

# Wage Polarization and Contract Employment\*

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This version: September 2016

**Abstract:** Contract employment is a predominant form of employment in developing countries. Conventional argument goes that wage polarization between regular and contract workers incentivizes the contracting out of select tasks. But what drives the wage polarization that persists despite the popularity of contract work? This paper formulates a unified model wherein the general equilibrium implications of heterogeneous tasks assignment under imperfect monitoring, polarized wages determined by efficiency considerations, and the coexistence of regular-, contract- and involuntary un-employment can be understood together. We classify the forces that drive co-movements of contract and regular wages and discuss their implications on the relative supply of high wage (regular) and low wage (contract) jobs. Using a comprehensive data set with detail records on contract and regular work at the establishment level in India, we find that contract wages do catch up, but do so inelastically in response to increases in the regular wage. These observations allow us to draw very nuanced conclusions concerning the mechanics of high wage job generation in the labor market.

**JEL Classification:** J31, J41, O43

**Keywords:** Contract Employment, Two-Tiered Labor Markets, Wage Polarization.

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\*We thank the Private Enterprise Development in Low-Income Countries (PEDL) programme of the CEPR for financial support. All errors are own own.

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‘Unlike the 3,178 pourakarmikas who are permanent employees ... the rest of the 18,000 sanitary workers are employed by solid waste management contractors. “My wife and I have been contract pourakamikas for 22 years.”’ *Times of India*, August 1, 2016.

## 1 Introduction

Contract labor, often referred to also as fixed-term contract work, temporary employment, or subcontracted work, is a global phenomenon. These are workers hired at a fixed-term basis with no guarantee, either contractual or legal, of permanent employment. Unlike regular workers, contract laborers are not subject to the same level of employment protection. Contract employee status typically carries a wage penalty, and offers less job security (ILO 2015). Globally, there is a great deal of disagreement concerning how best to regulate contract work, and related national legislations are not at all uniform. About 40% of all countries world wide do not impose any limitation on contract employment (Doing Business 2016). The other 60% either impose a ban on contract work in permanent tasks, restrict the maximal time duration of contract work, or adopt a combination of the two (Table 1).

Recent labor market reforms in a number of European countries have facilitated the emergence of a two tiered labor market, in which regular workers’ wages and job security continue to be protected by law, while the market for contract work has also been allowed to flourish (OECD 2004, 2006, ILO 2012).<sup>1</sup> In Spain and Germany, for example, respectively 25% and 15% of all wage employees are contract workers (Alexsynska and Muller 2016). In developing countries, the scale of the phenomenon is arguably greater particularly where the enforcement of labor legislation are often times insufficient (Almeida and Carneiro 2012). For example, over 65% of the man days hired in Indian manufacturing is carried out by subcontractors who served as middlemen in the hiring of contract laborers (Ramaswamy 2013, Soundararajan 2015) in the last decade. In Bangladesh, over 50% of the knitwear factories uses contract labor (Chan 2013). In Latin America, the share of contract workers range widely with some of the highest figures recorded at around 30% in Chile and Peru for example (Alexsynska and Mueller 2016).

This paper is concerned with the institution of contract labor in a developing country setting. We draw our empirical motivations from a comprehensive data set in India with employment and wage records of regular and contract workers at the establishment level. India is a particularly interesting case in part also because the country has seen a number of high profile and in some cases tragically violent labor disputes that received international attention (Seghal 2012, Gulati 2012). Indeed, contract labor as an institution universally reviled by workers was repeatedly singled out as the catalyst of these disputes: regular workers are threatened by the potential for job losses to

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<sup>1</sup>See also Cahuc and Postel-Vinay (2002), Bentolila et al. (2011) and Boeri (2011) for in depth analyses for the cases of France, Spain and Italy respectively.

low cost contract laborers, while contract workers who witness wage and other inequities day to day are not protected or organized enough to negotiate higher wages and better treatment.

Whereas contract labor can be seen simply as one of the means by which firms contract out production tasks and processes instead of directly hiring workers, a key point to note at the outset is that to understand the institution of contract work requires a departure from the canonical task approach to the labor market (Acemoglu and Autor 2011, Autor 2013). Indeed, a parallel literature which addresses the phenomenon of international offshoring exists, where arguably the only difference compared to contract work is that subcontractors are sourced globally instead of locally.<sup>2</sup> In a highly influential paper, Grossman and Rossi-Hansberg (2008) demonstrate that by appropriately allocating tasks between high wage domestic and low wage foreign workers, the efficiency gains that ensue will trickle down to domestic workers in the form of even higher wages. Evidence of efficiency gains have indeed been observed, for example in Bertrand, Hsieh and Tsivanidis (2015) via a small increase in GDP in India due to the proliferation contract labor spread by emerging staffing companies. The same study shows that regular wages went in opposite direction, however. Ahsan and Pagès (2007) examine the impact of lagged contract employment on average earnings per worker at the state-industry level in India, and likewise found a negative (though not significant) relationship. A first conceptual challenge of contract work thus relates to the causes of the failure of a trickle-down despite apparent efficiency gains once contract work is introduced.

Second, contract workers face higher transition probability to unemployment, and are not eligible for many of the benefits enjoyed by regular workers. All else equal, these workers should demand a compensating differential in the form of higher wages (Smith 1776, Rosen 1986).<sup>3</sup> Yet, a two-tiered wage structure persists in which a contract work wage penalty applies. This ranges from 30 - 60 percent in developing countries, to 1 - 34% in developed countries (ILO 2015). The two-tiered wage structure adds new dimensions to the canonical model for a number of reasons. First, wage polarization in the context of contract work is driven by contractual heterogeneity, as opposed to skill heterogeneity in the canonical model.<sup>4</sup> What gives rise to the need for a two-tiered contractual structure within the same firm for otherwise similar workers? Second, given that contractual terms and per labor cost differ, what explains the willingness on the part of employers to continue to hire regular workers at a premium even when in many developing country context, enforcement of employment protection legislation is imperfect at best (Almeida and Carneiro 2008, Basu, Chau and Kanbur 2012, and Soundararajan 2016)? Equally important, what explains the

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<sup>2</sup>For that reason, in fact, contract labor has also be commonly referred to as in-contracting (Fair Wear Foundation 2004, Verit'e 2012).

<sup>3</sup>Along similar veins, in two-tiered labor market model of Eswaran and Kotwal (1985), for example, permanent workers enjoys implicit insurance throughout the year, while casual workers are only employed in peak periods depending on demand conditions. For the implicit insurance they receive throughout the year, permanent workers willingly accepts lower pay in these contracts.

<sup>4</sup>Indeed, there has been a wave of court rulings to regularize contract workers, both in private establishments (Business Standards 2014) as well as in government departments in India (The Hindu 2014).

simultaneous failure for contract wages to catch up with regular wages despite the popularity of contract employment?

This paper formulates a model of the labor market in which the subcontracting of tasks to lower wage workers on a temporary basis coexist with the employment of regular workers at a wage premium and on a more permanent basis. To do so, we bring together a task-based model of the labor market and a two-tiered wage structure motivated by efficiency considerations. The rationale for this setup is two-fold. By incorporating contract employment as an assignment problem which allocates heterogeneous tasks of differing levels of complexity to regular and contract workers, this model reproduces a setup in which the gains from efficient task allocation can be directly passed on to workers. We then endogenize wages and employment in a setting where workers' individual effort cannot be directly monitored. Wage polarization occurs when employers account for the efficiency consequences of the promise of high wage permanent employment offered in rationed quantities for the completion of complex tasks, alongside involuntary contract employment in routine tasks at low wages and no guarantee of permanent employment. Both regular and contract employment now co-exist with unemployment. The efficiency wage approach to labor market segmentation has a long tradition (e.g. Stiglitz 1974, Shapiro and Stiglitz 1986, Saint Paul 1996), and is fitting in our context for it simultaneously accounts for the permanent nature of regular employment, the artificially higher wage that regular workers receive even without law enforcement, and the equilibrium existence of involuntary unemployment, in addition to contract workers in our case.

