. A basic question has to do with whether JC and JD have become increasingly concentrated in fixed-term contracts, which would be consistent with the fixed-term categories of contracts being used as shock absorbers increasingly intensively. Figures 6 and 7 take a first step in this direction by showing JC and JD rates, and the way in which each of them decomposes into the contribution of the different types of contracts. The level of JC can be defined as the sum, across expanding establishments, of the firm-level annual changes in the number of workers. JC can thus be further decomposed into the contributions of fixed term and open-ended employment. The contribution of fixed term work, for instance, is equal to the sum, across expanding establishments, of the firm-level change in the number of fixed-term workers. Contributions of open-ended contracts, and of other subcategories are constructed analogously. JC rates and the different contributions are then constructed as the ratios between these levels and total employment in expanding establishments, averaged over the initial and end years. It is these rates that Figure 6 is reporting. Figure 7 corresponds to the analogous construction for contracting establishments.

The evolution of JC rates over the period is dominated by the 1998-1999 crisis. JC plummets from over 10% in the pre-crisis period to less than 4% during these two years, to recover its pre-crisis levels in the 2000s. More interesting, however, is the relative contribution of open-ended vs. fixed-term contracts to these phases. While the reduction in JC during the crisis is fully explained by a reduction in the rate at which expanding establishments created open-ended jobs, its post 1999 recovery fully reflects an increased rate of creation of fixed-term jobs in these establishments. The creation of fixed-term jobs picks up first in the direct category, and then in the category of workers hired through agencies. As a general feature, the dynamics of JC in the 2000s have been dominated by those of JC in the fixed term categories, while the pre-2000 era had JC variability over time dominated by the category of open-ended contracts.

JD also reflects the economy's cycle closely, with a sharp increase in 1998-1999. It is also the case that the dynamics of JD are dominated by what happens to open-ended jobs over the 1990s, but becomes more closely linked to the dynamics of JD in fixed-term jobs afterwards.

Figure 8 presents the distribution of establishment-level changes in S_{fjt} separately for plants creating jobs and plants destructing jobs, focusing the attention solely on continuing

establishments. It is both the case that expanding establishments are more frequently increasing the intensity with which they use fixed-term workers, and that contracting establishments are reducing that intensity. In other words, plants tend to adjust in the fixed-term margin more than in the open-ended margin. This is consistent with the view that fixed-term contracts in general provide greater flexibility. On the other hand, the histogram for contracting establishments is less asymmetric around zero than that for expanding establishments. This is consistent with the observed secular move towards the use of fixed term workers. It is also worth pointing that most establishments change only modestly their contract mix between consecutive years, as pointed by the spike close to zero.

Figure 8 leaves out entering and exiting establishments, as well as those that do not change their total employment between two years. Consistent with Figure 5, it is clear that the distribution of fixed term worker shares for entering and exiting establishments does not differ importantly from the overall distribution. It is also the case that plants that do not adjust their overall employment level rarely change the intensity with which they use fixed term contracts, again consistent with the view that these contracts are primarily shock absorbers.

We can also quantify whether, consistent with the view that fixed term contracts are natural shock absorbers, the plants increasing (cutting) the share of fixed-term employment are those where new fixed-term jobs are being created (destroyed) or rather those where open-ended contracts are being destroyed (created). To do this we estimate a regression of the share of the change in the fixed-term employment share on job creation and a job destruction measures, generated as establishment-level counterparts of sector-level creation and destruction defined by Davis, Haltiwanger, and Schuh (1996):

$$\Delta S_{Fjt} = \alpha + \beta JC_{jt} + \delta JD_{jt} + \varepsilon_{jt}, \qquad (4)$$

where JC_{jt} and JC_{jt} are job creation and job destruction in plant j at time t. The job creation variable at the plant-level is given by $JC_{jt} = \max(g_{jt}, 0)$ and job destruction is given by $JD_{jt} = \max(-g_{jt}, 0)$ and g_{jt} is plant-level employment growth. Note that by construction job creation and destruction, at the plant-level, will in general not both be zero simultaneously (the exception is the case of an establishment for which employment remained constant

between two years). As such, this regression is equivalent to exploring the relationship between the share of fixed-term contracts and plant-level growth permitting a kink at zero growth.

Results of estimating equation (4), employment weighted, are presented in Table 3, panel 1. The first three columns correspond to regressions without time effects, while the regressions in columns 4-6 do control for time effects. We find a positive sign for JC and a negative one for JD. The estimated effect of a change in JC is significantly larger than that associated with a similar change in JD in columns 1 and 4. The rest of columns show that the asymmetry between the responses to JC and JD is driven by the direct fixed-term contracts category. Panel B, in turn, shows that the larger coefficient for job creation is concentrated in the later subperiod of the sample.

Notice that the *symmetric* aspect of the responses to JC and JD, reflected in an expansion of fixed-term employment in response to JC and a similar contraction in response to JD, is consistent with fixed-term employment being a more natural shock absorber than employment under open-ended contracts. Meanwhile, an asymmetric response, with the change in the direct fixed-term share responding disproportionately to JC rather than JD, points to expanding firms playing a more important role in the secular trend towards increasing the use of fixed term workers. Both of those patterns are reflected in the data. What is most interesting, though, is that the dynamics in the "direct" category seem more consistent with the second view, while the opposite is the case for the category of workers hired through third parties. We interpret this fact as evidence that the hiring of workers through agencies offers the most flexible type of contracts, and is thus the preferred adjustment margin in the face of shocks.

Overall, this descriptive analysis suggests that fixed-term contracts, especially those where workers are hired through agencies, yield more flexibility than open ended ones. As such, it is the fixed-term category that accommodates responses to shocks. There has also been a secular increase in the use of fixed term contract workers over the last two decades. The shift is pervasive across productive units, suggesting that it is plant-level characteristics (rather than sector or aggregate ones) that determine the intensity with which fixed term contracts are used.

5. Explaining the contract mix: firm characteristics and the effect of regulatory changes

We now move to studying the relationship between the use of fixed-term contracts, regulations and firm characteristics. This is motivated by the simple conceptual framework in above that identifies factors likely to be important in determining the contract mix. We estimate a model where the use of fixed-term contracts is regressed against firm or sector characteristics thought to be correlated with the need to use fixed-term contracts; statutory non-wage labor costs imposed by the regulation; and an interaction between the two dimensions. Our dependent variable is the share of employment represented by fixed-term contracts (either total, or hired through agencies, or hired directly). Our regressions can be written in the following form:

$$S_{Fjt} = \alpha + \theta_k + \lambda K_{jt} + \psi_1 \text{labor\_cost}_t + \psi_2 \text{labor\_cost}_t \times \text{Propensity}_j + \psi_3 \text{Propensity}_j + \rho S_{Fj\_pre} + \text{GDP\_growth}_t + \varepsilon_{jt}, \quad (5)$$

where S_{Fjt} is the share of fixed term workers in plant j at time (year) t; θ_k is a sector- or plant-level fixed effect; K_{jt} is a measure of the scale of the plant (its capital stock in year t); Propensity_j is a measure of how likely plant i is to use fixed term contracts (further explained below); labor_cost_t is mandatory non-wage labor costs as a fraction of the wage (from Figure 2); S_{Fj_pre} is the share of fixed term contracts in the plant in an earlier period; and GDP_growth_t, which varies only across years, is intended to capture aggregate shocks. (We do not include time fixed effects because one of our variables of interest, labor_cost_t, only varies accros time, but results are robust to controlling for a recession dummy rather than GDP growth.)

In terms of characteristics that determine the propensity a firm has to use less stable work contracts, we consider production workers as a fraction of the total labor force, and the effective payroll tax rate. Businesses with a greater share of production workers (as a proxy for low skill intensity) are likely less dependent on high human capital, and should be more inclined to hire workers through short-term contracts. Also, businesses more able to circumvent (either legally or informally) mandated non-wage labor costs are, ceteris paribus, likely more willing to hire workers using fixed-term contracts. We proxy this ability to circumvent mandatory payments through the effective payroll tax rate, calculated as the ratio of mandatory non-wage labor payments, other than social security contributions and mandatory bonuses, to the wage bill. The statutory rate for these taxes has been 9%

throughout the period (the "other payroll taxes" component in Figure 2b), and the average effective tax rate is close to 5% with a standard deviation of close to 1%. One may want to include social security contributions and bonuses in the calculated payroll tax rate, but these individual payments are not reported in ways that are consistent over time in the Manufacturing Survey, so we chose to abstract from them. Most importantly, we note that this effective payroll tax rate only varies at the sectoral level. Only the interaction effects with propensity are identified when we control for sector effects.

