Dismissal Disputes and Endogenous Sorting*

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Abstract

Dismissal disputes lead often to long and costly contract termination procedures and occur mostly in recessions. This paper investigates how disputes may affect the job-matching process. First, we present a simple accounting framework that corresponds with general dismissal legislation but is sufficiently flexible to accommodate country-specific legislation. Detailed information from a sample of 2,191 disputes that occurred in the Netherlands between 2006 and 2009 is used to adjust the framework to its institutional specificity. The resulting equilibrium matching model rationalizes endogenous sorting between lengthy and costly firing procedures. The model also rationalizes the longevity of the dual Dutch model and its political resilience.

Keywords: Disputes, Firing, Legislation, Sorting.
JEL Classification: E24, J08, J38, K31

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"Fuller utilization of the concepts and hypotheses of economic theory (in a sense described below) *as a part of the process of observation and measurement* promises to be a shorter road, perhaps the only possible road, to the understanding of cyclical fluctuations."

Tjalling C. Koopmans, 1947 (p.162)

1 Introduction

A dismissal dispute is a difference between an employer and an employee that prevents agreement on work contract termination. They regularly lead to costly and lengthy job termination processes and are more likely to occur in recessions. Resolutions of dismissal disputes can have many forms, which is emphasized by law practice and country specific legislation. Typically, disputes can be distinguished by *firm* dominant (mostly economic) and *worker* dominant (mostly disciplinary). These qualifications provide a taxonomy that is encoded in most countries' specific laws. Unavoidably, dismissal disputes are settled with the engagement of a third party or a court that ultimately rules on the nature of the dispute and sets mandatory compensation.

The economics of dismissal disputes, which adresses how firm-worker pairs act, choose, and sort within a specific institutional legislation, is at its infancy. Little is known of how dismissal disputes affect the job-matching process. How shall we model and account for different origins of dispute?[1] How long and how costly are dismissal disputes? Do courts and related third party institutions respond differently to different sorts of dispute? Such questions are barely touched upon in the existing literature, most likely because quantitative evidence on dismissal disputes is very difficult to assemble and very little

[1] A marked difference between dismissal disputes and strikes is that "*the incidence of strikes are positively related to general cyclical movements in the economy.*" (*op.cit.* Kennan (1986), p113)

information is available to the economics profession.

In the conviction that "there is no good measurement without theory", as argued prominently by Koopmans (1947), we first provide a candid taxonomy of dismissal disputes, using a simple static firm worker matching theory. With the help of an accounting framework, dismissal disputes can then easily be classified as *firm* dominant, *worker* dominant, or *both-to-blame*.[2] The latter category contains those cases where it is uncertain which party is responsible most for making the separation compulsory.

Armed with a well defined economic taxonomy, the paper looks at the key stylized facts of dismissal disputes in the Netherlands. The Dutch model of employment security is complex, as are most labor institutions. Within the Netherlands, no employer initiated separation can take place without prior authorization, either from a labour court or from the Public Employment Service (PES), an organization that has been in place since the Nazi occupation of the Netherlands in the early nineteen forties. The unique feature of the Dutch model is that separations at the PES can take place with no severance payments, so that a non obvious and complex sorting mechanism takes place in the labor market. The paper uses a unique data set that records detailed dispute level information on both the firm and the worker, including the wage, the penalty and procedural duration of 2,191 dismissal dispute cases that took place in the Netherlands between 2006 and 2009. The data − representative of the aggregate inflows into Dutch unemployment − show that the two institutions (the court and the PES) specialize in different types of dismissals.

[2]Both-to-blame: *"Of course, both are to blame. Of course. You may always set that down as certain when you see two persons who have formerly been on good terms fall out with each other.* T.S. Arthur (1853): Home Lights and Shadows.

The paper proposes a Diamond Mortensen Pissarides search model that highlights the trade off between separation at the PES and separation in court. Spelling out explicitly the time to fire, originally proposed by Garibaldi (1998), the model shows how different job worker pairs sort between a lengthy PES procedure and a shorter, but more expensive, court ruling. In equilibrium, all types of dismissals are observed by both organizations, but the model predicts that the court should specialize in cases where both parties are to blame, as data suggest. The economics of this sorting is straightforward. As the court provides an option to stop losses, firms are willing to undertake such a costly procedure.

Despite fierce political attacks for a period of seventy years or more the public employment service could survive. The model that we present predicts that once the PES is in place and the median voter is employed in a good job, the elimination of the PES is vetoed by the majority of voters. Consequently, it is in the interest of most agents to keep it alive, although during recessions when unemployment rises the political basis of the PES is frailer.

The paper is organized as follows. Section 2 develops an accounting framework for classifying different types of dismissal disputes. The goal of this section is to derive an accounting framework consistent with economics reasoning. The paper's epigraph pays tribute to the idea that the best way to embark in measurements and observations of economic phenomena is to make full use of economics as a scientific discipline. In addition, the taxonomy we provide is also consistent with the law practice observed in most countries and formally adopted in legislative initiatives.[3] Section 3 discusses in

[3]For example, in the Italian "Jobs act", approved by Parliament in November 2014, there is an explicit reference to *firm* dominant dismissals (economic in the Italian legislation) and *worker* dominant

short the history and some of the specific aspects of Dutch labor market institutions and presents the data on individual dismissal disputes. In Section 4 an equilibrium search model with endogenous sorting is presented that is coherent with the theoretical taxonomy of Section 2 as well as with the empirical findings from Section 3. Section 5 presents a relevant model extension that includes the possibility of institutional biases, and discusses other possible extensions such as aggregate productivity and the role of financial constraints. Section 6 concludes.