This unified setup gives rise to a number of useful insights. First and foremost, the model identifies a symbiotic relationship between wage distribution and employment. There is a direct effect going from wage polarization to the intensity of regular relative to contract employment. A reverse feedback effect also exists which governs the extent of wage polarization as a function of contract employment. This reverse feedback is driven the endogeneity of the regular wage as an efficiency wage which responds to employment prospects, as well as the need for the contract wage to be acceptable conditional on the likelihood that a contract worker is subsequently regularized. To date, empirical research on contract work has exclusively focused on the first link, where various measures of employment protection legislations are used as proxies for the relative cost of hiring regular workers.<sup>5</sup> Our understanding about the forces that drive wage polarization between regular and contract workers is extremely limited, however. As one consequence of this neglect, despite popular assertions that trade liberalization put pressure on firms to cut cost, there is as yet no analytical framework that guides our thinking about whether the need to cut cost will be accomplished by increasing high wage complex jobs, or by increasing low wage routine jobs.

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<sup>5</sup>For example, Sapkal (2016) finds that contract labor hiring rises with stricter employment protection laws and enforcement. Chaurey (2015) examines the hiring of contract labor with respect to demand shocks depending on the strictness of employment protection legislation. Early, though with focus on total employment only, Besley and Burgess (2004) studies the role of employment regulations on employment, investment, output and productivity.

How closely in sync are contract wages and regular wages? In this paper, we make the simple observation that the answer depends critically on the extent to which contract employment impacts a worker's ability to search for a regular job while on the job relative to the regular job search capability of an unemployed worker. When contract work severely deters a worker's ability to search for a regular job, contract workers will rationally demand compensation for the expected regular wage forgone. It follows that an exogenous shock that raises the regular wage can potentially be wage equalizing if the regular to contract wage ratio narrows as contract workers demand higher pay in tandem. By contrast, if regular job search capabilities are unaffected regardless of employment status, then an exogenous increase in the regular wage is necessarily wage polarizing as long as the reservation wage of contract workers remains unchanged. A priori, neither possibilities can be ruled out. For example, that the inability to search full time may negatively impact the likelihood of subsequent employment has been well documented and studied (e.g. Rogerson, Shimer and Wright 2005, Chau 2016). Meanwhile, contract employment may nonetheless provide useful firm-specific information about job availability (e.g. Cahuc and Postel-Vinay 2002). What is the net effect?

Evidence on the average likelihood of regularization of a contract worker is available in some European contexts, ranging from 5 - 7% in France and Spain, to 38 to 47% in Germany and Austria respectively for example (Alexander and Muller 2016). These relatively high likelihood of regularization is consistent with a majority of the studies so far that view contract workers as entry level workers who may be promoted with some probability possibly even higher than that of unemployed workers (Blanchard and Landier 2002, Belot, Boone and van Ours 2007, Boeri 2012, and Güell and Mora 2015). Similar evidence in the developing country context is very thin, and limited to a small number of select cases. But what anecdotal information is available suggests a very different picture compared to the European case. For example, the International Commission for Labor Rights report on contract workers find that even after several years of doing the same jobs as regular workers, contract workers have only a small chance of being absorbed as regular workers. The Times of India (2016) reported on cases of seemingly permanent employment of contract workers in India at low wages and benefits alongside regular workers with permanent employment status and higher wages and benefits. In both the European case and the developing country case, we are not aware of systematic evidence on the likelihood of regularization of contract workers relative to unemployed workers.

The main findings of this paper are three-fold. First and foremost, we affirm the importance in having a gauge on the likelihood of regularization of contract workers relative to unemployed workers in understanding the institution of contract work. In particular, we show formally that a demand driven increase in the regular wage is *wage equalizing* if contract workers are at a significant disadvantage in landing regular employment compared to an unemployed worker. By contrast, a demand driven increase in the regular wage is *wage polarizing* if contract workers face little to

no disadvantage in finding regular work.<sup>6</sup> Importantly, while data on the actual regularization likelihood of contract and unemployed workers is not available, our model shows that inferences can be made about the *regularization likelihood deficit* of contract relative to unemployed workers by empirically ascertaining the elasticity of the contract wage with respect to the regular wage. Using data from the Annual Survey of Industries with data at the firm level for 40 manufacturing industries (at the one-digit level) spanning the period 1998-2011 in all states of India, we find evidence in support of the conclusion that a demand driven increase in the regular wage is in fact robustly wage polarizing for the case of India. This is consistent with the casual observations above indicating that in fact contract and unemployed workers are not particularly different in terms of their ability to find regular employment.

Second, we show that the wage polarizing / equalizing role of a change in the regular wage has important and nuanced implications on how employment, output and income distribution respond to shocks. Consider for example a shock driven by export market promotion that drives up demand for regular workers and thus regular wages. We show that firms respond by raising output because the value of the output has risen, but if and only if regular employment demand is wage polarizing, firms *increase* the share of low wage contract worker in the labor market and adjust task allocation in response to a *more polarized wage distribution* between regular and contract workers. Consider by contrast a increase in labor supply through regional immigration, for example. Here, firms similarly raise output as regular wages are adjusted downwards due to the increase in labor supply, but if and only if regular employment demand is wage polarizing, immigration strictly decreases the share of low wage contract workers in the labor market, and wage inequality between contract and regular workers improves.

We then provide a series of efficiency and distributional implications of contract employment. At the level of the firm, we draw attention to three types of externalities: task assignment externalities, firing externalities, and total employment and output externalities. With these observations, we conclude that an unregulated equilibrium is inefficient, and pure efficiency gains can be had through government interventions. By itself this observation is not surprising since the model operates in a second-best setting with involuntary contract and unemployment. What our observations do provide are a new set of rationale for policy interventions that are previously underappreciated. These includes initiatives that (i) encourage employers to assign more tasks to contract workers, (ii) discourage employers from firing regular workers too often, and (iii) encourage employers to raise output and employment. Importantly, we furthermore show that at least for the case of India where regular wage increases are wage polarizing, these efficiency gains are necessarily accomplished at the peril of both the wage and the welfare of *all workers*. In addition, we show that a reduction on the

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<sup>6</sup>Our setting can be easily extended to cover cases where employment as a contract worker facilitates regular employment, as in the European case. We show that the data does not support such a hypothesis in the India case.

cost of subcontracting tasks to contract workers unambiguously reduce the wage of regular workers and the welfare of unemployed workers, contrary to the prediction of Grossman and Rossi-Hansberg (2008) in a task-based model situated in competitive labor market setting. Taken together, these findings provide basis for understanding why contract employment is indeed a catalyst of labor disputes.

This paper contributes to several areas of research. The determinants of wage inequality in labor markets has been a longstanding area of research inquiry. Studies range from institutional determinants such as contractual dualism (Eswaran and Kotwal 1985, Basu, Chau and Kanbur 2015), minimum wages (Fields 1974), efficiency wage considerations (Shapiro and Stiglitz 1986), fair wage concerns (Akerlof and Yellen 1998), and firm heterogeneity (Helpman, Itshoki and Redding 2010), to name a few. In this literature, high (low) wage jobs and employment in high (low) wage firm are synonymous, and as such policies that address wage inequality operates by fine-tuning the selection decision at the firm level. A separate literature addresses wage inequality determined by worker characteristics, such as skill (e.g. Harrison 2006), gender (Blau and Kahn 2016) and immigration status (Card and Shleifer 2009), for example. Despite the breadth and depth of work on wage inequality, evidence on the relationship between wage inequality and contractual heterogeneity *within the firm* among similar workers is very rare. This paper contributes to this broad literature by singling out wage inequality as both a determinant and an outcome of contract work in a model where the same firm offers both high and low wage jobs to otherwise similar workers. By doing so, we open discussion on the efficiency implications of efforts to address wage inequities that exist within firms.

This paper also contributes to the literature on task outsourcing both international and domestic. In this literature, the focus has been the determinants of outsourcing (Jones and Kierzkowski 1990) and the impact of outsourcing on output and local wages (Feenstra and Hansen 1996, Grossman and Rossi-Hansberg 2008). Few studies, however, deal with the endogeneity of the net cost advantage associated with task outsourcing. Cazes and de Laiglesia (2015) is one exception which finds a positive relationship between wage polarization and the share of temporary contract workers, using the interdecile ratio  $D9/D1$  of wage earnings as the measure of wage inequality. To this literature, our study provides the first conceptual setting in which to examine the determinants of wage polarization as a function of contract work, and a first empirical examination of this issue with India as a case in point.

Finally, there is an important literature specifically on contract work as a response to employment protection legislation such as firing restrictions in a developed country context. Saint Paul (1996) is a pioneering study in which a model of efficiency wage is used to explain the difference in wages but contract workers are hired at an exogenously given wage. Güell and Mora (2015) likewise uses an efficiency wage model to examine the issue of contract labor. Critical in the model

are a number of assumptions: employers hire entry level workers as contract workers; entry level workers are attracted to contract work for it pays a fully enforced minimum wage, and contract work offers a path to regular employment.<sup>7</sup> In our setting, contract workers do not enjoy a fully enforced minimum wage. Furthermore, we show an equilibrium in which both the contract wage and contract employment are endogenously determined, depending on the rational expectation that regular job search while on the contract work may in fact be deterred.