There are potential concerns about these proxies for the propensity to use fixed term contracts being endogenous to the choice of contract mix. For example, some temporary contracts are exempt from the mandatory non-wage labor costs depicted in Figure 2, so that a firm that has a higher share of fixed-term contracts will likely pay a lower effective tax rate. To address these concerns, we use measures of propensity that pre-date the sample over which we estimate specification (5). Specifically, we estimate (5) for the period 1998-2009 and calculate a fixed (for the plant) measure of $Propensity_j$ using only information for a prior period (that is, averaging over 1993-1997). We also control for either plant effects or initial conditions directly, the latter captured by the 1993-1997 average share of fixed term workers at the plant (S_{Fj_pre}). For the effective tax rate, more likely correlated with S_{Fjt} by construction (since employers pay less payroll taxes for temporary workers), we further use the three-digit sector average as a regressor, rather than the plant-level one.

As far as the labor costs index in equation (5), we have mentioned that different types of contracts included under the "fixed-term" heading in the EAM allow employers to circumvent the obligation to cover these costs. Therefore, higher values of our labor cost index should in principle be associated with a more intensive use of fixed-term contracts, especially in the businesses where propensity to use these contracts is higher to begin with. Moreover, greater incentives to use fixed-term contracts should be particularly important for firms that already have higher propensity to use fixed term workers, so we would expect the coefficient associated with the interaction term in equation (5) to be positive.

Table 5 presents results of estimating equation (5), with Table 4 reporting basic descriptive statistics for the variables included in this analysis. Panel A of Table 5 presents regressions including plant-level fixed effects, while in plant B regressions include three-digit sector-level effects and initial conditions (i.e. S_{Fj_pre}). Standard errors are clustered at the

plant level (in panel A, robust standard errors are equivalent to clustered standard errors given the inclusion of plant fixed effects).[10] Our estimations are employment-weighted.

Results in Table 5 show that, indeed, the use of fixed term workers increases steeply with increases in the non-wage labor costs. For an average "propensity" establishment, an increase in the labor cost index of 0.1 (close to the increase observed over our period of study) leads to an increase in the share of workers of close to 0.43, or 43%.[11] To place this number in context, we note that the average share of fixed term workers went from 0.14 in 1993 to 0.44 in 2009. That is, over the estimation period the observed increase in the labor cost could more than account for the increase in the use of fixed terms workers at the average plant.

The effect associated with an increase in labor costs is especially large in plants that we have characterized as more inclined to use fixed term workers. For instance, low skill plants are more likely than high skill plants to respond to increased payroll taxes by increasing their use of fixed term contracts in response. For a plant with pre-1998 share of production workers one-standard deviation (0.52) above its mean, for instance, the impact of a 0.1 increase in the labor cost index on the share of fixed-term workers goes up by 0.025 compared to the impact for the plant with average fraction of production workers. This is consistent with the hypothesis that technologies that require less skill in the labor force make plants more willing to use contracts of a temporary nature. A related hypothesis consistent with these findings is that employers tend to write more stable contracts with workers whose skills the employer values more, possibly because match-specific human capital is more likely to arise in the case of these workers. It is also interesting to note that lower skill intensity, as proxied by a higher share of production workers, only affects the use of fixed term contracts through agencies. We also interpret this finding as evidence consistent with plant using contracts that are flexible but generate little or no attachment between the employer and the employee especially to hire low-skill workers, whose permanence at the job is not that important to the employer.

[10] Since the share of production workers varies only at the plant-level, the coefficient associated with this propensity measure is only reported in Panel B. Similarly, the effective payroll tax rate varies at the sector level, and it is reported only in Panel A (since some plants change sectors over time).

[11] The estimated magnitudes of effects that we discuss in the text are calculated using the coefficients in the last three sets of columns, where payroll taxes and production workers are included simultaneously.

Similarly, plants in sectors with higher pre-1998 effective payroll taxes respond more intensely to increases in the labor cost. Our view is that some employers are less able to keep their workers out of full formality, for instance because they rely more on government services and are thus more closely monitored, or because they are larger. A high (early) effective rate of payroll taxes is interpreted here as signaling that the plant is more exposed to labor costs imposed by the regulation. Finding that plants with this characteristic are more sensible to increases in mandated labor costs is in line with our expectations. In particular, we find that plants in a sector with early effective labor tax rate one standard deviation above the mean respond to an increase in labor costs of 0.1 by increasing their share of fixed term contracts in 0.48 rather than the 0.43 effect that we find for the average plant.

We also find that an increase in the size of plants is associated with a more intense use of to use fixed-term contracts. Comparing panels A and B of table 5, it is clear that this is a within-plant phenomenon. Across plants, larger sizes are only associated more hiring of temporary workers through agencies, but with lower direct hiring through fixed term contracts.

6. Productivity and the contract mix.

Reforms that facilitate the use of fixed-term contracts have been partially conceived as ways to boost productivity in an environment where more restrictive contract regulations distort the allocation of workers across businesses and activities, potentially forcing them to remain at low productivity businesses. Beyond allocative efficiency, however, there are reasons why fixed-term contracts may also have an effect on productivity at the micro level. First, fixed-term contracts allow more flexibility in adjusting factors of production and may facilitate the movement of production from less to more productive activities within a plant. Second, lower dismissal costs for fixed-term contracts could imply higher within-establishment productivity because plants are no longer forced to keep unproductive workers, or discouraged from investing in technologies that require adjusting the labor force to be taken full advantage of. On the other hand, lower dismissal costs may imply that firms are less discerning at the time of hiring, so match quality and productivity may actually be lower. Finally, lower dismissal costs may imply less investments in firm-specific human capital, as workers are more mobile and both firms and workers invest less in specific skills. While the first two effects push towards higher productivity, the last two channels would imply lower productivity in plants

that rely more on fixed-term contracts.[12] Thus, it is an empirical question whether fixed-term contracts increase or decrease plant productivity.

To analyze productivity implications of the use of fixed-term contracts, we estimate difference-in-difference specifications where establishment-level productivity is regressed against both establishment and year effects, as well as a measure of the intensity with which the establishment uses fixed-term contracts, captured by the share of fixed-term contracts out of all employment. We let the relationship between productivity and the use of fixed term contracts vary with the current skill intensity at the plant. This interaction tries to get at the question of whether firms that are in greater need of skill (and presumably of match-specific quality) are more likely to see productivity losses associated with the use of fixed-term workers. Since we control for establishment and year effects we are exploiting within plant variation over time in identifying these effects – that is, we are relating changes in productivity (i.e., productivity growth) with changes in the use of fixed term contracts.

Thus, we estimate the following expression:

$$TFP_{jt} = \psi_j + \tau_t + \omega_1 S_{Fjt} + \omega_2 S_{Pjt} + \omega_3 S_{Fjt*} S_{Pjt} + \eta_{jt}. \qquad (6)$$

where TFP_{jt} is a measure of productivity for plant j in year t, constructed as the residual from a KLEM production function; S_{Pjt} is the share of production workers in that plant and year; and ψ_j and τ_t are plant fixed effects and time effects. Both the share of fixed term contracts and its interaction with the share of production workers could be endogenous in this equation. We try to address this concern through an IV estimation of equation 6. Inspired by equation 5 and results in Table 5, our instruments are the interaction between labor costs and the pre-1998 share of production workers, and the interaction between labor costs and the pre-1998 payroll tax rate in the sector.[13]

Results from this exercise are presented in Table 6. We focus on the results of the IV estimation, reported in columns (5) through (6), but first note that estimated effects differ importantly between OLS and IV regressions. We find that a plant that uses more fixed term workers has greater productivity when evaluated at the mean level of production workers.

[12] Autor, Kerr and Kugler (2007) is one of the few studies that has examined the effect of dismissal costs on productivity. They find that exemptions to the employment-at-will doctrine in the U.S., which increased dismissal costs, had a small negative effect on firm-level productivity.

[13] The share of production workers may be viewed as endogenous here as well so that an additional instrument is necessary. We plan to explore this issue in future work.

The relationship is stronger for those plants that use production workers more intensively (proxying here for low skill intensity), and in fact it becomes quite weak at sufficiently low, but still relevant, levels of the share of production workers. For a plant with average share of production workers (a 0.7 share, see table 4), a one standard deviation increase in the share of labor represented by fixed-term contracts is associated with an 8.2 log points increase in TFP. The effect goes to less than 2 logs points if the share of production workers is one standard deviation below its mean. The relationship between plant TFP and the share of fixed-term contracts of a specific type (direct or through agency) is similar to the one just described.