2 A Taxonomy of Dismissal Disputes

The economics of dismissal disputes is seemingly related to job security and employment protection legislation. The literature on EPL is at least 25 years old. Therefore it is difficult to do justice to all contributions. Emerson (1988) was probably the first to summarize country specific legislation with simple indicators. Lazear (1990) predicts the neutrality of severance payments when wages are flexible and was the first to use cross country regression to assess the impact of job security provisions on employment. The typical modeling tool for job security provisions is a simple firing tax, dissipated outside the match or paid to third parties (Mortensen and Milard, 1994). Gáldon-Sánchez and G*ü*ell (2003) propose an efficiency wage model with firing costs due to dismissal conflicts. Garibaldi and Violante (2005) assess the difference between severance payments and firing taxes. Blanchard and Tirole (2008) provide a framework for the optimal design of employment protection institutions in the context of dual labour markets. Alvarez and

dismissals (disciplinary in the Italian legislation).

Veracierto (2012) model temporary contracts as a special case of a separation tax.

This paper considers a single worker-firm output pair as a single job. The focus is on dismissal at the level of the job, and we think mainly of individual dismissals. The framework is static. We assume that the measure of a job is 1. There is no attempt to consider how these jobs were formed in the first place. Information is perfect.

The productivity of the job has two key components. A specific worker component x and a specific firm component y. The x component refers to the individual contribution to the productivity of the job, including worker motivation and health condition. The y component refers to firm specific characteristics, technological conditions, market and demand conditions that have nothing to do with the worker. We assume that total productivity in the job z is the sum of the firm and worker component so that

$$z = x + y$$

In the space x, y there is a job for every single point in the Cartesian space $\Re^2$. The statistical properties of the job space and the underlying distribution is not particularly relevant at this stage, and we be outlined in Section 4.[4]

The wage that the worker gets from being on the job is fixed at w and it is independent of the productivity x and y. We also assume that the worker's outside option is a flow f

[4]It is natural to think of x as being drawn from a random variable X and y being drawn from a random variable Y that belong to joint continuous distribution $f(x, y)$ so that in the most general form we will have that

$$F(x \leq a, y \leq b) = \int_{-\infty}^{b} \int_{-\infty}^{a} f(x, y) dx dy$$

where F is the joint cumulative distribution.

strictly lower than the wage. This implies that the worker enjoys a rent (or a net utility) from the job as

$$U = w - f \ > 0 \quad \forall \{x, y\} \in \Re^2 \tag{1}$$

Since U is strictly positive, a worker will never want to severe a relationship.

The firm has no capital cost and it is only hiring this worker. The outside option of the firm is zero. This implies that the firm profit $J(x, y)$ in a job of $\{x, y\}$ is

$$J(x, y) = x + y - w \tag{2}$$

From the profit function we can define the iso-profit contour as the combinations of x, y that yield a given profit to the firm. In a x, y space there are various properties of profit contour that are evident from equation (2). Isoprofits i) are downward sloping linear functions; ii) have a unit slope in absolute terms and iii) curves at the north east yield higher profit values to the firm.

Let us suppose that the firm can initiate a separation. The firm will destroy any job if $J(x, y) < 0$. There exists a marginal iso-profit $J(x, y) = 0$, such that

$$y = -x + w \tag{3}$$

Figure 1 plots the marginal good job contour.

Definition 1 *The firm worker pair engages in a dismissal dispute each time* $J(x, y) < 0$ *and* $U(x, y) > 0$.

Result 2.1 *Each job in a* (x, y) *space below the marginal contour job represents a dismissal dispute.*

This simple definition yields a natural classification of dismissal disputes.

Definition 2 *A dismissal dispute is firm dominant whenever* $x > 0$ *and* $y < 0$.

In terms of Figure 1, a *firm* dominant dismissal belongs to the fourth quadrant in the Cartesian diagram below the marginal good job contour. In law jargon such a *firm* dominant dismissal is often referred to as an economic dismissal.

Definition 3 *A dismissal dispute is worker dominant whenever* $x < 0$ *and* $y > 0$.

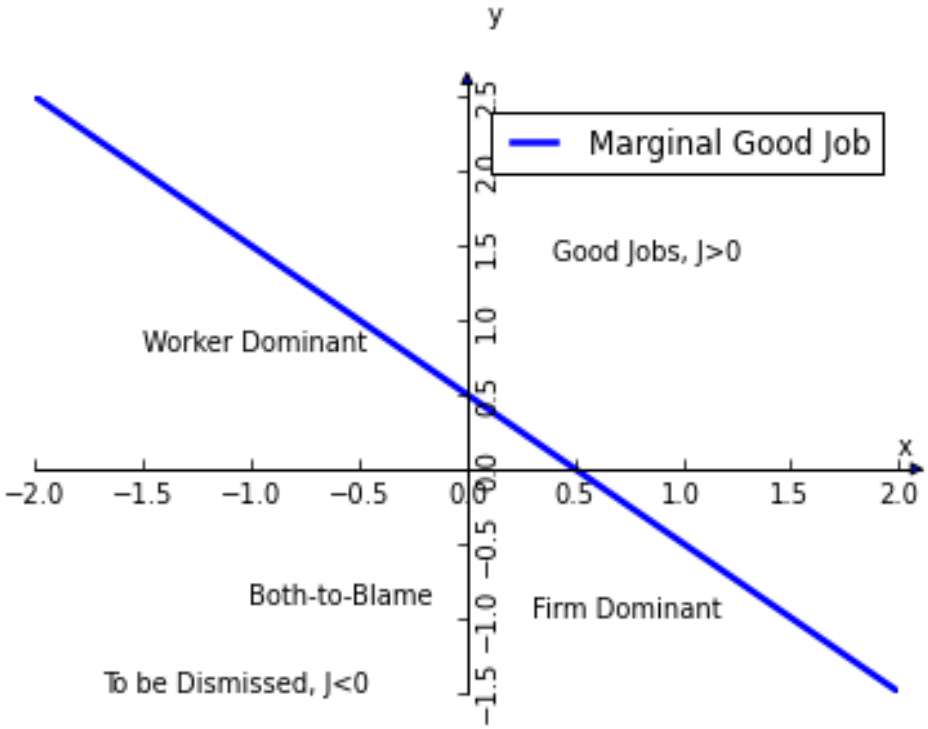
In terms of Figure 1, a *worker* dominant dismissal belongs to the second quadrant in the Cartesian diagram below the marginal good job contour. In law jargon such a *worker* dominant dismissal is often referred to as a disciplinary dismissal.