The next section provides narratives on contract labor employment in India and more specifics on the broad features of the data that motivated our work. Section 3 formulates the model and defines the equilibrium, and explores the efficiency and distributional properties of the equilibrium. Section 4 presents an empirical analysis of the elasticity of the contract wage with respect to the regular wage at the firm level. Section 5 concludes and discusses the policy implications of our findings.

## 2 Salient Features of Contract Labor Employment in India

Employment protection in India is regulated by a number of national level labor regulations. The Industrial Disputes Act of 1947 governs labor relations in firms employing 100 or more workers. State governments can make amendments to central legislations, and enforcement of employment protection legislation can vary significantly across states (Sapkal 2016, Besley and Burgess 2003). In particular, the Act prohibits forced layoffs without permission from the state. Violations carry a substantial fine and prison sentence. Employees are eligible to severance pay and other benefits. Employees covered by the Act are typically referred to as regular workers.

While contract employment is a mainstay in the Indian labor market, contract workers are not covered by the Industrial Disputes Act. Contract workers are defined in legal terms as temporary workers who are paid for less than 240 days in any 365 day period. The Contract Labor Regulation and Abolition Act of India prohibits the hiring of contract workers in works that are perennial in nature. The Contract Labor Act grants the state the authority to ban the use of contract labor in any establishment, and makes provisions to protect workers in case of wage payment delays (Rajeev 2010, Deshpande et al. 2004). Enforcement of these regulations is weak, however, and the practice of contract labor has become increasingly widespread. (Bhandari and Heshmati 2008).

We aggregate data from the Annual Survey of Industries (ASI) in India to the industry-state-year level.<sup>8</sup> Figure 1a presents kernel density plots of the share of contract man days in total man

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<sup>7</sup>Boeri 2011 also offers a model of contract employment as entry level work, where employers strictly prefer contract workers, but the actual level of contract employment is exogenously given due to government regulations. Cahuc and Postel-Vinay (2002) formulates a matching model of contract work. In this model as well, employers strictly prefer hiring contract workers and actual share of contract employment is fixed by law.

<sup>8</sup>The ASI contains data on both the employment and wage dimensions of firm-level hiring of regular and contract workers in 40 manufacturing industries from 1998-2011.



days in an industry by state in 1999 and in 2009. As shown, the share of contract work is nontrivial in a sizeable share of the industries across states, and this share is growing over time. Averaging across industries and years, the share of contract man days in total man days rose from 27% in 1998 - 2005 to 38% in 2005-2011 (Table 2).

Figure 1b presents kernel density plots of the regular and contract wages during the same time periods. Evidently, there is indeed a contract labor wage penalty, and this penalty has persisted despite the popularity of contract work. Averaging across industries and years, the regular wage has risen from 127 rupees per man day in 1998 - 2005 to 207 rupees per man day in 2005-2011 (Table 2). Contract wages have also risen, from 85 rupees per man day in 1998-2005 to 142 rupees per man day in 2005-2011.

Define the contract labor intensity at the industry-state-year level as the total contract man days as a fraction of regular man days. Also define the extent of wage polarization as the contract-regular wage ratio. These two variables are also included in Table 2. Evidently, over time both the contract labor intensity as well as the extent of wage polarization as measured by the contract wage ratio have grown. As discussed earlier in the introduction, the direction of causality between these two variables is of interest. In particular, the elasticity of substitution between contract and regular employment measures causality going from how a change in wage polarization affect the contract labor intensity. In Table 3, we ignore the potential for reverse causality, and present the OLS estimates of the elasticity of substitution of contract and regular employment by regressing the log contract labor intensity on the log contract wage ratio, in addition to time and industry fixed effects. Consistent with the raw summary statistics, we find a positive elasticity at around 0.2 when both industry and time fixed effects are included. From a labor demand standpoint, this suggests counter-intuitively that a high contract wage ratio is associated with higher intensity of contract labor use.

From our discussion in the introduction, these regression estimates are subject to reverse causality concerns, if it is indeed the case that the contract wage ratio is endogenous with respect to the contract labor intensity itself. As a first look into whether such an endogenous relationship can be detected in the data, we provide instrumental variable estimates of the elasticity of substitution between contract and regular work. We do so by instrumenting for the potentially endogenous contract wage ratio using a measure of the strictness of employment protection regulation *à la* Besley and Burgess, revised and reported in Sapkal (2016) using state level amendments to the Industrial Dispute Act of 1947. Based on this employment protection measure, three binary variables are defined for each Indian state: pro-employer, neutral, or pro-worker. We use the first two as instruments, and present in Table 4 the 2SLS estimates of the elasticity of substitution between contract and regular labor with time and industry fixed effects. The estimated elasticity is at around -1.03, and thus of the right sign. More importantly for our analysis to follow, the Hausman

test for endogeneity rejects the hypothesis that wage polarization is exogenous at  $p = 0.000$  for each case.

With these basic features in mind, we now proceed to describe the model where the two-way relationship between contract employment, and contract wage ratio will be spelled out.

### 3 A Model of Wage Polarization and Contract Work

This model has two building blocks. A task based model of the labor market, and polarized wages determined by efficiency considerations. Specifically, each worker is assigned to one of a continuum of tasks, and tasks are heterogeneous in the sense that across tasks labor productivity are not equally sensitive to the unobserved effort of a worker. For example, complex tasks may require the full attention of a worker, but routine tasks may be completed simply as a function of a worker showing up. Wage polarization come into play when employers pay regular workers the efficiency wage with a promise of permanent employment, while they pay contract workers just enough to show up. In equilibrium, regular and contract workers are hired and assigned to tasks taking into account the effort implications of the polarized wages. We now specify the model with three sets of considerations in mind:

- worker-specific characteristics such as the cost of effort and the time rate of discount,
- firm- / industry-specific characteristics such as the substitutability between complex and simple tasks, the likelihood of regularization by contracts, and the cost of subcontracting tasks to contract workers in addition to wage costs;
- policy parameters including the presence of employment protection legislations such as firing costs and unemployment benefits and trade policies, and other labor market wide variables such as labor supply.

#### 3.1 Workers and Effort

The model is set in discrete time. At each time period, there is a constant pool of  $N$  identical workers, and there are three employment states: regular employment ( $r$ ), contract employment ( $c$ ), and unemployment ( $u$ ). Regular employment ( $N_r$ ) refers to long term employment relationships that are interrupted only by unanticipated termination. Contract employment ( $N_c$ ) refers to fixed-term employment, one period in our case.

##### Regular Workers

At each time period, the utility of a worker depends on wage income  $w$  and work effort  $e$ ,  $U(w, e) = w - e$ . A worker in regular employment receives  $w_r$  and can choose between the high effort  $e = e_r$

required for the job to be completed, or shirk at  $e = e_o < e_r$ .  $e_o$  denotes the effort cost of showing up at work. At  $e = e_r$ , the likelihood of turnover in the following period is given at  $q$ . The separation probability  $q$  is taken as given to the worker, and its dependence on exogenous factors as well as government policy on firing will be specified in the sequel. At  $e = e_o$ , the likelihood of separation in the following period is given by  $q + \sigma$ , where  $\sigma$  denotes the likelihood that a shirking worker is discovered and fired.

Denote  $V_r(e)$  as the steady state value function of a regular worker depending on his effort level,  $V_u$  the value function of an unemployed worker, and  $\beta$  the time discount factor:

$$\begin{aligned} V_r(e_r) &= w_r - e_r + \beta(qV_u + (1 - q)V_r(e_r)), \\ V_r(e_o) &= w_r - e_o + \beta(qV_u + (1 - q)V_r(e_o)) - \beta\sigma(V_r(e_o) - V_u), \end{aligned} \quad (1)$$

these show the tradeoffs between effort savings  $e_r - e_o > 0$  and discounted utility loss due to unemployment  $\beta\sigma(V_r(e_o) - V_u)$  facing a shirking regular worker. Let  $b$  denote a per period unemployment benefit for an unemployed worker at zero effort  $e = 0$ , and  $n_r$  the likelihood that an unemployed worker finds regular employment:

$$V_u = b + \beta(n_r \max\{V_r(e_r), V_r(e_o)\} + (1 - n_r)V_u). \quad (2)$$

An incentive compatible regular employment contract is an efficiency wage  $w_r$  – function of the separation rate and the regular employment likelihood  $q$  and  $n_r$  – that solves:

$$\begin{aligned} w_r(q, n_r) &= \min\{w_r | V_r(e_r) \geq V_r(e_o)\} \\ &= e_r + b + \frac{(1 - \beta(1 - q - n_r))(e_r - e_o)}{\beta\sigma} \\ &\equiv \bar{w}_r + n_r(e_r - e_o)/\sigma. \end{aligned} \quad (3)$$

Thus, the efficiency wage is a rising function of both the separation rate  $q$ , and the regular employment likelihood  $n_r$ . The former requires that the higher the likelihood of a regular contract is terminated due to unanticipated factors, the more an employer will have to compensate a worker to elicit effort. Furthermore, the easier it is for an unemployed worker to find regular employment, the higher the efficiency wage will need to be.