An additional, better known, story about potential gains from the flexibility provided by fixed-term contracts concentrates in gains in aggregate productivity from a better allocation of resources across businesses. Aggregate productivity gains are not only derived from within-plant productivity increases, but also by the reallocation of resources to more productive uses in response to shocks. The latter source of productivity gains is best taken advantage of when resources can in fact be easily reallocated. As corroborated by the evidence we have presented, fixed-term contracts provide greater flexibility, and in this sense should be associated with greater aggregate productivity via enhanced allocative efficiency.

We begin our empirical analysis for this hypothesis by examining whether the use of fixed-term contracts at the plant changed the covariance between size and productivity, a measure of allocative efficiency. In particular, we estimate a regression of the share of firm j's output out of its 3-digit sector's output, $Share_{Yjkt}$, on sector and time effects, on TFP_{jt}, and on the interaction of TFP_{jt} with the share of fixed-term employment out of total employment in the plant, S_{Fjt}:

$$Share_{Yjkt} = \rho_j + \pi_t + \xi TFP_{jt} + \kappa TFP_{jt} \times S_{Fjt} + \mu_{jt}. \qquad (7)$$

Thus, if indeed greater reliance on fixed-term contracts allows more productive firms to increase their market share more easily and less productive firms to shrink, then the coefficient associated with the interaction term should be positive. We note that this specification is intended to quantify the extent to which the covariance between size and productivity is related to the use of fixed-term contracts – as such, the regression is simply a descriptive device to quantify this relationship.

Results of this exercise are reported in Table 7. The covariance between productivity and market share is positive (as allocative efficiency would require) for any level of the share

of employment represented by fixed-term contracts. It is also larger for plants that use fixed-term contracts more intensively. This is consistent with fixed-term contracts allowing greater flexibility for a plant to expand or contract in response to productivity shocks. However, the magnitude of the difference is not particularly large. While a one standard deviation increase in productivity is associated with a 0.47% market share increase for the plant with average share of fixed term workers, the figure only goes up to 0.49% if the plant has a fixed term contract share one standard deviation above the mean. It is also worth noticing that the coefficient associated with the interaction between TFP and Sfjt is only positive for fixed term contracts through agencies—which would be consistent with contracts through third parties providing greater flexibility—, though results shown below at the sector level are not fully consistent with these differences. Further exploration of this issue is thus necessary before reaching more definite conclusions.

We explore this last hypothesis, and at the same time take an alternative look at allocative efficiency, focusing directly on the aggregate (sector) level. In particular, we look at the effects of fixed-term contract use on within-sector productivity changes and reallocations within 3-digit sectors. At this level, aggregate productivity TFP_{kt} can be constructed as the output-share-weighted TFP average, and decomposed into two terms: the simple average of TFP and the covariance between TFP and output shares (associated with allocative efficiency) This is the decomposition known as the Olley-Pakes (OP) decomposition:

$$TFP_{kt} = (1/N_{kt})\sum_{j\in k} TFP_{jt} + \sum_{j\in k}(Share_{Yjkt} - \overline{Share}_{Ykt})(TFP_{jt} - \overline{TFP}_{kt}) \quad (8)$$

To examine how these components of aggregate productivity are correlated with the use of fixed-term contracts, we estimate regressions of each term of the OP decomposition (the right-hand side of equation 8) on sector effects, time effects and on the share of fixed-term contracts in the 3-digit sector.

Results are reported in Table 8. Focus first on Panel A, which covers the full estimation period. Results indicate, again, that a more intensive use of fixed-term contracts is associated with greater productivity, both within-plant and in terms of allocative efficiency. A one standard deviation in the sector level share of fixed term contracts (0.15, see Table 6) is associated with an increase of close to 6.6 log points in average TFP and an increase of 2.5

log points in the covariance between productivity and market shares. The implied overall change in aggregate productivity is close to 9 log points.

As a alternative way to look at the issue of allocative efficiency, we run a regression of the variability of TFP within a 3-digit sector on the share of fixed-term contracts in the 3-digit sector, controlling for sector and time effects. Hsieh and Klenow (2009) have pointed out that, in a static model with decreasing returns to scale and a single profitability shock, a more efficient allocation of resources is associated with less dispersion in measured TFP.[14] While other forces (such as endogenous innovation and entry) could counteract this implication, we examine the relationship between the use of fixed term contracts and the dispersion of TFP keeping the Hsieh-Klenow framework as a guide. Results are presented in the last column of Table 8, and are broadly consistent with the use of fixed term contracts being associated with greater allocative efficiency in the form of reduced dispersion in TFP.

Our results in this section are interesting in that they support hypotheses according to which greater flexibility in the ways in which workers can be hired are productivity enhancing, despite concerns that employers may be tempted to only hire workers for short periods of time, eroding potential gains from on-the-job training. Several qualifications must be underlined, however. First, those same results indicate that the productivity gains associated with a more intensive use of fixed-term contracts are greatest in businesses with lower skill intensity requirements. This effectively provides evidence that the dangers of fixed term contracts do bite when these contracts are used for activities with high human capital and experience requirements. Second, many employers are likely able to identify occupations within their businesses in which stable worker-employer matches are beneficial. Together with the fact that certain types of fixed-term contracts can be effectively become permanent (such as contractual work) this suggests that many employers are likely able to take advantage of the greater flexibility and lower costs provided by fixed-term contracts without having to face the costs associated with them.

[14] There is a contrast between "measured TFP" constructed when sector level prices are used to deflate plant level outputs and inputs, and similar measures of TFP that take advantage of plant level deflators to arrive at appropriate measures of physical quantities. The former is frequently termed TFPR ("revenue" productivity) and the latter TFP. It is a TFPR measure that we use in this paper. Even in the presence of heterogeneous efficiency (and thus dispersion in TFPQ) competition should imply homogeneous TFPR in the kind of models just described.

Before concluding we note that in panel B we estimate the same specifications for the later time period. Results are similar in panel B to those in panel A with one main exception. The share of fixed term contract workers from agencies has a negative and significant effect in the later period on the TFP simple average and the Olley-Pakes cross term. Understanding why there is this change in the later period is an area for future research. We note however that the impact of fixed term contract agency workers is still negative on the TFP dispersion index in the later period.

7. Conclusions and policy implications

This paper provides a descriptive analysis about a relatively unexplored issue: the use of more flexible types of contracts to hire workers. Our analysis is motivated by the increasingly intensive use of fixed-term contracts in Colombia's manufacturing industry following extensive labor market reforms in the early 1990s. We first provide an in-depth description of the use of these types of contracts in the manufacturing industry of the country, both across years for the industry as a whole, and across sectors and individual businesses. Guided by that initial description, we undertake an exploratory analysis of likely factors associated with the use of fixed-term workers, both in terms of policy, and firm and sector characteristics. We also explore whether a more intensive use of fixed-term contracts is associated with productivity gains, a potential benefit that partly motivated reforms that removed limits to the use of these contracts.

Our findings show that the increase in the use of fixed term contracts over the last two decades is pervasive across all (manufacturing) sectors and establishments. At the same time, it is businesses that face greater volatility, those with a lesser need for a skilled labor force, and those less able to circumvent mandatory non-labor costs that have moved towards fixed term contracts in a more determined manner. The fixed-term contract category is a natural shock absorber, as suggested by the fact that both Job Creation and Job Destruction are concentrated in the category of fixed-term contracts. We also find that the shift towards fixed-term contracts intensified, especially in these types of establishments, with increases in mandatory non-wage labor costs associated with regulatory changes In terms of the productivity implications of the use of fixed-term contracts, we find that this practice is associated with increases in within-plant productivity, again especially in businesses with low skill needs, and the degree to which activity is allocated to the most productive businesses. Businesses with high demands of skilled labor force experience much lower gains (or even

losses) in productivity with the more intensive use of fixed-term contracts. We also find some evidence of improved allocative efficiency from the increased use of fixed-term contracts although here the evidence is somewhat more mixed.

Several interesting implications stem from this analysis, some related to the ongoing policy debate about fixed term contracts and other labor regulations. First, our findings point at important aggregate productivity gains stemming from the use of fixed term contracts. This helps to settle a debate about whether these flexible types of contracts in fact indeed increase productivity, given the potential cost in terms of not fully reaping productivity gains from on-the-job training. Lifting limits to the use of flexible contracts, hence, does lead to productivity gains. Perhaps not surprisingly, the typical employer seems to be able to judge when using open-ended rather than fixed-term contracts is detrimental to the productivity of his business, as evidenced for the fact that productivity is positively associated with the use of fixed term workers over a large plausible range of businesses characterized in terms of skill mix. On the other hand, however, we do find evidence that the effect on TFP of using fixed-term employment more intensively is in fact negative for the more high skill-intensity plants.