Definition 4 *In a dismissal dispute both parties are to blame when* $x > 0$, $y > 0$ *and* $x + y < w$ *or whenever* $x < 0$ *and* $y < 0$.

In terms of Figure 1, a *both-to-blame* dismissal belongs to the first or third quadrant in the Cartesian diagram below the marginal good job contour. We say that in a dismissal dispute the two parties are *both-to-blame*, because it is uncertain whether or not the lack of profitability can be contributed more to *worker*, to *firm* characteristics, or to both in equal proportions.

Note that the taxonomy we provide does not depend on the specific wage structure imposed. While it is natural to have a dismissal dispute when the worker and the firm

Figure 1: The taxonomy of dismissal disputes



do not agree on the job separation, the taxonomy survives in case of more efficient job separation. One can easily assume that the wage is a fraction ω of total productivity so that $w = \omega(x + y)$. Then the marginal contour would still be negatively sloped and would coincide with the 45 degree line. The model we present in section 4 is in line with privately efficient separations.

3 Facts From Real Life Institutions

Institutions for worker dismissal are often complex, unique, and country-specific. In the Netherlands, for example, firms are obliged to seek *a priori* permission to terminate an open-ended or permanent employment contract. Permission can be obtained from two

established, but fundamentally different, organizations: the civil courts and the public employment service. The firm chooses the organization from which it will request a permission to terminate a contract on the basis of the grounds for dismissal. The two organizations coexist for almost 70 years. Despite fierce political debate the resilience of this duality in obtaining permission to fire permanent workers is amazing.

3.1 Institutions

The Civil Court

The introduction of the Civil Code of Law in 1838 is a milestone in the history of Dutch labor market legislation. Inspired by the *1804 Code Napoléon*, the civil code is extended with a new national civil law that seeks to find a balance between the employer, the employee, and their contracted relationship. Originally, these articles were all written to protect the employer, not the employee. The introduction of the first legislative measures that aimed for the protection of the employee was in 1909 when the Law on Employment Contracts was enacted. The basis of Dutch labor law is Chapter 7 of the Civil Code that is used by civil courts to deal with disputes and controversies on employment provisions.

***The Public Employment Service* (PES)**

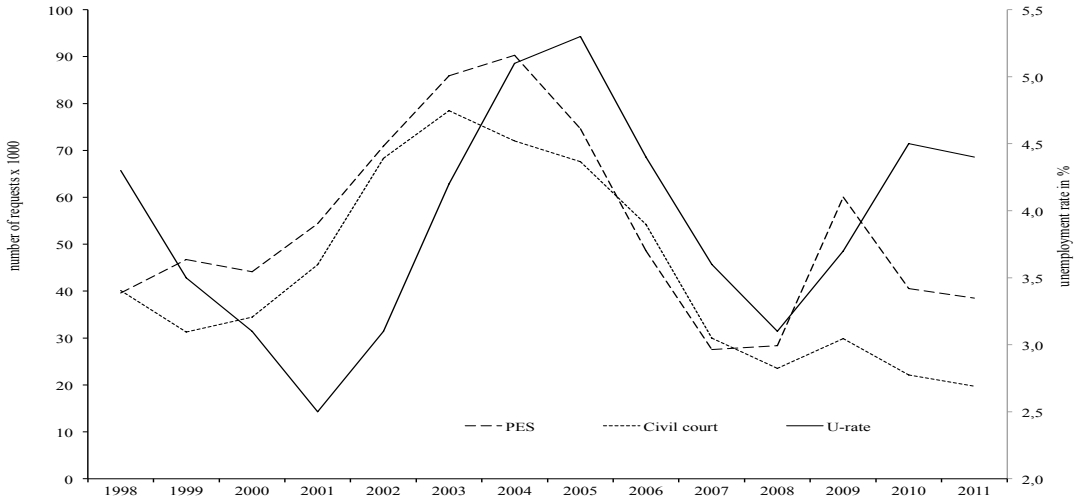
On June 11$^{\text{th}}$ 1940 the German occupying forces enacted the First Enforcement Resolution (*Eerste Uitvaardigingsbesluit*), prohibiting any dismissal in Dutch firms without prior permission of the *Labor Inspectorate*. A reasonable cause was required to obtain dismissal approval. If a proposed dismissal was judged unreasonable by the Inspectorate,

permission to terminate the employment contract was not given. When the war had ended the Dutch government still held office in London. It upheld this resolution by the declaration of the Extraordinary Resolution Labor Relations of October 5th, 1945 (*Buitengewoon Besluit Arbeidsverhoudingen 1945*). The goal of the declaration was *"to sustain and increase employment and to encourage production and productivity in order to stimulate the economic recovery."* At the time the Dutch did not have a parliament to approve the 1945 resolution. The declaration obtained the status of a royal decree with the power of law.

A network of public employment offices replaced the *Labor Inspectorate*. To date no less than 30 local labor market regions are equipped with 130 local offices. These offices are responsible for observing the implementation and execution of the extraordinary resolution by order of the government.[5] On May 14th, 1998, the parliament approved the Repair Law of Flexibility and Security, turning the 1945 decree into formal law. The law states that an employer must ask for and needs to obtain permission for dismissal of a tenured worker. Without prior permission from a civil court or from the PES a dismissal is voidable. A PES decision can not be appealed, but it is possible to start a court procedure when the employer or the employee disagrees. A dismissal request that is granted by the PES comes with an exemption of severance payments.