### Contract Workers

At each time period, a worker who agrees to contract employment receives  $w_c$  at effort  $e = e_o \geq 0$ .  $e_o$  denotes the level of effort required to show up at work and perform what is minimally required to guarantee wage payment at the end of a period. We assume, as discussed earlier, that a contract worker may face a different probability of regularization compared to an unemployed worker. We denote this likelihood as  $n_r(1 - \gamma)$ , where  $\gamma \in [0, 1]$  gives the regularization likelihood deficit that

a contract worker faces. The value function of a contract worker is thus:

$$V_c = w_c - e_o + \beta(n_r(1 - \gamma) \max\{V_r(e_r), V_r(e_o)\} + (1 - n_r(1 - \gamma))V_u). \quad (4)$$

For the contract employment to be at least as desirable as unemployment, the contract wage solves:

$$\begin{aligned} w_c(q, n_r) &= \min\{w_c | V_c \geq V_u\} \\ &= e_o + b + \gamma n_r(e_r - e_o)/\sigma \\ &\equiv \bar{w}_c + \gamma n_r(e_r - e_o)/\sigma \end{aligned} \quad (5)$$

and by definition of the efficiency wage in (3), the contract wage is linked directly to the regular wage via:

$$w_c(q, n_r) = \bar{w}_c - \gamma \bar{w}_r + \gamma w_r. \quad (6)$$

Thus, contract and regular wages are positively correlated if and only if  $\gamma > 0$ . The interpretation is akin to one of compensating differential. If contract employment entails a reduction in the ability of a contract worker to seek regular work, the contract wage  $w_c$  must compensate for the wage loss. Meanwhile, if contract employment in fact facilitates regular job search, than the contract workers are willing to undertake wage cut in order to gain an edge at the search for a regular job.

### 3.2 Employers and Task Assignment

We assume an increasing and strictly concave aggregate production function  $F(y) = y^\alpha$ ,  $\alpha \in (0, 1)$ , yielding revenue  $p_o F(y)$  at constant world price  $p_o$ .  $y$  is produced upon completion of a continuum of tasks  $y(i)$  on the unit interval  $i \in [0, 1]$ .  $y$  is a constant elasticity of substitution aggregator function of all tasks performed:

$$y = \left( \int_0^1 y(i)^{\frac{\eta-1}{\eta}} di \right)^{\frac{\eta}{\eta-1}}.$$

where  $\eta$  is the elasticity of substitution. The output of each task  $y(i)$  depends on a combination of the number of regular ( $\ell_r(i)$ ) and/or contract ( $\ell_c(i)$ ) workers employed for the task. In particular, we normalize units so that:

$$y(i) = \ell_r(i) + \ell_c(i)/a(i)$$

and thus one unit of regular worker delivers one unit of task  $i$ , while  $a(i)$  is the unit contract labor requirement of task  $i$ . We assume without loss of generality that  $a(i)$  is increasing in  $i$ , with  $a(0) = 1$ , and  $a(1) \rightarrow \infty$ .  $i$  may be interpreted as the rank order of the complexity / effort intensity of task  $i$  in  $[0, 1]$ , such that higher index  $i$  tasks are much costlier to accomplish when only contract workers are employed. By assumption, contract and regular workers are almost never one-to-one perfectly substitutable except in task 0. Furthermore, there are some tasks that are prohibitively costly for contract workers to engage in. All of these assumptions can be altered readily in theory,

but we want to begin first a setting where a combination of two types of workers employed is readily guaranteed, consistent with what we observe in the data in Section 2. In order to capture parametrically a reduction in the cost of subcontracting tasks, we assume that the unit contract labor requirement takes the form:

$$a(i) = a_o(i) - \delta(a_o(i) - 1)$$

where  $\delta \in [0, 1)$  parameterizes the cost of subcontracting, and  $a_o(i)$  is a function satisfying all of the properties of  $a(i)$  discussed above. preserves all of the assumptions we have made so far  $a(i)$ . An increase in  $\delta$  will be referred to in what follows as a parametric reduction in the cost of contracting, which preserves all of the properties of  $a(i)$  stated above.

To obtain an expression for aggregate profit, we note that firms incur costs arising from two sources. The first comes from wages. Combined wage costs to pay for regular and contract work is:

$$\int_0^1 [w_r \ell_r(i) + w_c \ell_c(i)] di.$$

The second relates to firing. To formalize the endogeneity of firing decisions depending on the nature of employment protection legislation in place, we introduce worker-specific and unanticipated productivity shocks per period. Specifically, for each regular worker hired, job continuation is contingent on the realization of a negative productivity shock at the beginning of a time period. With probability  $q_o$ , a negative productivity shock occurs. The size of this productivity shock will be expressed in terms of the additional cost that the employer will need to incur in order to maintain production at planned level  $y(i)$ . We call this  $x > 0$ , a random variable with cumulative distribution function  $\phi(x)$ . The actual separation rate  $q$  will depend on the size of the threshold level of productivity shock, henceforth  $x^*$  beyond which the employer will be better off firing the worker at firing cost  $T$  and hire a new worker from the pool of job seeker at efficiency wage  $w_r$ . The firing cost  $T$  is exogenously given by employment protection legislation. Accounting for  $\bar{w}$ , the separation rate per regular worker is thus

$$q = q_o(1 - \phi(x^*)),$$

while the expected cost per regular worker employed accounts for the wage cost  $w_r$ , the firing cost  $T$  at probability  $q$ , and the cost of negative productivity shocks when they do occur  $x$ :

$$w_r(x^*) = [w_r(q, n_r) + q_o(1 - \phi(x^*))T] \int_0^1 \ell_r(i) di + q_o \int_0^{x^*} x d\phi(x).$$

Taken together the unit cost of task  $i$  is simply:

$$w_r(x^*)\ell(i) + w_c a(i)(1 - \ell_r(i)).$$

The decision problem of the employer is three-fold. First, the employer chooses  $x^*$  to minimize the cost of hiring a regular worker. Doing so yields a separation rate  $q$  facing each regular worker, as well as the the cost of hiring a regular worker  $w_r(x^*)$ . In this decision-making, the employer takes as given employment protection legislation already in place, the endogeneity of the efficiency wage with respect to the separation rate from (3), and the regular employment likelihood of the unemployed  $n_r$ .

Second, the employer also chooses  $I^*$  to minimize the unit cost of each task  $i$ . Doing so yields a range of tasks to be completed by contract workers, and the complementary range of tasks to be completed by regular workers. Conditional on this choice, the employer now knows the unit cost of production of every tasks  $i$ , and by implication, the minimal unit cost of the aggregate labor input  $y$ , denoted henceforth as  $c_y$ .

Finally, the employer maximizes profits by choice of aggregate labor input  $y$  taking as given the unit cost of production  $c_y$ , and the output price  $p_o$ .

### Turnover Likelihood

We begin with the determination of the separation rate. By inspection of the regular wage cost  $w_r(x^*)$  and the efficiency wage in (3), setting the threshold  $x^*$  at  $x^* = (e_r/\sigma) + T$  minimizes the cost of hiring a regular worker  $w_r(x^*)$ . This follows since  $T$  is the firing cost, while  $e_r/\sigma$  is the marginal change in the efficiency wage as  $q$  rises from (3).  $x^*$  minimizes unit cost by equating the the cost (firing and efficiency wage) of raising  $q$ , and the benefits (through negative productivity shock avoidance) of raising  $q$ . Thus, even in the absence of a government imposed firing cost  $T = 0$ , employers do not automatically fire workers whenever a negative shock occurs, for

$$q = q_o(1 - \phi(x^*)).$$

Interestingly, the separation rate is linked to the parameters of the efficiency wage in a intuitive way. Specifically, the increase in the efficiency wage required to elicit effort when  $q$  rises is proportional to the ratio  $e_r/\sigma$ . The higher the ratio of unobservable effort to the likelihood of discovery a shirking worker, the more salient efficiency wage considerations are. Consequently, employers minimize cost by showing a willingness to tolerate more negative productivity shocks, and thus a lower separation rate.