To put these conclusions in perspective, we note that in previous work we have found an increase in allocative efficiency associated with the comprehensive package of reforms implemented at the beginning of the 1990s (Eslava et al. 2004, 2006). Our results in the current paper suggest that part of that increase in efficiency could be related to the labor market component of that reform effort, of which a key piece was the introduction of greater contractual flexibility. Findings in this paper are also related to a previous study of ours on factor adjustment and adjustment costs following the reforms (Eslava et al. 2010). We found in that study that the adjustment of factor demands changed after the reforms of the early nineties in ways that are consistent with a reduction of the cost of reducing employment under open-ended contracts (Eslava et al. 2010). In particular, we found evidence consistent with Job Destruction becoming more responsive to negative shocks, and businesses starting to use the capital margin as a main absorber of positive shocks. That study covers a period ending in 1998 and focuses solely on the relative demand of capital vs. workers under open-ended contracts, given the emphasis on contrasting pre-1990 with post 1990, and the fact that fixed-term contracts are only reported starting in 1992. The evidence in the current paper further complements findings of that study by suggesting that part of the employment destroyed after the reforms moved to the fixed-term category, and that employment under fixed term contracts became a main shock absorber in the post-reform era.

As a second set of results worth discussing, not only we find evidence that fixed-term contracts are attractive on a number of dimensions related to productivity gains and response to shocks, but also find that increases in mandatory non-labor costs lead to a more intensive use of fixed-term contracts. This constitutes evidence in support of our prior that an important fraction of fixed-term contracts in our sample are either informal labor contracts or non-labor contracts, through which both employers and employees can circumvent mandatory non-wage labor costs and contributions. An increase in these costs, which supposedly applies to all workers, and increases welfare for them, seems to be effectively displacing employment to categories of contracts not covered by these regulations.

A suggested implication of this finding is that labor and non-labor types of contracts, legally conceived to play different roles (with non-labor contracts supposed to cover activities other than the day-to-day tasks of businesses) are effectively being used as substitutes. This introduces a duality in the labor market than can have detrimental consequences on a wide arrange of fronts: workers' welfare, the sustainability of public finances and of the social security system, etc. In essence, the problem is that the very same task can be executed by a worker formally employed by the firm, and by one hired as a contractual worker, via an associative employment cooperative, or simply as an outright informal worker. Workers under these alternative types of contracts cost less to the employer, have higher income for a given level of wage (since they do not pay contributions corresponding to the employee); effectively enjoys the same health coverage but does not contribute to the system;[15] does not contribute to the different public activities funded through labor taxes; has very little pension protection, and can be more easily separated from his job (at least compared to workers under open ended contracts).

In terms of worker welfare, fixed-term contracts (understood as a mixture of true fixed-term labor contracts and non-labor contracts) can be beneficial or detrimental, depending on a complicated balance of factors: for a given cost to the employer the employee receives a higher income, but potentially has a less stable job and worst future pension perspectives.

[15] Though the health system supposedly ensures the worker who contributes, judicial rulings have effectively implied that every individual has the same coverage of contributing workers. Most recently, a ruling by the Constitutional Court deemed unconstitutional any difference between the plan covering workers who contribute and that covering other individuals.

In terms of allocative efficiency, meanwhile, businesses better able to circumvent these regulations, such as micro-establishments, those outside government, and those with access to better management advice, have an advantage over others, even if less efficient in terms of their production technology. While our results in terms of allocative efficiency partially dispel these concerns, it is also important to mention that, given the coverage of the AMS, they say nothing about the allocation between micro-establishments and larger ones, or across government and non-government activities, rural and urban ones, etc. The results also have little to say about the bulk of informal jobs, concentrated in establishments with less than 10 workers. While we are unable to formally measure the potential costs of regulations that affect the relative cost of formal and informal contracts in terms of economy-wide allocative efficiency, we do point that our results suggest an important effect of these regulations in the relative use of the different types of contracts, and that this has a potentially large effect on aggregate productivity.

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Table 2. Descriptive Statistics

Panel A. (1992-2001)

	(1) Mean	(2) S.D.	(6) P50	(7) P75	(8) P90	(9) P99
Sfjt	0.1221	0.2658	0	0.0513	0.5509	1
Sfjt - agency	0.0413	0.1388	0	0	0.1053	0.7708
Sfjt - direct	0.0793	0.2339	0	0	0.2615	1
Job Creation	0.2162	0.5280	0	0.1266	0.5225	2
Job Destruction	0.2667	0.5684	0	0.2000	0.8571	2

Panel B. (2002-2009)

	(1) Mean	(2) S.D.	(6) P50	(7) P75	(8) P90	(9) P99
Sfjt	0.3261	0.3869	0.0814	0.6966	1	1
Sfjt - agency	0.1126	0.2397	0	0.0517	0.5	1
Sfjt - direct	0.1998	0.3424	0	0.2281	0.9	1
Job Creation	0.2473	0.5620	0	0.1539	0.6977	2
Job Destruction	0.1817	0.4713	0	0.1053	0.4211	2

Panel C. Overall period (1992-2009)

	(1) Mean	(2) S.D.	(6) P50	(7) P75	(8) P90	(9) P99
Sfjt	0.2154	0.3423	0	0.3357	0.8957	1
Sfjt - agency	0.0739	0.1949	0	0	0.3	1
Sfjt - direct	0.1344	0.2948	0	0.0345	0.7	1
Job Creation	0.2304	0.5441	0	0.1395	0.5882	2
Job Destruction	0.2278	0.5279	0	0.1539	0.6019	2

Table 3. Changes in Sfjt as a function of Job Creation and Destruction (Equation 4) - Employment weighted

Panel A.

	(1) Changes in Sfjt	(2) Changes in Sfjt - agency	(3) Changes in Sfjt - direct
JC	0.1483***	0.0781***	0.0661***
	(0.0012)	(0.0008)	(0.0011)
JD	-0.0895***	-0.0779***	-0.0123**
	(0.0036)	(0.0024)	(0.0032)
Year Effects	YES	YES	YES
R-squared	0.1310	0.0856	0.0403
N	129,039	129,039	129,039

Panel B. With year dummies interactions

	(1) Changes in Sfjt	(2) Changes in Sfjt - agency	(3) Changes in Sfjt - direct
JC9201	0.0959***	0.0550***	0.0399***
	(0.0017)	(0.0012)	(0.0015)
JD9201	-0.0913***	-0.0729***	-0.0205***
	(0.0045)	(0.0031)	(0.0041)
JC0209	0.2056***	0.1034***	0.0948***
	(0.0018)	(0.0012)	(0.0016)
JD0209	-0.0967***	-0.0904***	-0.0042
	(0.0057)	(0.0039)	(0.0052)
Year Effects	YES	YES	YES
R-Squared	0.1450	0.0921	0.0450
N	129,039	129,039	129,039

Notes: *** p<0.01, ** p<0.05, * p<0.1, robust standard errors in parentheses.

Table 4. Descriptive Statistics for Regression Analysis 1998-2009

	Plant level			3-digit sector level		
	N	Mean	St. Dev.	N	Mean	St. Dev.
Fixed term contract share	95968	0.2731	0.3709	337	0.2569	0.1209
Fixed term contract share - Agency	95968	0.0908	0.2157	337	0.0882	0.0534
Fixed term contract share - Direct	95968	0.1720	0.3260	337	0.1575	0.0998
Pre-1998 Share of Production Workers deviated from mean)	72387	0.0000	0.1857	337	0.0123	0.0841
Pre-1998 Avg. Payroll tax rate	95968	0.0000	0.0019	336	-0.0017	0.0059
Share of production workers	89558	0.7003	0.2171	336	0.7146	0.0845
TFP	83072	4.0852	0.6490			
Output share	89556	0.0038	0.0200			
TFP weighted mean				336	4.3948	0.4581
TFP simple mean				336	4.1019	0.3244
Standard deviation of TFP				336	0.5907	0.1560
OP variance term				336	0.2930	0.2684
TFP weighted mean (1993-2009)				476	4.3906	0.4393
TFP simple mean (1993-2009)				476	4.0904	0.3153
Standard deviation of TFP (1993-2009)				476	0.5828	0.1435
OP variance term (1993-2009)				476	0.3003	0.2543
		Mean			St. Dev.	
Labor Costs		0.4886			0.0110	