[5]See also Jacobs (2004): Chapter 7 in *The Termination of the Contract of Employment.*

Figure 2: Dismissal requests since 1998



3.2 Empirical Facts

Figure 2 shows all the dismissal requests that have been submitted to the two organizations during the period 1998 through 2011. In the periods 2003-2004 and 2008-2009 at the onset of the Great Recession the number of dismissal requests to the public employment service increased relative to the number of requests to the civil court. The volumes of requests to both institutions are *leading indicators* for the unemployment rate. In recessions as well as during expansions the PES grants firms permission to dismiss workers, and so allow firms to avoid severance payments. In recessions, when more firms are hit by downward shocks, the number of dismissal requests directed to the civil courts and to the PES increase, but the increase in requests to the PES is higher. This fact hints at the policy's efficacy in bad times to lower firing costs.

Individual Data on Dismissal Requests

The data collected for this study is a representative sample of 2,191 individual files on dismissal processes that occured during the years 2006 to 2009. They incorporate 1,029 court requests for dismissal and 1,162 dismissal requests to the PES.[6] The files contain detailed information on the reasons why the dismissal was imminent. Table 1 summarizes the different origins of the dismissal requests. *Worker* dominant reasons include absence from work due to long-term sickness, disciplinary reasons related to conduct, ability or capability, and other substantial reasons. This category corresponds with the area in Figure 1 where $x < 0$ and $y > 0$. A majority of dismissal requests for *worker* dominant reasons that have been submitted to the PES are cases of long-term illness (>2yrs). *Firm* dominant reasons include redundancy, relocation or reorganization. This category corresponds with the area in Figure 1 where $x > 0$ and $y < 0$. *Both-to-blame* reasons consist of those cases where it is doubtful which party is responsible most for making the separation compulsory. These include *pro forma* cases,[7] fairness issues, disagreements, and other disturbed relationships between an employee and an employer. The *both-to-blame* category corresponds with the area in Figure 1 where $x > 0$, $y > 0$ and $x + y < w$ or whenever $x < 0$ and $y < 0$.

Table 1 reports the key sorting facts from our empirical exercise. The unconditional

[6]See Frenk (2013) for detailed information about the data collection and its representativeness for the Netherlands, and Appendix 1 for information on data confidentiality.

[7]*Pro forma* cases are experience-based situations where the employer and the employee are in agreement of the contract termination, but the termination of the contract requires formal approval. The court can then apply a formal but simple court formula to determine the height of the severance pay. In these cases the court just needs to produce a verdict that states the amount of severance pay, without the need to do much additional research on the details and reasonability of the contract termination. About 80 percent of all 1,029 court cases in our data are *pro forma* cases.

distribution shows that approximately 50% of the cases are *firm* dominant, 32% are *both-to-blame* and the rest (approximately 20%) are *worker* dominant. More interesting are the conditional distributions: 69% of the court cases (32% of overall observations) belong to the *both-to-blame* category. Simultaneously, 72% of PES cases are *firm* dominant. We thus find strong evidence that civil courts specialize in the *both-to-blame* cases, while the PES specializes in *firm* dominant cases.

Table 2 reports differences between the two institutions in the distributions of process duration, tenure, age, gender, hourly earnings and weekly hours worked. All mean differences are significant, except gender. Compared to court, the PES receives dismissal requests for workers who are two years and three months older, have one year more tenure, earn €2.77 per hour less, and work 1.77 fewer hours per week. In a standard Mincer equation with age and tenure profiles and all other available explanatory variables, but without education, which we do not observe, the hourly wage difference between the court and the PES reduces to about 10 percent. The most substantial difference is found in process durations: PES procedures take much longer than court rulings.

Differences in Procedural Durations

In Table 3 more detailed information is given on the differences in process duration for the different reasons of requested contract termination. The facts that can be established from Table 3 are as follows. Court and PES procedures for *worker* dominant reasons take longer. The PES procedure duration outweighs the court procedure duration more than three weeks in all categories. *Both-to-blame* cases are only sporadically presented to PES.

This is due to the fact that the PES is prone to reject dismissal requests that comprise difficult disputes. Not only do duration outcomes differ substantially between the two organizations, but they vary in various other dimensions as well. In order to identify specifically salient process duration differences an econometric model will be estimated.

Let X, Y, and PES be dummy variables, with $X = 1$ if $x > 0$, $Y = 1$ if $y > 0$, and $PES = 0$ representing a court request and $PES = 1$ a request to the PES. This yields the following $[X; Y; PES]$ combinations:

$[0; 0; 0]$ represents dismissal requests to court of *both-to-blame* cases (710 observations).

$[1; 0; 0]$ represents dismissal requests to court of *firm* dominant cases (242 observation).

$[0; 1; 0]$ represents dismissal requests to court of *worker* dominant cases (77 observations).

$[1; 0; 1]$ represents dismissal requests to PES of *firm* dominant cases (843 observations).

$[0; 1; 1]$ represents dismissal requests to PES of *worker* dominant cases (309 observations).

Combinations $[0; 1; 1]$ and $[1; 1; 1]$ are *'good jobs'* and are not observed in the data; the 10 observations for which $[0; 0; 1]$ are excluded since the PES considered 8 of the 10 requests as unreasonable. The econometric model specification yields:

$$Duration = \beta_0 + \beta_1 X + \beta_2 Y + \beta_3 PES + \beta_{12} PES \times Y + \boldsymbol{\gamma}\boldsymbol{\Gamma} + \varepsilon \tag{4}$$

Duration is the process length measured in days, $\boldsymbol{\gamma}$ is a vector of parameters, $\boldsymbol{\Gamma}$ is a matrix of explanatory variables. The first column of Table 4 reports parameter estimates of the *baseline* model, when $\boldsymbol{\gamma} = \mathbf{0}$. The combination $[0; 0; 0]$ of dismissal requests of *both-to-blame* cases submitted to the court is the reference category. The model's parameter

estimates can then be interpreted as follows: $\hat{\beta}_0 = 9.04$ is the average length of court procedures for *both-to-blame* cases. $\hat{\beta}_1 = 1.35$ is the $-$ insignificant $-$ difference in court duration between *firm* dominant and *both-to-blame* cases. $\hat{\beta}_2 = 24.2$ is the difference in court procedural length between *worker* dominant and *both-to-blame* cases. $\hat{\beta}_3 = 26.1$ is the significant difference in procedural length between PES and court procedures for *firm* dominant and *both-to-blame* cases. $\hat{\beta}_3 + \hat{\beta}_{12} = 24.6$ is the significant difference in procedural length between PES and court procedures for *worker* dominant cases and *both-to-blame* cases. $\hat{\beta}_{12} = 1.50$ is the $-$ insignificant $-$ difference-in-difference estimate in procedural durations between the PES and the court and between *worker* and *firm* dominant cases. These estimates confirm the results from Table 3 that when it is uncertain which party is responsible most for the requested termination of the job contract, *i.e.* a *both-to-blame* dispute whether $x < 0$ or $y < 0$, the average PES ruling takes much more time than a court procedure.