### Task Assignment

Turning now to task assignment, denote  $I^*$  as the threshold task such that an employer is strictly indifferent between hiring a contract or a regular worker, given the cost minimizing  $x^* = e_r/\sigma + T$  above:

$$I^* = \{I \in [0, 1] \mid w_c a(I) = w_r(x^*)\}.$$

Such a threshold task uniquely exists given the assumptions we have imposed so far on the regular and contract wage, and since  $a(i)$  is monotonically increasing in  $i$ . Furthermore, for all tasks more complex than  $I^*$ , it is cost minimizing to employ only regular workers. While, for all less complex tasks  $i < I^*$ , it is cost minimizing to employ only contract workers.

The unit cost function  $c_y$  of the aggregate labor input solves  $c_y = \min_{y(i)} w_r(x^*) \int_{I^*}^1 y(i) di + w_c \int_{I^*}^1 a(i) y(i) di$  subject to the constraint that  $\int_0^1 y(i) di = 1$ . It follows that

$$c_y(w_r, w_c) = \left( w_r(x^*)^{1-\eta}(1 - I^*) + \int_0^{I^*} (w_c a(i))^{1-\eta} di \right)^{\frac{1}{1-\eta}},$$

which is increasing in and homogeneous of degree 1 in  $w_r(x^*)$  and  $w_c$ , but locally invariant to  $I^*$  since  $I^*$  is the cost minimizing threshold task.

### Total Employment

We can now complete the employer's profit maximizing problem by choice of  $y$  :

$$y(c_y, p_o) = \{y \mid p_o F_y(y) = c_y\} = (\alpha p_o / c_y)^{\frac{1}{1-\alpha}}$$

is a strictly decreasing function of  $c_y$  and increasing function of  $p_o$ . Furthermore, total regular and contract employment are given by:

$$\ell_r = \int_{I^*}^1 y(i) di \equiv \theta_r(I) y(c_y, p_o), \quad \ell_c = \int_0^{I^*} y(i) a(i) di \equiv \theta_c(I) y(c_y, p_o)$$

where  $\theta_r(I^*)$  and  $\theta_c(I^*)$  are respectively strictly decreasing and increasing function of the fraction tasks assigned to regular and contract workers:

$$\begin{aligned} \theta_r(I) &\equiv (1 - I^*) \left( 1 - I^* + \int_0^{I^*} \frac{a(i)^{1-\eta}}{a(I^*)^{1-\eta}} \right)^{\frac{\eta}{1-\eta}}, \\ \theta_c(I) &\equiv \int_0^{I^*} a(i)^{1-\eta} di \left( a(I^*)^{1-\eta}(1 - I^*) + \int_0^{I^*} a(i)^{1-\eta} di \right)^{\frac{\eta}{1-\eta}}. \end{aligned}$$

Henceforth, we assume that total work force  $N$  is sufficiently large so that for every level of output in the range of relevant wages and prices to be characterized in detail in the sequel, there is enough workers to go around for all to be hired as contract workers:

$$N > \left( \int_0^1 a(i)^{1-\eta} di \right)^{1/(1-\eta)} y(c_y, p_o). \quad (7)$$

By doing so, we work with situations where regular employment is not a consequence of an aggregate labor supply constraint which forbids a high enough number of contract workers to be hired even if it is profit maximization to do so.

### 3.3 Equilibrium Conditions

A steady state equilibrium in this economy is a combination of regular and contract wages, a productivity shock threshold  $\bar{x}^*$ , an assignment of tasks  $I^*$ , and an allocation of workers  $N_i, i = r, c, u$  such that two sets of conditions are satisfied. The first set requires that employers offer incentive compatible contracts, so that regular workers are paid the efficiency wage from (3)

$$w_r = \bar{w}_r + \frac{n_r}{\sigma}(e_r - e_o),$$

and contract workers are paid according to (4)

$$w_c = \bar{w}_c + \gamma n_r(e_r - e_o)/\sigma.$$

These two conditions dictates the extent of wage polarization in the economy as a function of the likelihood of regular employment  $n_r$ , among other things:

$$\frac{w_r}{w_c} = \frac{\bar{w}_r + n_r(e_r - e_o)/\sigma}{\bar{w}_c + \gamma n_r(e_r - e_o)/\sigma}. \quad (8)$$

By inspection, the relationship between wage polarization and regular employment likelihood is ambiguous, depending in particular on the rate at which the contract wage keeps pace with the regular wage through the parameter  $\gamma$ . In Figure 1, the PP schedules display a family of such relationships between wage polarization and regular employment likelihood as  $\gamma$  successively increases from  $P_1P$  to  $P_3P$ . From these and (3), we distinguish between two types of wage polarizing conditions:

**Definition 1.** *Growth in demand for regular employment is strictly wage polarizing (wage equalizing) if and only if the wage ratio  $w_r/w_c$  is strictly increasing (decreasing) in  $n_r$ .*

From (8), regular employment growth is strictly wage polarizing if and only if

$$\gamma < (>) \frac{w_c}{w_r} \Leftrightarrow \gamma < (>) \frac{\bar{w}_c}{\bar{w}_r}. \quad (9)$$

When  $\gamma$  is sufficiently small, a higher regular employment likelihood raises the efficiency wage for regular work, but the contract wage does not keep pace fast enough. Consequently, growth in regular employment further intensifies wage polarization in the labor market. Naturally, this is only a partial equilibrium response, as a more polarized labor market, given by a low contract to regular wage ratio, may further change the availability of regular employment, as employers adapts task assignments and total employment responses.

A second set of steady state equilibrium condition requires that inflows into regular employment from previously unemployed workers and workers in contract work ( $n_r(N - \ell_r - \ell_c) + n_r(1 - \gamma)\ell_c$ ) equals outflows into unemployment ( $q\ell_r$ ) in such a way that regular employment is time invariant:

$$n_r = \frac{q\theta_r(I)}{N/y(c_y, p_o) - \theta_r(I^*) - \gamma\theta_c(I^*)}. \quad (10)$$



In figure 2, the  $EE$  schedule displays the relationship between regular employment likelihood and equilibrium wage polarization, accounting for the profit maximizing choice that the threshold task  $I^*$  reflects the extent of wage polarization in the economy:

$$a(I^*) = \frac{w_r}{w_c}.$$

As shown  $EE$  is downward sloping.<sup>9</sup> Intuitively, as the regular wage ratio increases, employers reassign tasks previously completed by regular workers to contract workers. This decreases the likelihood of getting a regular job.

At the limit, when the regular wage ratio  $w_r/w_c \rightarrow \infty$ , the share of tasks requiring regular workers goes to zero, and thus  $n_r = 0$ . Meanwhile, as  $w_r/w_c \rightarrow 1$ , we arrive at another benchmark case where all workers are regular workers. In this case, the unit cost of the aggregate labor input collapses to  $c_y = w_r$ , and  $n_r$  uniquely solves:

$$n_r^o = \left\{ n_r \mid \frac{qy(w_r, p_o)}{N - y(w_r, p_o)} = \bar{w}_r + \frac{n_r}{\sigma} e_r \right\}.$$

### 3.4 Steady State Equilibrium

The intersection of the wage polarization  $PP$  schedule and the employment equilibrium  $EE$  schedule gives the steady state equilibrium of this model. As shown, for any set of parameter values satisfying the assumptions we have made so far,<sup>10</sup> a unique steady state equilibrium  $(n_r^*, w_r^*/w_c^*)$  exists. The following proposition summarizes a number of useful properties of this equilibrium:<sup>11</sup>

**Proposition 1.** *Starting from a steady state equilibrium where contract and regular work co-exist:*

- *A ban on contract work decreases total output and increases the wages of regular workers. The value of regular work  $V_r(e_r)$  and the value of unemployment  $V_u$  are both strictly higher under the ban.*

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<sup>9</sup>To see this, note that since  $I^*$  is chosen to minimize cost,  $w_r\theta_r(I^*) + w_c\theta_c I^* = c_y$ . It follows that

$$\theta'_c(I^*) = -\frac{w_r}{w_c}\theta'_r(I^*).$$

Totally differentiating the above to obtain the slope of  $n_r$  with respect to  $I^*$ , it can be readily verified that the sign of  $\partial n_r / \partial I^*$  is given by the sign of the following expression:

$$- \left[ N - \gamma(\theta_c(I^*) + \frac{w_r}{w_c}\theta_r(I^*))y(c_y, p_o) \right]$$

By cost minimization,  $\theta_c(I^*) + \frac{w_r}{w_c}\theta_r(I^*) < \theta_c(1) \equiv \int_0^1 a(i)^{1-\eta} di)^{1/(1-\eta)}$ . Since  $\gamma < 1$ , it follows by assumption in (7) that the sign of  $\partial n_r / \partial I^*$  is negative.