Table 5. Changes in the labor regulation and the use of fixed-term workers

Panel A: Plant Fixed Effects, Robust Standard Errors

	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	Sfjt	Sfjt - agency	Sfjt - direct	Sfjt	Sfjt - agency	Sfjt - direct	Sfjt	Sfjt - agency	Sfjt - direct
Pre-1998 share of production workers (De-meaned)									
Pre-1998 effective payroll tax rate (De-meaned)				-154.172**	-67.240**	-83.450**	-147.850**	-60.244**	-83.618**
				[1.166]	[0.655]	[0.913]	[1.148]	[0.636]	[0.898]
Labor Cost	4.158**	2.110**	1.494**	4.272**	2.152**	1.562**	4.281**	2.162**	1.562**
	[0.008]	[0.006]	[0.007]	[0.008]	[0.006]	[0.007]	[0.008]	[0.006]	[0.007]
Labor Costs * Pre-1998 share of production workers (De-meaned)	2.153**	1.854**	0.390**				1.384**	1.536**	-0.039
	[0.043]	[0.030]	[0.036]				[0.043]	[0.030]	[0.036]
Labor Costs * Pre-1998 effective payroll tax rate (De-meaned)				331.890**	146.618**	177.071**	319.041**	132.402**	177.413**
				[2.329]	[1.299]	[1.828]	[2.290]	[1.258]	[1.795]
Initial conditions: pre-1998 average dependent variable									
Log (Capital)	0.020**	0.005**	0.014**	0.019**	0.004**	0.014**	0.019**	0.004**	0.014**
	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
GDP Growth	1.671**	0.700**	0.828**	1.673**	0.701**	0.829**	1.672**	0.701**	0.829**
	[0.003]	[0.002]	[0.003]	[0.003]	[0.002]	[0.003]	[0.003]	[0.002]	[0.003]
Constant	-2.020**	-0.924**	-0.827**	-2.064**	-0.942**	-0.852**	-2.063**	-0.942**	-0.852**
	[0.005]	[0.003]	[0.004]	[0.005]	[0.003]	[0.004]	[0.005]	[0.003]	[0.004]
Panel B: Three-digit-sector fixed effects - Standard Errors Clustered at the Pla									
Observations	64761	64761	64761	64786	64786	64786	64761	64761	64761
R-squared	0.734	0.789	0.698	0.734	0.789	0.698	0.734	0.789	0.698
Year effects	NO	NO	NO	NO	NO	NO	NO	NO	NO
Plant effects	YES	YES	YES	YES	YES	YES	YES	YES	YES

Panel B: Three-digit-sector fixed effects - Cluster Standard Errors

	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
VARIABLES	Sfjt	Sfjt - agency	Sfjt - direct	Sfjt	Sfjt - agency	Sfjt - direct	Sfjt	Sfjt - agency	Sfjt - direct
Pre-1998 share of production workers (De-meaned)	-0.949	-0.793	-0.149				-0.555	-0.639	0.093
	[0.972]	[0.765]	[0.877]				[0.959]	[0.760]	[0.847]
Pre-1998 effective payroll tax rate (De-meaned)									
Labor Cost	4.767**	2.199**	2.004**	4.849**	2.228**	2.057**	4.872**	2.240**	2.068**
	[0.357]	[0.278]	[0.321]	[0.357]	[0.278]	[0.323]	[0.359]	[0.279]	[0.330]
Labor Coststst * Pre-1998 share of production workers (De-meaned)	2.138	1.681	0.437				1.332	1.366	-0.058
	[2.011]	[1.594]	[1.823]				[1.986]	[1.583]	[1.763]
Labor Costs * Pre-1998 effective payroll tax rate (De-meaned)				337.888**	140.659*	198.036**	325.881**	127.450+	199.713**
				[86.706]	[70.350]	[70.160]	[82.865]	[66.368]	[62.563]
Initial conditions: pre-1998 average dependent variable	0.614**	0.810**	0.505**	0.622**	0.812**	0.512**	0.614**	0.810**	0.505**
	[0.025]	[0.031]	[0.048]	[0.025]	[0.031]	[0.048]	[0.025]	[0.031]	[0.048]
Log (Capital)	0.001	0.010**	-0.015**	0.000	0.010**	-0.015**	0.000	0.010**	-0.015**
	[0.003]	[0.003]	[0.002]	[0.003]	[0.003]	[0.002]	[0.003]	[0.003]	[0.002]
GDP Growth	1.819**	0.802**	0.865**	1.829**	0.805**	0.871**	1.821**	0.803**	0.865**
	[0.084]	[0.065]	[0.070]	[0.085]	[0.066]	[0.070]	[0.084]	[0.065]	[0.070]
Constant	-2.125**	-1.143**	-0.640**	-2.106**	-1.132**	-0.632**	-2.118**	-1.140**	-0.636**
	[0.174]	[0.137]	[0.159]	[0.171]	[0.137]	[0.153]	[0.172]	[0.137]	[0.158]
Observations	64761	64761	64761	64786	64786	64786	64761	64761	64761
R-squared	0.304	0.399	0.193	0.303	0.399	0.192	0.305	0.400	0.194
Year effects	NO	NO	NO	NO	NO	NO	NO	NO	NO
Three-digit sector effects	YES	YES	YES	YES	YES	YES	YES	YES	YES

Robust standard errors in brackets

Table 6. Plant productivity and the use of fixed term contracts

Panel A: Plant Fixed Effects, Robust Standard Errors

VARIABLES	(1) TFP OLS	(2) TFP OLS	(3) TFP OLS	(4) TFP IV	(5) TFP IV	(6) TFP IV
Share of fixed term workers (Sfjt)	-0.1362**			-0.3770**		
	[0.0026]			[0.0490]		
Share of fixed term workers-agency (Sfjt-agency)		-0.0891**			-0.8273**	
		[0.0040]			[0.1229]	
Share of fixed term workers-direct (Sfjt-direct)			-0.1730**			-1.0312**
			[0.0032]			[0.1111]
Spj	0.0869**	0.1368**	0.1343**	-0.1117**	-0.2142**	-0.0456**
	[0.0022]	[0.0020]	[0.0018]	[0.0114]	[0.0114]	[0.0110]
Share of fixed term workers*Spj	0.2108**			0.8558**		
	[0.0037]			[0.0266]		
Share of fixed term workers-agency*Spj		0.1349**			1.7304**	
		[0.0053]			[0.0799]	
Share of fixed term workers-direct*SPj			0.2361**			2.1269**
			[0.0045]			[0.0606]
Constant	4.0179**	3.9860**	3.9883**			
	[0.0015]	[0.0014]	[0.0013]			
Observations	83072	83072	83072	61982	61982	61982
Panel B: Three-digit-sector fixed effects - Standard Errors	0.753	0.752	0.753	0.033	0.006	-0.047
Year effects	YES	YES	YES	YES	YES	YES
Plant effects	YES	YES	YES	YES	YES	YES
First-stage F statistic - Share of Fixed-term worker				3040.29	3215.46	816.39
First-stage F statistic - Share of Fixed-term worker*Spj				25860.5	15263.44	5701.27

Robust standard errors in brackets

** p<0.01, * p<0.05, + p<0.1

Table 7: Allocative efficiency and the use of fixed term contracts - Plant level regressions

Panel A: Plant Fixed Effects, Robust Standard Errors	(1)	(2)	(3)
VARIABLES	Outputshare	Outputshare	Outputshare
TFP	0.0071**	0.0068**	0.0077**
	[0.0000]	[0.0000]	[0.0000]
Share of fixed term workers (Sfjt)	-0.0013**		
	[0.0002]		
Share of fixed term workers-agency (Sfjt-agency)		-0.0110**	
		[0.0003]	
Share of fixed term workers-direct (Sfjt-direct)			0.0079**
Labor Costs * Pre-1998 share of production workers (De-r			[0.0002]
TFP*Share of Fixed-term workers	0.0008**		
	[0.0000]		
TFP*Share of Fixed-term workers - Agency		0.0033**	
		[0.0001]	
TFP*Share of Fixed-term workers - Direct			-0.0016**
			[0.0000]
Constant	-0.0073**	-0.0034**	-0.0071**
	[0.0001]	[0.0001]	[0.0001]
Observations	83072	83072	83072
R-squared	0.951	0.951	0.951
Panel B: Three-digit-sector fixed effects - Standard Errors	YES	YES	YES
Plant effects	YES	YES	YES

Robust standard errors in brackets
** p<0.01, * p<0.05, + p<0.1

Table 8. Aggregate TFP and fixed term contracts - Sector level regressions

Panel A: Overall Period (1993-2009)