The second column in Table 4 reports parameter estimates when the model is extended with a set of $-$ 22 $-$ additional explanatory variables. The F-test yiels $F(22, 2154) = 1.92$ with $p = .006$. The marginal effects on process duration of *Hours* – one contracted hour more per week – and *Wage* – one Euro more in the hourly wage – are practically similar and equal to one additional procedural hour.[8]

[8] A 40 hours working week lasts 7 days. The marginal effects of procedural length per hour are $40/7 \times .178 = 1.02$ and $40/7 \times .172 = .98$, respectively.

Estimating Differences in Firing Costs

Not all requests submitted by employers are granted. The court denies 7.5 per cent of all dismissal requests, the PES denies 12.4 per cent. Differences in firing costs are computed for granted dismissal requests of individual workers obtained from the public employment service or from the civil court.[9] Before starting a civil court procedure the employer is obliged to pay a court fee. The size of this fee depends on the legal form of the employer. The employer will also incur the costs of ongoing wage payments for the duration of the dismissal. This duration period can be divided into two components. The first component is the time the court needs for a verdict. This starts at the moment a request is registered and lasts until the moment the court reaches a decision. The second component is the time between the verdict and the duration of employment contract termination, which is determined by court ruling. The civil court is not bound to observe the statutory notice period and can decide when the employment contracted shall be dissolved. The final cost component is the firing costs in terms of severance pay to be borne by the firm.

Civil courts *"are free to assess the amount of compensation to be paid by the employer; there is no statutory minimum or maximum. This makes it very difficult to forecast the results of the procedure."* (op cit. Jacobs (2004), p103). However, Dutch civil courts do have a guideline to determine these costs; a formula for cantonal judges states that firing costs should, in principal, be equal to the product of three factors. Factor A is a weighting factor of the years of age of the employee $A = 0.5$ for $age < 35$; $A = 1$ for $35 \leq age < 45$; $A = 1.5$ for $45 \leq age < 55$, and $A = 2$ for $age \geq 55$. Factor B is the gross

[9]See Pfann (2006) for how to measure heterogeneous firing costs in Dutch firms.

monthly wage. Factor C is a correction factor that is determined by the civil court, with $0 \leq C \leq 2$. If $C < 1$, the employee is held liable for negligence, and if $C > 1$ the employer is held liable. In all other, mostly *pro forma*, cases $C = 1$. The compensation formula provides guidance, but the courts are free to determine the exact amounts indeed. The data on compensation decisions are obtained directly from the court records.

An employer that submits a request for dismissal to the PES will incur ongoing wage costs during the time of the dismissal procedure. The period can be divided into three parts: the procedural time, the time to notice, and the period of notice. The procedural time is the time between submission and the pronouncement. The time to notice is the period between the pronouncement and the start of the notice period. The notice period is defined by the employees years of tenure. A notice period equals 1 month for tenure less than 5 years, 2 months for tenure less than 10 years, 3 months for tenure less than 15 years, and 4 months for tenure of 15 years or longer.

Table 6 shows the outcomes of the computations of heterogeneous firing costs based on our data set on individual dismissal cases. The average firing costs that a firm faces if a dismissal request is approved by the PES is €7,480. That is about 500 times the average hourly wage rate of a worker permitted to be laid off by the PES. The average firing costs a firm faces if a dismissal request is submitted to and approved by the civil court is 30,982. That is about 2,000 times the average hourly wage rate of a worker permitted to be laid off by the court. The average firing costs for the civil court procedure are found to be four times the average PES firing costs. The median costs are two times larger.

Another striking dissimilarity between the two procedures is the differences in vari-

ances of the firing costs. The standard deviation of the firing costs through the civil court is €54,808; the standard deviation of firing costs associated with the public employment service is €5,648; almost ten times higher. Dismissal procedures through court are characterized by higher costs and much larger variations in costs and duration. Given these outcomes, why then do not all employers apply for dismissal permission from the public employment service always? The answer is primarily an argument of expected time-saving. The decisions taken by the PES can be challenged in court by the employer as well as by the employee; and cases of troubled employer-employee relationships will not be dealt with by the public employment service. If the PES considers a request unreasonable, permission to terminate the employment contract shall not be granted (but valuable time and costs shall be foregone).

The key empirical facts can be summarized as follows:

- In aggregate data, the share of requests at the PES increases in recessions.
- PES authorization takes almost one month longer than court ruling.
  (This is the largest difference observed between the two institutions.)
- PES specializes in *firm* dominant cases.
- Courts specialize in *both-to-blame* cases.
- *Worker* dominant cases are equally split between the two institutions.
- Court procedures are more expensive with larger variations in costs and duration.

4 A Search Model with Endogenous Sorting

4.1 The Dual Dimension of Job Level Productivity

There is a measure 1 of identical risk neutral workers that are matched to a firm in an imperfect labor market. There is no aggregate uncertainty and we focus on stationary equilibria. Jobs are created by the meeting of unemployed workers and a vacancy in an imperfect labor market. The matching function is $x(u, v)$ with constant return to scale, and we shall indicate with θ the vacancy unemployment ratio. The job filling rate for a firm is $q(\theta)$ and the job finding rate for a worker is $\theta q(\theta)$. Firms post vacancies at a flow cost of c, but we postpone the job creation decision to the general equilibrium dimension. Firms and workers discount the future at a rate of preference r and jobs die exogenously at rate δ. Workers survive the firm specific job δ and survive into unemployment.