<sup>10</sup>These include worker specific parameters  $\{e_r, e_c, b, \gamma\}$ , firm specific parameters  $\{\alpha, q_o, \eta\}$ , discount factor  $\beta$ , labor market parameter  $N$ , as well as policy parameters  $T$  and  $p_o$ .

<sup>11</sup>The formal proofs of these results are relegated to the Appendix.

- A parametric reduction in the cost of subcontracting (an increase in  $\delta$ ) unambiguously lowers the regular wage and the contract wage. The value of work  $V_r(e_r)$  and  $V_c$  as well as the value of unemployment  $V_u$  consequently declines.
- In equilibrium, the regular wage ratio overstates the average productivity differential between regular and contract workers:

$$\frac{w_r^*(x^*)}{w_c^*} = a(I^*) > \frac{\int_0^{I^*} a(i)di}{I^*}.$$

With a ban on contract work, the equilibrium likelihood of regular employment is given at  $n_r^o$  as shown in Figure 3 which strictly exceeds  $n_r^*$ . By shifting tasks to be completed by contract workers, employers collectively lower the likelihood of regular employment along the  $EE$  schedule. This lowers the efficiency wage required to deliver high effort through (3). The combined effect of a lower probability of regular employment, and a wage efficiency wage is necessarily a lower value of work  $V_r(e_r)$  and a lower value associated with unemployment  $V_u$ . With a higher cost of production and the inability to cost minimize by hiring contract laborers, output necessarily declines.

To take this argument a step further, the next property of the steady state equilibrium considers a parametric reduction in the cost of subcontracting through an increase in  $\delta$ . Once again by shifting realized relative wage costs, employers respond by offering less regular employment opportunities. Effectively, the  $EE$  schedule shifts downwards, and the likelihood of regular employment  $n_r^*$  declines unambiguously. Thus, in sharp contrast to the prediction in Grossman and Rossi-Hansberg (2008), a parametric reduction in the cost of subcontracting work in our setting strictly decreases both the regular and the contract wage through (3) and (4). In turn, the benefits of cost savings (subcontracting cost plus wage cost) are monopolized by employers.

The last item of the proposition clarifies the meaning of the equilibrium wage polarization and thus the sources of employer gains through the hiring of contract workers. We know that there is a productivity differential  $a(i) \geq 1$  between regular and contract workers for all task  $i$ . In equilibrium, wage polarization captures precisely this productivity differential evaluated at the marginal task  $w_r^*/w_c^* = a(I^*)$ . But since  $a(i) < a(I^*)$  for all  $i < I^*$ , equilibrium wage polarization  $w_r^*/w_c^*$  is an overstatement of the average productivity differential  $\int_0^{I^*} a(i)di/I^*$ .

Taking all three observations together, the message is uniformly that in our second best world, employers and workers (including regular, contract and unemployed) have diametrically opposed views concerning the virtues of contract work. Furthermore, while workers are ex ante identical, the equilibrium wage polarization that prevails between regular and contract workers tracks the productivity deficit of contract workers at the marginal  $I^*$ . Such a productivity differential exists because contract workers are paid less than the efficiency wage. Nonetheless, employers strictly prefer contract employment, as the productivity adjusted contract wage cost  $w_c^*a(i)$  is strictly less than the corresponding regular wage  $w_r^*$  for every inframarginal task performed by contract workers.

We now turn to comparative statics properties. In particular we focus on two types of shocks: (i) an increase in export opportunities that raises  $p_o$ , and (ii) an increase in the supply of labor that raises  $N$ . A priori, both shocks should encourage an expansion in production and employment. But what about the share of high wage regular jobs to low wage contract work?

**Proposition 2.** *Starting from a steady state equilibrium, if and only if growth in regular employment is wage polarizing (equalizing):*

- *an increase in export opportunities that raises  $p_o$  strictly increases (decreases) the fraction of tasks  $I^*$  completed by contract workers, and intensifies (decreases) wage polarization in the labor market;*
- *an increase in the supply of labor  $N$  strictly decreases (increases) the fraction of tasks  $I^*$  completed by contract workers, and decreases (intensifies) wage polarization in the labor market.*

Each of these shocks give rise to a shift of the  $EE$  schedule in Figure 3. For the case of export expansion,  $p_o$  increases and as such, aggregate employment  $y$  increase as well. All else equal, therefore, the likelihood of regular employment  $n_r^*$  rises as  $EE$  shifts upwards. Consequently, both the regular and the contract wage increases, but the corresponding change in wage polarization  $w_r^*/w_c^*$ , and thus the share of tasks assigned to regular and contract workers, depend only on whether the  $PP$  schedule is positively or negatively sloped. An increase in the supply of labor operates in the opposite way. By raising the supply of labor, all else constant the likelihood of regular employment declines. This shifts the  $EE$  curve downwards. Consequently, the regular wage and the contract wage decreases, but the corresponding change in wage polarization will once again depend on whether the  $PP$  schedule is positively or negatively sloped.

## 4 Contract Workers in India

In this section we pose question: does an increase in regular employment opportunities give rise to more polarized or less polarized wages between regular and contract workers in practice? To do so, we note that the regular employment likelihood  $n_r$  is very hard to directly measure, for from the definition of the  $EE$  schedule, it requires information on the turnover rate  $q$ , the search capability deficit of contract workers  $\gamma$ , and the total supply of labor  $N$ , for example. In what follows, we attempt to obtain a simpler way of directly assessing the answer to our question.

From Definition 1, regular employment growth is wage polarizing if and only if

$$\gamma \frac{w_r}{w_c} < 1.$$

From (4), the contract wage is given by:

$$w_c = \bar{w}_c - \gamma \bar{w}_r + \gamma w_r$$

Totally differentiating, we obtain:

$$\begin{aligned} dw_c &= \gamma dw_r + d\bar{w}_c - \gamma d\bar{w}_r \\ d\ln w_c &= \frac{\gamma w_r}{w_c} d\ln w_r + \frac{\bar{w}_c}{w_c} d\ln \bar{w}_c - \gamma \frac{\bar{w}_r}{w_c} d\bar{w}_r \end{aligned}$$

With this in mind, we now proceed to ascertain the size of  $\gamma w_r/w_c$ , by regression log contract wage on log regular wage in addition to year, industry, state, and firm fixed effects.

$$\ln w_{c,ijkt} = \delta \ln w_{r,ijkt} + D_i + D_j + D_k + D_t + \epsilon_{ijkt}$$

where  $\epsilon_{ijkt}$  is the error term, for an observation in firm  $i$ , industry  $j$ , state  $k$  and year  $t$ . The elasticity of the contract wage with respect to the regular wage  $\delta$  gives the magnitude of the parameter  $\gamma w_r/w_c$  we seek.

In Tables 4 and 5, we display the results. Table 4 summarizes the results of fixed effects pooled regression including all firms, industries, and states. The regression is overall highly significant, and the relevant coefficient is positive, and strictly less than one. These show that a one percent increase in the regular wage leads to a corresponding increase in the contract wage by slightly less than 0.3%. These suggest first and foremost that  $\gamma$  is strictly positive. In other words, contrary to claims that contract work assist workers in finding regular employment, our findings suggest that the opposite is true. Importantly, since the estimated  $\delta$  is strictly less than one in all of our estimations, our findings are consistent with the case where regular employment growth is *wage polarizing*. These results are robust to various specifications, including different combinations of fixed effects, as well as variable elasticity by industry in Table 5.

This allows us to draw useful conclusions concerning the mechanics of high wage job generation in the Indian labor market. Indeed, returning to the model, the Indian case corresponds to an upward sloping  $PP$  schedule. It follows, therefore, that we expect export expansion to raise the wage of both regular and contract workers for example. Export expansion will also promote the subcontracting of work to low wage contract workers, coupled with an even more polarized wage distribution between regular and contract workers.