	Dependent variable			
	(1)	(1)	(1)	(1)
Regression on (each regressor in separate regression):	TFP weighted average	TFP Simple Average	Olley Pakes Cross Term	Standard Deviation of Plant TFP
Sectorial share of Fixed-term workers	0.7600**	0.5473**	0.2127**	-0.2506**
	[0.0012]	[0.0013]	[0.0007]	[0.0008]
Sectorial share of Fixed-term workers - Agency	0.3441**	0.1602**	0.1839**	-0.5434**
	[0.0017]	[0.0017]	[0.0013]	[0.0014]
Sectorial share of Fixed-term workers - Direct	1.2114**	0.9963**	0.2151**	-0.1622**
	[0.0017]	[0.0018]	[0.0010]	[0.0009]
Labor Costs * Pre-1998 share of production workers (De-meane				
Observations	476	476	476	476
Year effects	YES	YES	YES	YES
Sector effects	YES	YES	YES	YES

Panel B: 1998-2009

	Dependent variable			
	(1)	(2)	(3)	(4)
Regression on (each regressor in separate regression):	TFP weighted average	TFP Simple Average	Olley Pakes Cross Term	Standard Deviation of Plant TFP
Sectorial share of fixed-term workers	0.0975**	0.0669**	0.0306**	-0.2633**
	[0.0014]	[0.0016]	[0.0012]	[0.0014]
Sectorial share of Fixed-term workers - Agency	-0.2776**	-0.0628**	-0.2148**	-0.7145**
	[0.0024]	[0.0021]	[0.0015]	[0.0021]
Sectorial share of Fixed-term workers - Direct	0.2942**	0.1832**	0.1111**	0.0202**
	[0.0018]	[0.0020]	[0.0019]	[0.0015]
Observations	336	336	336	336
Year effects	YES	YES	YES	YES
Sector effects	YES	YES	YES	YES

Note: The reported coefficients correspond to separate regressions of each dependent variable (listed in columns in the table) on a single regressor (share of fixed term workers)
Robust standard errors in brackets
** p<0.01, * p<0.05, + p<0.1