The joint output of a single job is characterized by two key idiosyncratic dimensions. The components are match specific. The x component refers to the individual characteristics of the job. The y component refers to the technological productivity of the firm. We can think of x as being drawn from a continuous random variable X of *worker specific characteristics* such as worker attitude toward the job, health, motivation, etc. Conversely, y is drawn from a random variable Y that refers to technological conditions, market characteristics, demand conditions that have nothing to do with the worker. The two dimensions are drawn from a joint continuous distribution $f(x, y)$ so that in the most

general form we have that

$$F(x \leq a, y \leq b) = \int_{-\infty}^{b} \int_{-\infty}^{a} f(x, y) dx dy$$

where F is the joint cumulative distribution. We say that a job space is *complete* when x and y are continuous with support $X \in \Re$ and $Y \in \Re$. In a complete job space there is a job in any set $A \in \Re^2$. To simplify the general equilibrium of the model, we assume that the individual productivity X is independently distributed from the technological productivity Y.[10] The total idiosyncratic productivity of a single job is the sum of the two components and for simplicity we shall indicate with $z = x + y$ the total idiosyncratic productivity of the job and with F_{X+Y} the joint cumulative distribution.[11] To make the derivation simple, we also assume that the distribution F_{X+Y} has finite support over the interval $[z^l, z^u]$.

4.2 The Life of a Job, Ages and the Key Value Function

We assume that each newly created job has a fixed initial productivity $\overline{z} = \overline{x} + \overline{y}$. The idea is that a job has an initial learning phase in which the true productivity is not totally determined to the parties. The average duration of the learning phase is $\frac{1}{\lambda}$, so that at

[10] The job destruction and the existence of the two types of institutions in equilibrium does not depend on the assumption of independence that can easily be dropped

[11] A basic result in probability theory (Ross, 2002) is that F_{X+Y} is the *convolution* of the distributions F_X and F_Y and the denstity z is

$$f_{X+Y}(z) = \int_{-\infty}^{\infty} f_X(z - y) f_Y(y) dy$$

the end of this period the firm learns the long term quality of the job.

Conditionally upon on the realization of the shock λ, the firm (or the match at this stage) learns its long term productivity value z. We assume that the productivity is fixed thereafter and no other productivity shocks hit the firm. Nevertheless, conditional upon the realization of the shock, the firm faces a key continuation decision. The firm may or may not endogenously destroy the job. If the job is continued, it enters its maturity stage. We say that a mature job is a *good job* with idiosyncratic productivity $x + y$. If the firm wants to interrupt the job it will enter into a firing procedure.

There are two possible ways to terminate a job: through a permission via *Public Employment Service* or through a *court ruling*. We will discuss the two different procedures in the next stage. In what follows we shall indicate with J the value of a new job and with $J^g(x+y)$, $J^{pes}(x+y)$ and $J^{ct}(x+y)$ the value of a good job, a job that is under a PES procedure and a job that is under a *court* procedure

$$(r+\delta+\lambda)J = \overline{x}+\overline{y}-w(\overline{x}+\overline{y})+\lambda\int_y\int_x Max\left[J^g(\xi,\nu),J^{pes}(\xi,\nu),J^{ct}(\xi,\nu)\right]dF(\xi,\nu)d\xi d\nu \tag{5}$$

Equation (5) is the general expression for the value of a new job. The firm effectively discounts its flows at rate $r+\delta+\lambda$. Further, the flow value of a new job is $\overline{x}+\overline{y}-w(\overline{x}+\overline{y})$. Conditional on the realization of the λ shock, the firm learns its long run productivity and endogenously chooses i) whether the job should continue and ii) whether the separation procedure should follow the court ruling or the public employment service.

The wage is determined endogenously. We will assume that the firm and the worker

split the surplus in a Nash Bargaining fashion whenever the surplus is positive. Conversely, when the job has no surplus and is undergoing a dismissal procedure, the worker participation constraint (in the forms of its life time value of unemployment value) binds. The participation constraint is given by the endogenously determined unemployed permanent income, which we shall indicate with rU. If the surplus for the job is $S(x+y)$, the wage rule reads

$$w(x+y) = \begin{cases} argmax\{(W-U)^{\beta}(J-V)^{1-\beta}\} & if \quad S(x+y) \geq 0 \\ \\ rU & if \quad S(x+y) < 0 \end{cases} \tag{6}$$

where $S(x+y) = J(x+y) + W(x+y) - V - U$ is the surplus from the job. A similar wage rule was used by Acemoglu (2001) in a model of bad jobs.

4.3 The Dismissal Procedure

Fully Operational Jobs

A *good* job is fully operational and delivers positive value to the firm at the realized productivity $x+y$, $J^{g}(x+y) > 0$. A good job survived the learning phase and stays operational until the firm dies for exogenous reasons at rate δ. It thus follows that

$$J^{g}(x+y) = \frac{x+y-w(x+y)}{r+\delta}; \quad J() \geq 0 \tag{7}$$

The derivation of the wage is standard in search models and is coherent with Pissarides (2000). Indicating with b the flow value of unemployment, the wage in a good job reads

$$w(x+y) = b(1-\beta) + \beta(x+y+c\theta)$$

where the wage is the linear combination of the value of unemployment and the productivity of the job, augment by the rent flow $c\theta$. In what follows we will make use of the concept of the job contour, precisely as we did in Section 2. Using the wage rule, the value of the job can be written as

$$J^g(x+y) = \frac{(1-\beta)(x+y-rU)}{r+\delta}$$

where $rU = b + \frac{cx}{1-\beta}\theta$. For given value of unemployment U, the job contour is the combination of x and y that guarantee to the firm a value of $\overline{J}$. Note that the contour in the space x, y have the same properties as in Section 2 (Figure 1).[12] The marginal good job delivers zero value to the firm and its contour $J(\tilde{x}+\tilde{y}) = 0$ reads

$$\tilde{y} = -\tilde{x} + rU \tag{8}$$

The intuition is clear. Since the productivity will permanently be at the value $x+y$ the firm will hold a good job as long as the flow profit from the marginal job is positive. Any job above in the (x, y) space above marginal $\tilde{y}, \tilde{x}$ contour is fully operational.