## 5 Discussion

With equilibrium involuntary unemployment, the steady state equilibrium is in general inefficient,<sup>12</sup> and efficiency gains can be accomplished by increasing employment opportunities, and thus output. In what follows, we discuss the efficiency consequences of government interventions on the

<sup>12</sup>To see this, consider a measure of aggregate surplus that sums of all producer profits, workers' income net of effort (both wage and alternative employment). Aggregate surplus is given by:

$$S^* = p_o F(y^*) + bN - [(b + e_r)\ell_r^*(\hat{I}^*) - (b + e_o)\ell_c^*(\hat{I}^*)]y^*.$$

other two decisions that employers make, namely, on firing through the choice of  $x^*$ , and on task assignment through the choice of  $I^*$ .

### Firing Externality

Consider government policies that induce a change in the separation likelihood  $q$ . This can be accomplished by changing the firing tax  $T$  (subsidy if  $T$  is negative), with an appropriately tailored production subsidy (or production tax if  $T < 0$ ) to keep the unit cost impact of this policy neutral.

Starting from  $q = q_o(1 - \phi(\bar{x}^*))$ , consider an decrease in  $q$  made possible for example by an increase in the firing cost  $T$ . By decreasing the steady state number of job vacancies, the  $EE$  curve is shifted downwards. Meanwhile, by lowering the frequency of turnover, the efficiency wage  $w_r$  must fall, and the  $PP$  curve is shifted to the left. The combined effect on the likelihood of regular employment is thus ambiguous in general.

Starting from a scenario of zero firing cost, suppose that  $e_r/\sigma$  is sufficiently small. This implies that the shift of the  $PP$  curve will be relatively insignificant. Furthermore, this also means that the turnover rate is relatively high to begin with since  $q^* = q_o(1 - \phi(e_r/\sigma))$  is relatively high to begin with. The effect of an increase in the firing cost  $T$  is thus a reduction in the likelihood of regular employment. This results in a reduction in both the regular and the contract wage, and accordingly an increase in total employment in equilibrium. In other words, we have just made a case for reducing turnover by introducing a firing cost  $T$  in order to improve overall efficiency in the labor market,

The reason why introducing a firing cost make sense in this setting is that employers do not internalize the wage consequences of their firing decisions. In equilibrium, there is too much firing for employers are not able to internalize the general equilibrium wage consequences of their individual firing decisions. The result is that the efficiency wage and the contract wage (since  $\gamma > 0$ ) are both too high, and consequently employment and output are both too low.

### Task Assignment Externality

Consider now a exogenously imposed regulation to increase the set of tasks assigned to contract workers from  $I^*$ . Starting from a steady state equilibrium, a small change in  $\hat{I}^*$  does not impact the unit cost of production, but simply requires employers to reduce regular employment. The result is that the  $EE$  schedule shifts downwards. In equilibrium, the likelihood of regular employment declines, and this induces a reduction in both the regular efficiency wage and the contract wage.

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It follows that

$$\begin{aligned} \frac{\partial S^*}{\partial y} &= c_y(w_r^*, w_c^*) - \left[ (b + e_r)\theta_r^*(\hat{I}^*) - (b + e_c)\theta_c^*(\hat{I}^*) \right] \\ &= (w_r^*(T) - b - e_r)\theta_r^*(\hat{I}^*) + (w_c - b - e_c)\theta_c^*(\hat{I}^*) \end{aligned}$$

which is strictly positive.

These generate a decline in the unit cost  $c_y$ , and encourages more aggregate employment, raising total surplus.

Thus, steady state equilibrium in fact exhibits under-assignment of tasks to contract workers if overall efficiency is the only concern. An appropriately designed contract employment subsidy program can be implemented to achieve this goal.

## 6 Conclusion

In this paper, we have provide a framework in which the efficiency and distributional consequences of the institution of contract work can be examine. We have shown that there is a bi-directional relationship between contract employment and wage polarization between regular and contract workers. While existing work tend to focus on the relationship going from wage polarization to contract employment, we argue that the relationship in reverse wherein contract employment itself impacts wage polarization is a critical determinant of the ability of a labor market to generate high wage job in the face of positive shocks. We have also provided an approach to empirical ascertain the nature of this relationship. In the Indian case, we find that contract wage catch up relatively inelastically with regular wage. Based on the predictions of our model, positive demand shocks will only give rise to an increase in the use of contract labor. But this is precisely what we see in the data, where decades of wage improvements in the Indian labor market have coincided with an ever increasing share of low wage contract workers.

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Table 1: Number of countries with legal prohibitions on permanent tasks, and /or maximum duration on fixed term contracts (FTC). Source: Doing Business (2016).

	FTC Prohibited for Permanent Tasks	FTC Not Prohibited
Max. Duration on FTC	28	43
No Limit on Duration of FTC	42	78

Table 2: Summary of Statistics

Year: 1999-2004					
<i>Variables</i>	Obs	Mean	Std. Dev.	Min	Max
Share of Contract Workers (%)	2,319	0.267	0.213	0	1
Average Regular Wage (rupees per man day)	2,310	127.482	83.657	38.754	1820.341
Average Contract Wage (rupees per man day)	2,319	84.610	27.513	14.118	275.000
Contract Labor Intensity	2,310	0.767	3.0154	0	82.6
Wage Polarization (contract wage / regular wage)	2,310	0.729	0.184	0.078	0.999
Year: 2005-2011					
<i>Variables</i>	Obs	Mean	Std. Dev.	Min	Max
Share of Contract Workers (%)	3,208	0.377	0.239	0	1
Average Regular Wage (rupees per man day)	3,142	207.332	185.793	44.046	4829.13
Average Contract Wage (rupees per man day)	3,208	142.132	175.757	0.000	7945.804
Contract Labor Intensity	3,142	1.086	2.860	0.000	63.772
Wage Polarization (contract wage / regular wage)	3,142	0.745	0.187	0.000	0.999

Notes: 1. Contract Labor Intensity measures the ratio of contract to regular man days; 2. Data include all observations where regular wage is greater than contract wage to rule out contract employment in professions with specialized skills.

Table 3: The Elasticity of Substitution between Contract and Regular Employment

<b>Models</b>	<b>OLS</b>				<b>2SLS</b>	
<i>Explanatory Variables</i>	[1]	[2]	[3]	[4]	[5]	[6]
Ln Contract-Regular Wage Ratio	0.2159 (3.64)***	0.2805 (4.57)***	0.0300 (0.52)	-1.039 (-2.92)***	-1.266 (-3.35)**	-1.355 (-2.53)*
Industry Fixed Effects	Yes	Yes	No	Yes	Yes	No
Time Fixed Effects	Yes	No	Yes	Yes	No	Yes
R-squared	0.2342	0.1754	0.0606	0.1707	0.0787	.
N	5,451	5,451	5,451	5,451	5,451	5,451

Notes: 1. Standard errors are provided; 2. Data include all observations where regular wage is greater than contract wage to rule out contract employment in professions with specialized skills; 3. \*\*\* p<0.01; \*\* p<0.05; \* p<0.1.

Table 4: The Regular Wage Elasticity of the Contract Wage

<i>Explanatory Variables</i>	(1) Log Contract wage	(2) Log Contract wage
Log Reg. Wage	0.292 (0.00606)***	0.224 (0.0156)***
Constant	2.813 (0.0314)***	3.230 (0.0986)***
Industry fixed effects	Yes	Yes
Year fixed effects	Yes	Yes
State fixed effects	Yes	No
Factory fixed effects	No	Yes
Observations	105,382	105,382
R-squared	0.413	0.289
Number of clusters		42,837

Notes: 1. Robust standard errors clustered at the factory level are in parentheses; 2. \*\*\* p<0.01; \*\* p<0.05; \* p<0.1.