Figure 3: Workers under Different Types of Contracts, 1992-2009

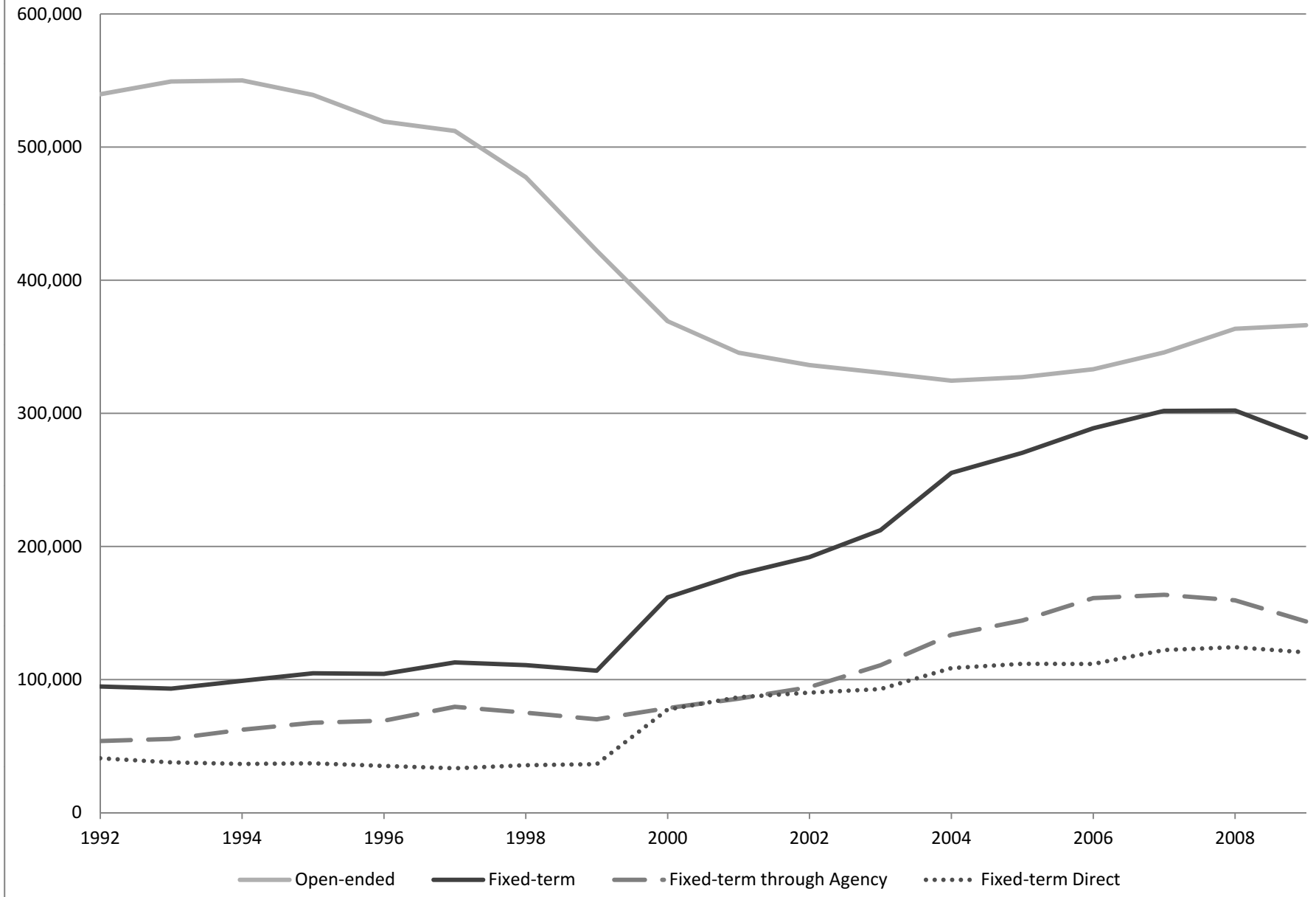

Figure 4: Decomposing the change in Sft

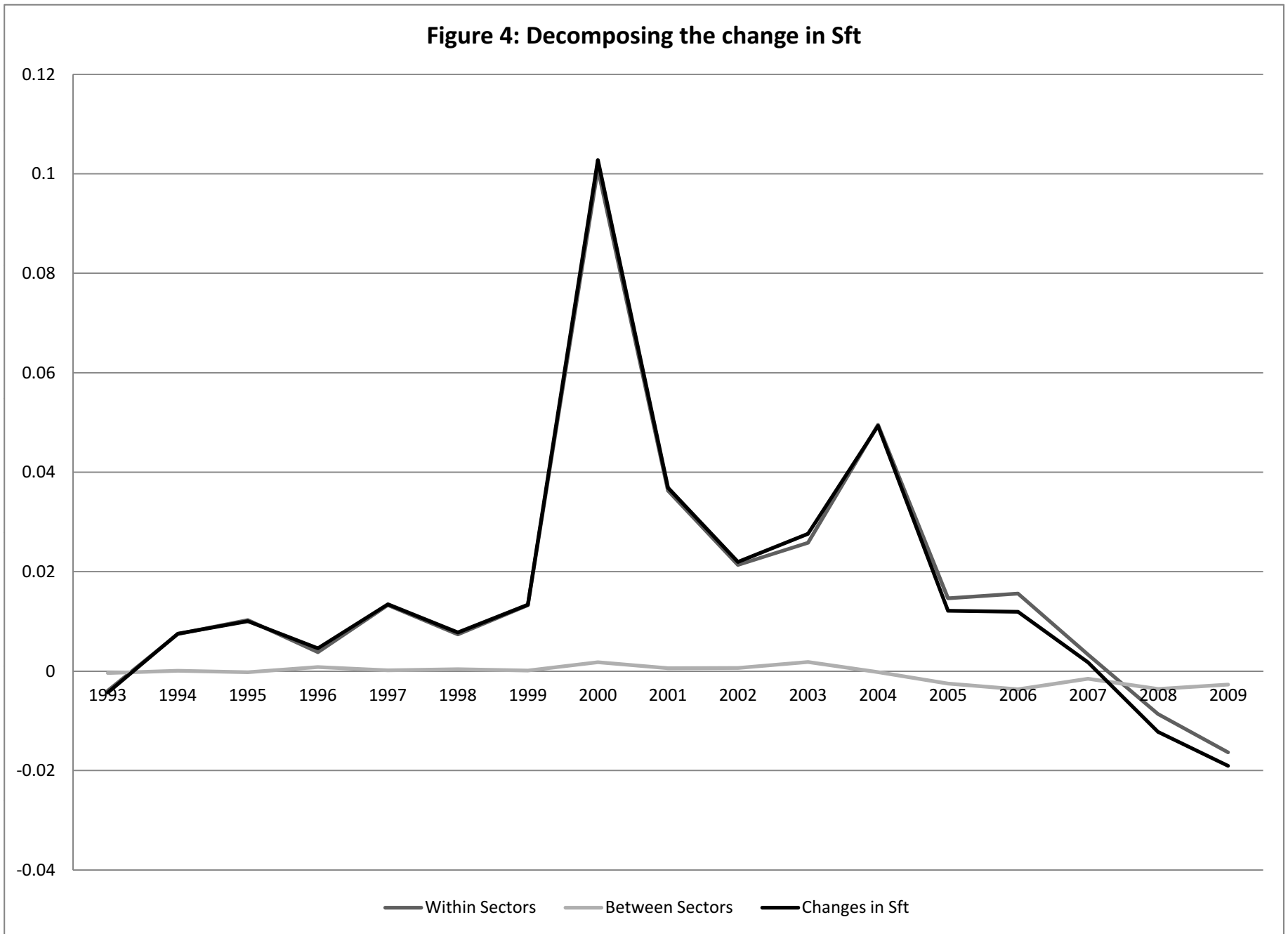

Figure 5: Decomposing the change in Sfkt

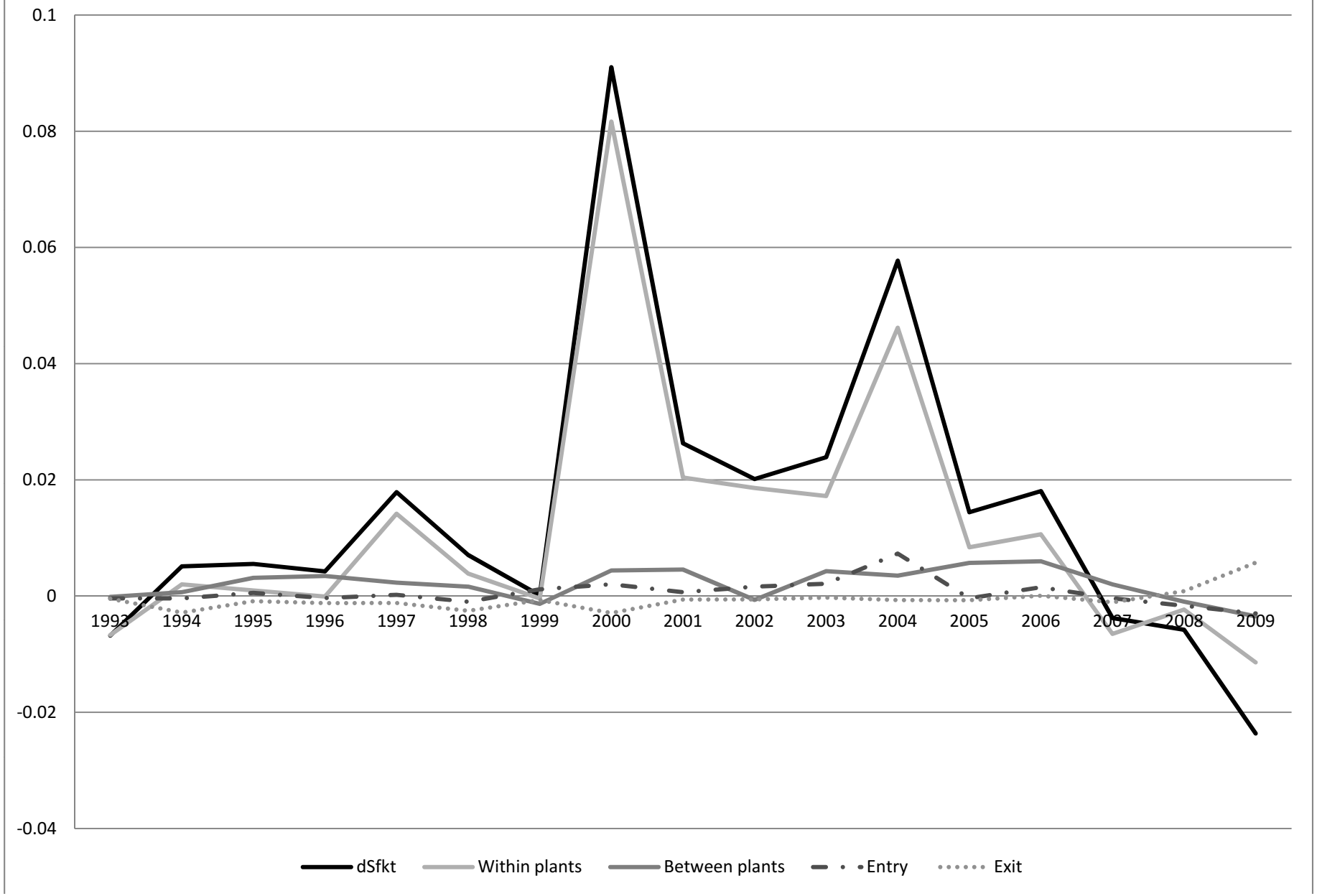

Figure 6: Decomposition of Total JC Rates