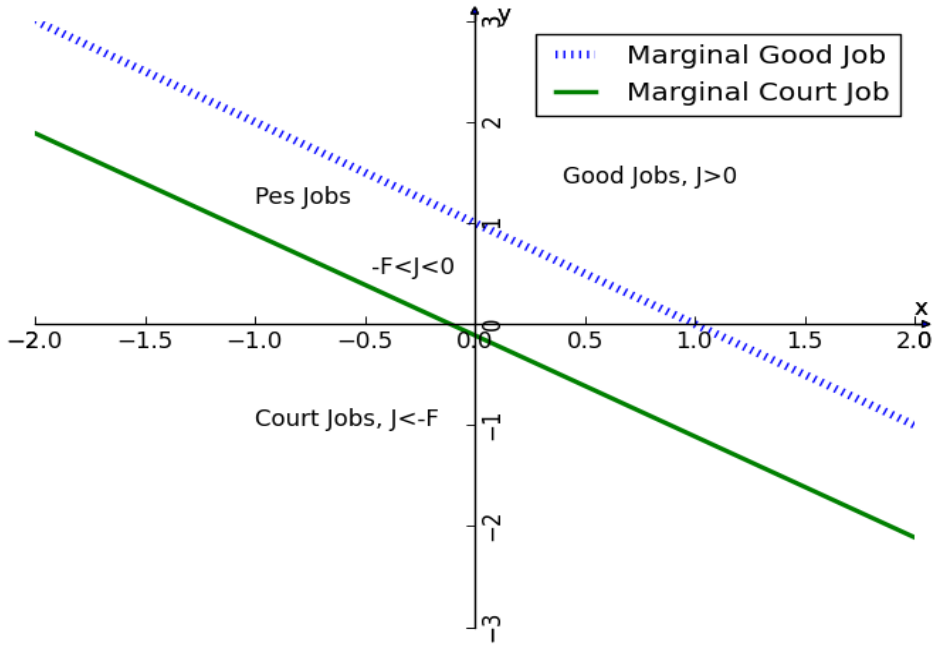
[12]The job contours i) are downward sloping linear function, ii) have a unit slope in absolute terms and iii) delive higher values to the north east.

Public Employment Service

When a job has negative value, the firm enters the firing procedure. To begin with, we assume that the firm has the option of applying for a firing position through the Public Employment Service at no cost. Conditional on the application, the firm is entitled to firing at the instantaneous rate s. The idea of stochastic firing was introduced by Garibaldi (1998). The firm takes as given the arrival rate of stochastic firing permission. The higher is s, the quicker is the firing authorization. Clearly, as $s \to \infty$, firing takes place immediately and the firm immediately fires the worker. Conditional upon a firing permission, the firm may be forced to a firing cost. For simplicity, we assume that in the case of PES procedure, the firing cost is zero. This implies that the cost of firing in the case of PES is just a time cost, due to the fact that the job must be in place as long as the firing permission arrives. This is coherent with the evidence provided in Section 3.

In a general framework one can assume that PES behavior may be affected by worker or firm characteristics, so that $s = s(x, y)$. The idea is that a job with poor characteristics may increases or decrease the chance of obtaining a firing permission. Then the PES changes the procedure depending upon the specific type of dismissal it faces. In other words we will say that the PES behavior is biased toward worker characteristics when $\partial s/\partial x < 0$. Conversely, PES behavior is neutral when $s(x) = s^{pes} \ \ \forall x$. In what follows we will consider the case of a PES neutral and will postpone the discussion of a PES biased in the extensions.

Figure 3: The Job Space and the Marginal Job Contour



The value of a job at the PES reads

$$(r+\delta)J^{pes}(x+y) = x+y-w^{pes}(x+y)+s^{pes}\left[Max(0,J^{pes}(x+y))\right] \tag{9}$$

Since positive valued jobs are operational, in equation (9), the PES procedure yields negative total value to the firm and $J^{pes} > 0$, so that we can get rid of the max operator. In addition, the wage is determined by the worker's participation constraint so that $w^{pes} = rU$. This implies that the the value of a job undergoing a PES procedure is

$$J^{pes}(x+y) = \frac{x+y-rU}{r+\delta+s^{pes}}; \quad J^{pes}(x+y) \leq 0$$

Court Ruling

Firms also have the option of going to court. The court procedure has two key feature. It involves a court firing permission s^{ct} that is strictly quicker than a PES procedure. In other words, $s^{ct} > s^{pes}\ \forall x, y$. Conditional on a firing permission, the firm incurs a strictly positive random firing tax. Firing costs are drawn from a distribution $G \sim (-F, \sigma_F^2)$. Note that the court ruling in the Dutch model is mainly in terms of a wage transfer to the worker, while in the paper we emphasize the firing costs. In search economies with flexible wages and Nash bargaining, mandatory transfers are prepaid by the workers in forms of lower entry wages (Garibaldi and Violante, 2005).

Since the firm is risk neutral, the expected value of a job undergoing a court procedure reads

$$(r+\delta)J^{ct}(x+y) = x + y - w^{ct}(x+y) + s^{ct}\left[Max(-F, J^{ct}(x+y))\right] \tag{10}$$

Confronting equation (9) and (10) it is clear that the court procedure offers to the firm an option to stop losses. When the expected value of a job is sufficiently bad, it must be optimal entering the expensive firing procedure. We can thus also get rid of the max operator in equation (10) and define the job in court as

$$J^{ct}(x+y) = \frac{x + y - rU - s^{ct}F}{r + \delta + s^{ct}}; \qquad J^{ct}(x+y) \leq -F$$

where the worker's participation binds and $w^{ct}(x+y) = rU$ This suggests that there

exists a job contour such that

$$J^{ct}(x^{ct} + y^{ct}) = J^{pes}(x^{ct} + y^{ct}) \tag{11}$$

Simple algebra shows that in the case of a neutrally biased PES, the marginal court job thus solves

$$y^{ct} = -x^{ct} - rU - \frac{s^{ct}F(r + \delta + s^{pes})}{s^{ct} - s^{pes}} \tag{12}$$

We have thus established some important results.