Table 5: Regular Wage Elasticity of the Contract Wage (By Industry)

<i>Var.</i>	15	16	17	18	19	20	21
Log Reg.	0.199	0.186	0.305	0.579	0.248	0.236	0.213
Wage	(0.0271)***	(0.0437)***	(0.0261)***	(0.0792)***	(0.037)***	(0.0667)***	(0.0442)***
Const.	3.270	3.138	2.936	1.747	3.191	3.141	3.138
	(0.122)***	(0.176)***	(0.123)***	(0.361)***	(0.166)***	(0.285)***	(0.205)***
N	26,286	2,242	8,687	2,134	1,450	1,037	2,747
R-sq	0.271						
# of factories	11,401	888	3,474	1,171	667	545	1,099
<i>Var.</i>	22	23	24	25	26	27	28
Log Reg.	-0.0218	0.258	0.250	0.304	0.367	0.328	0.324
Wage	(0.158)	(0.0537)***	(0.015)***	(0.0189)***	(0.0218)***	(0.0248)***	(0.0276)***
Const.	4.241	2.910	3.054	2.818	2.523	2.789	2.856
	(0.74)***	(0.28)***	(0.0748)***	(0.0931)***	(0.103)***	(0.12)***	(0.129)***
Obs.	1,139	1,331	11,199	4,102	8,118	8,518	6,028
R-sq.	0.243						
# of factories	588	439	4,061	1,865	3,723	3,083	2,733
<i>Var.</i>	29	30	31	32	33	34	35
Log Reg.	0.247	0.352	0.263	0.253	0.357	0.237	0.381
Wage	(0.0697)***	(0.074)***	(0.0315)***	(0.0357)***	(0.0383)***	(0.0425)***	(0.0514)***
Const.	3.196	2.707	3.065	3.077	2.672	3.229	2.591
	(0.331)***	(0.374)***	(0.157)***	(0.183)***	(0.193)***	(0.208)***	(0.241)***
Obs.	5,979	208	3,858	1,259	622	4,675	1,930
R-sq.	0.305						
# of factories	2,763	99	1,686	517	282	1,822	732

Notes: 1. All regressions include year and factory fixed effects; 2. Robust standard errors clustered at the factory level in parentheses; 3.\*\*\* p< 0.01, \*\* p< 0.05, \* p< 0.1; 4. Industry codes:15 Food products and beverages; 16 Tobacco Products; 17 Textiles; 18 Wearing apparel: Dressing and dyeing of fur; 19 Leather, luggage, handbags, footwear; 20 Wood and products; 21 Paper and paper products; 22 Publishing and printing; 23 Coke, refined petroleum products, and nuclear fuel; 24 Chemical and chemical products; 25 Rubber and plastic products; 26 Other non-metallic mineral products; 27 Basic metals; 28 Fabricated metal products; 29 Machinery and equipment; 30 Office accounting computing machinery; 31 Electrical machinery and apparatus; 32 Radio, television and communication equipment; 33 Medical, precision and optimal instruments; 34 Motor vehicles & Other Transport; 35 Other transport equipment; 36 Furniture; 37 Recycling.

Figure 1a  
Kernel Density of the Share of Contract Man Days to Total Man days (1999, 2009)

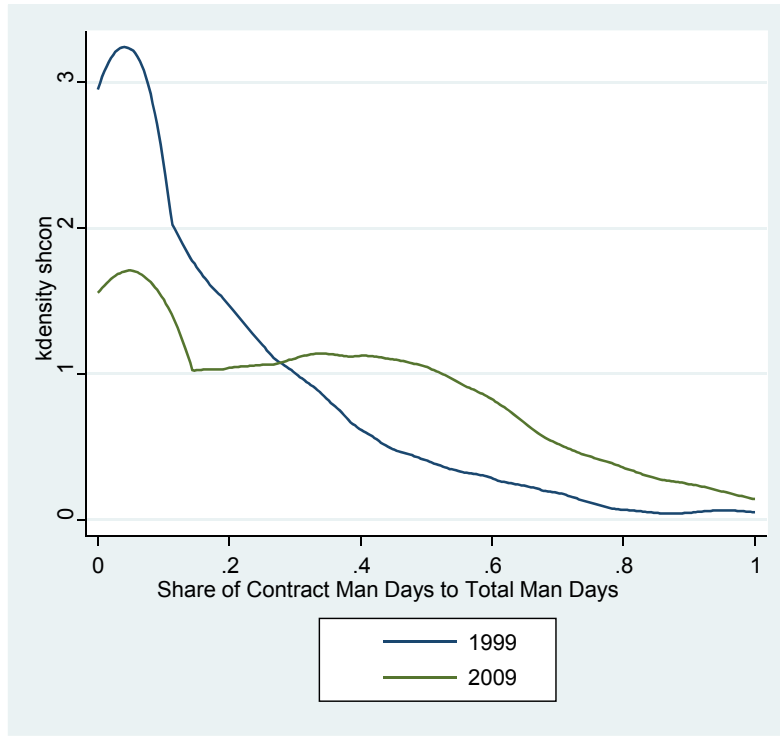


Figure 1b  
Kernel Density of Regular and Contract Wages (1999, 2009)

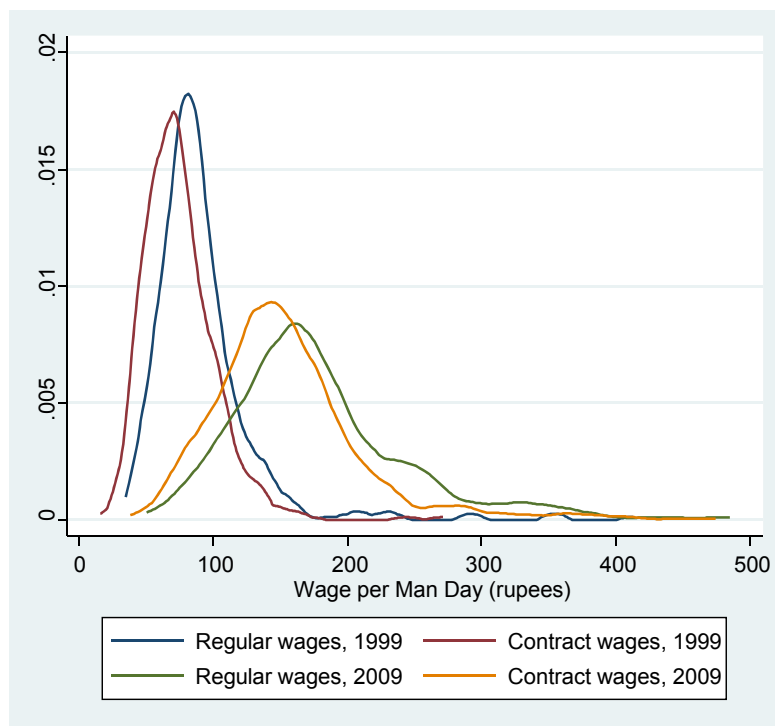


Figure 2  
The PP Schedule

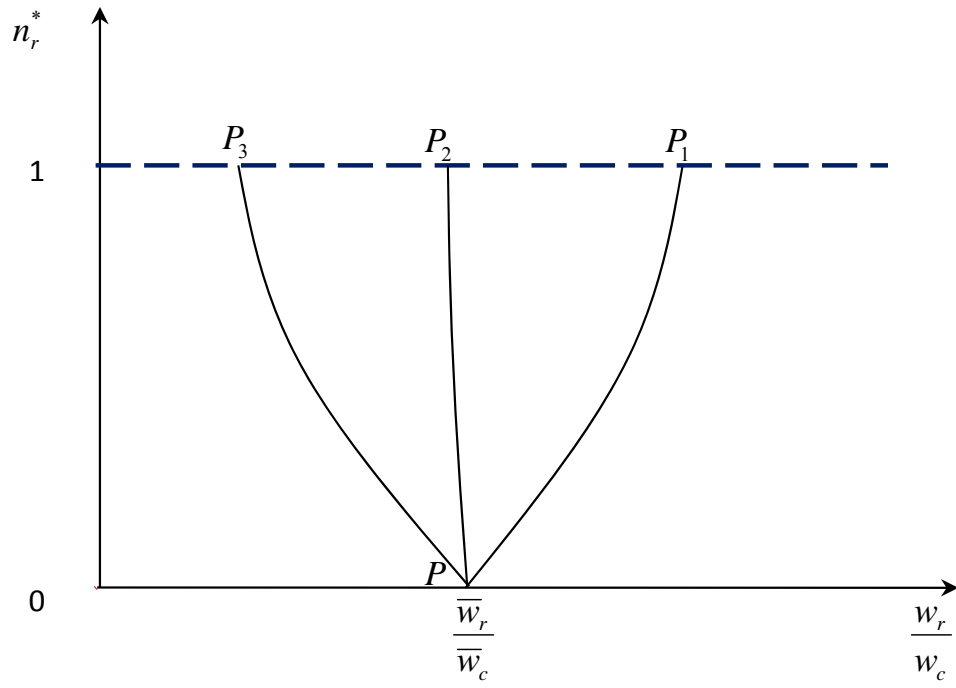


Figure 3  
The EE and the Steady State Equilibrium