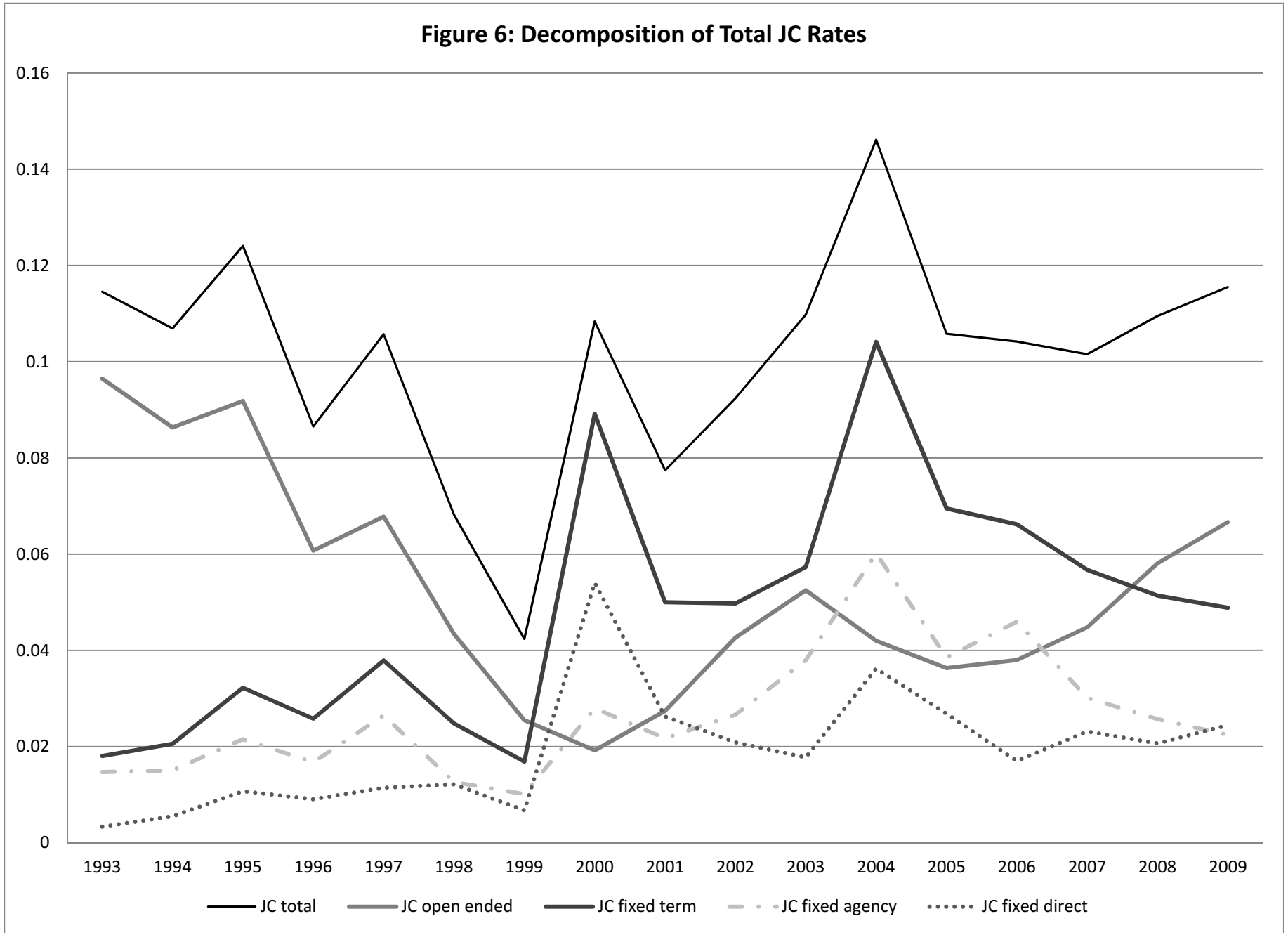

Figure 7: Decomposition of Total JD Rates

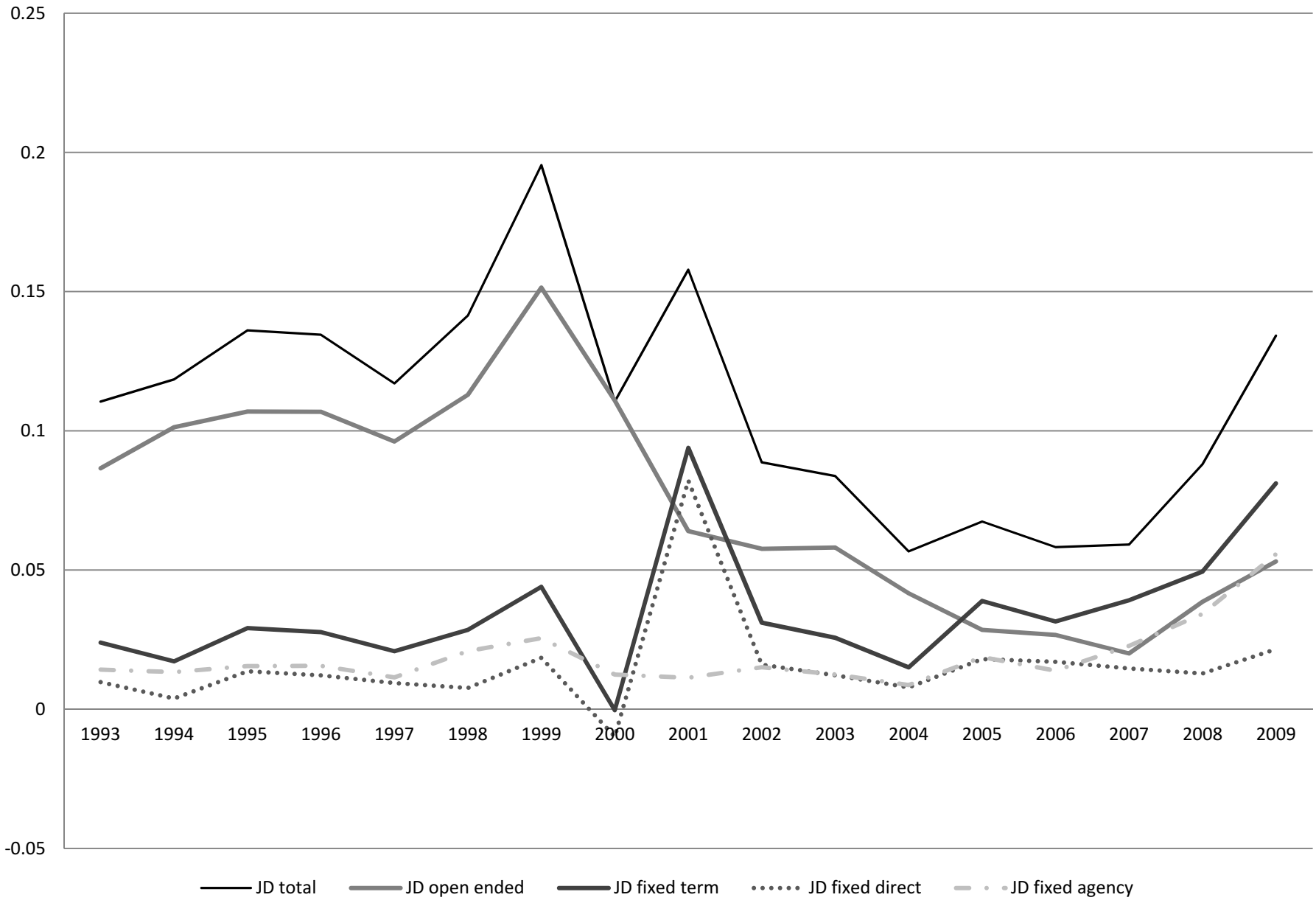

Figure 8a - Histogram for changes in Sfjt - expanding continuing establishments

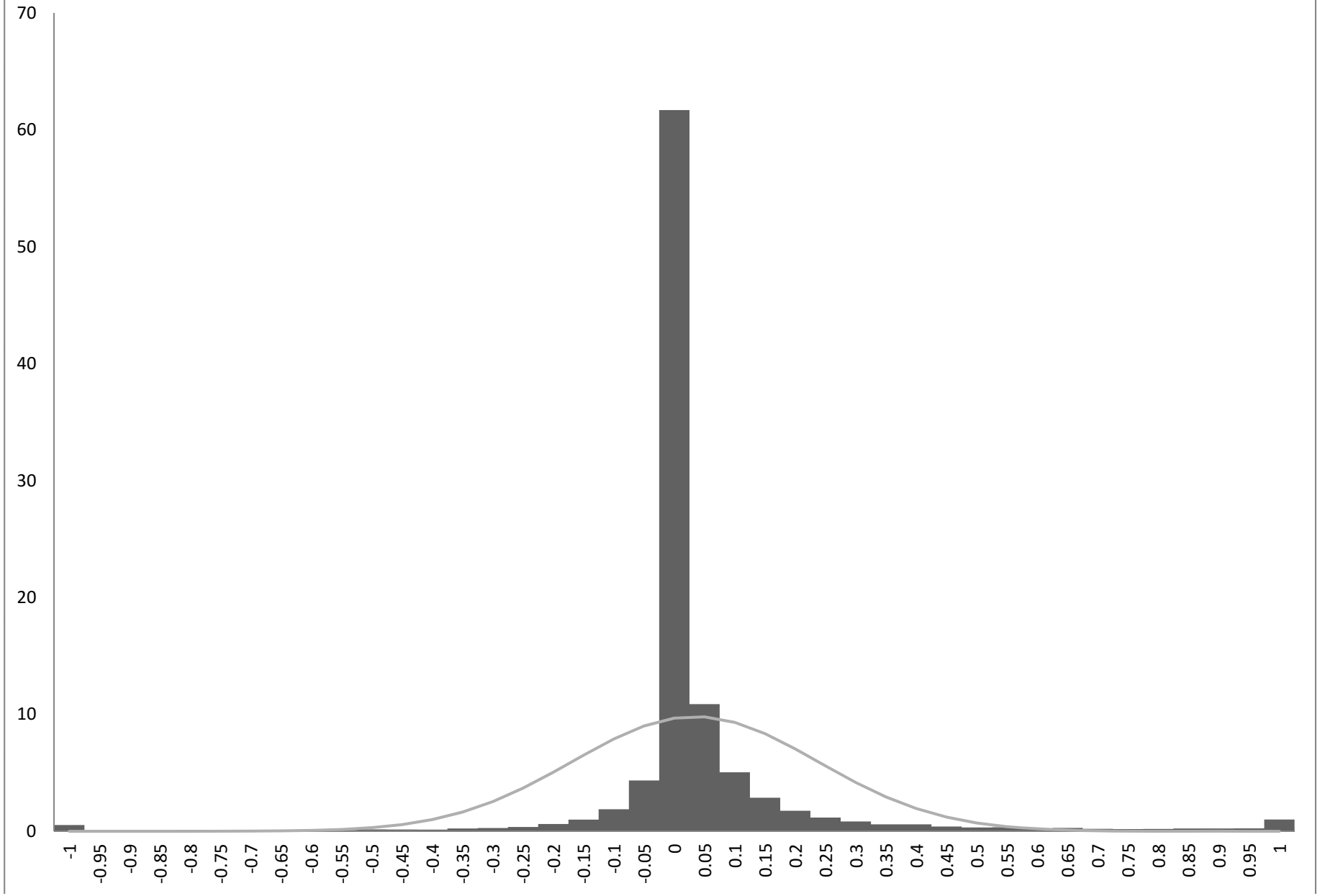

Figure 8b - Histogram for changes in Sfjt - contracting continuing establishments