Proposition 1 *The job space is complete and in equilibrium good jobs, PES jobs and court jobs will simultaneously coexist.*

Proof. The proof is straightforward. Just notice that the contour of the marginal PES job lies strictly below the marginal good job as long as $\frac{F(r+\delta+s^{pes})}{s^{ct}-s^{pes}} > 0$, which is guaranteed from the fact that court ruling is quicker than PES procedure, or that $s^{ct} > s^{pes}$.

The economics of Proposition (1) is the following. In choosing between the court and the PES procedure, the firm has to trade off between a higher expected firing cost and quicker court ruling procedure. If the job characteristics are not too bad, the firm strictly prefers a longer queue through the PES offices. Nevertheless, as any of the job characteristics turn out sufficiently bad in any of the characteristics, the firm is willing to exercise the stop loss option guaranteed by the expensive court procedure.

Proposition 2 *Both-to-Blame dismissal cases ($x < 0, y < 0$) go to court.*

Proof. The proposition is true in partial equilibrium as long as $rU > \frac{(r+\delta+s^{pes})s^{ct}F}{s^{ct}-s^{pes}}$.

Yet in general equilibrium U is an endogenous variable and the parameter restriction is complicated. In any event, the tendency of uncertain cases to go to court is also evident from Figure 3. Since the court offers an option to stop losses, the model certainly predicts that sufficiently difficult cases go to court.

Result 4.1 *Firms are more likely to enter the PES procedure when court firing costs increase, when the PES permission rate increases, and when court ruling becomes slower.*

Proof. The proof is based on a simple comparative static over the marginal job contour of equation (12). The marginal contour shifts down with an increase in firing costs F, a fall in court speed s^{ct} and an increase in s^{pes}.

A Caveat

An important caveat is in order. In our model of time to fire, as in most models of costly dismissal, parties would have incentives to bargain over the dismissal costs to avoid deadweight losses linked to employment protection legislation. In the present setting, workers receive their outside option while firms incur job losses. This is fully coherent with the Dutch model, where firms need prior authorization for dismissing workers. Yet, parties would still have incentives to bargain over the deadweight losses and to avoid the dismissal procedure. In models of perfect information, such potential deals are ruled out by assumption, in line with the mainstream employment protection legislation literature (Bentolila and Bertola, 1990). Our assumption is also coherent with the data, since 80 percent of job termination authorized by the Court are *pro forma* cases. In models of

imperfect information, bargaining over the deadweight losses would imply the use of court ruling in equilibrium. Models of strikes are coherent with these setting (Kennan, 1986; Kennan and Wilson, 1993). More recent theories on bargaining with deadlines would also imply the use of court ruling in equilibrium.

4.4 Job Creation and General Equilibrium

Using the marginal contour in good job and in court described by equations (8) and (12), and recalling the definition of $z = x + y$, the expected value of a job at PES and in court read respectively

$$S^{pes}(\theta, z^{ct}, \tilde{z}) = -\frac{1}{r + \delta + \lambda + s^{pes}} \int_{z^{ct}(\theta)}^{\tilde{z}(\theta)} F_{X+Y}(m))dm$$

$$S^{ct}(\theta, z^{ct}) = -\frac{1}{r + \delta + \lambda + s^{ct}} \int_{z^{l}(\theta)}^{z^{pes}(\theta)} F_{X+Y}(m))dm$$

These two expected values describe two important features of the model. First, the expected costs of the procedures are endogenously determined. Second, the costs tends to zero as the arrival rate of the procedure becomes infinitely large. Note also that these two costs are dissipated and can not be undone by wage transfers.

Using the wage rule, equation (6) for evaluating $w(\overline{x} + \overline{y})$ into the value of a new job, the free entry condition imposes that the value of a vacancy be zero ($V = 0$), so that the

value of a new job is equal to expected search costs

$$\frac{c}{q(\theta)} = J(\theta, z^{pes}, z^{ct}). \tag{13}$$

where $J(\theta, z^{pes}, z^{ct})$ is the expected value of a new job.

Definition 5 *The general equilibrium is a set of employers value functions (J^i, W^i), value of unemployment rU, marginal contour (z^{ct}, z^g) market tightness (θ), wages w^i, aggregate stocks (n^i, u) for good jobs, PES jobs and court jobs $(i = g, ct, pes)$ such that*

1. *wages w^i satisfy the wage rule; equation (6);*
2. *(z^{ct}, z^g) satisfy the marginal contours; equations (8) and (12);*
3. *market tightness θ satisfy the job creation condition; equation (13)*
4. *aggregate stocks satisfy the balance flow conditions (see Appendix).*

We are now in a position to establish existence and few basic comparative static results.

Result 4.2 *Equilibrium exists and it is unique.*

Proof. See appendix.

Result 4.3 *An increase in the arrival rate of firing authorization at both institutions (s^{pes}, s^{ct}) increase market tightness and has ambiguous effect on unemployment.*

Proof. This results is derived from equation (13). The increase in the arrival rates increases the value J at given market tightness. General equilibrium is restored by an

increase in expected search cost linked to the the entry of new vacancy in to the market that drive up θ.

As a corollary to the last result, one may want to consider a particular case of the model, namely one in which the PES does not operate. The model with only a court ruling is just a limit case of the model we just solved in which $s^{pes} \to 0$. If PES authorization is never warranted, the option to avoid the court has no value in equilibrium and firms are obliged to use the court. Such economy features larger expected firing costs, with standard predictions that follow from the literature and are summarized in the following corollary.

Corollary 4.1 *In an economy with no PES expected firing costs are higher. Job destruction is lower and so is job creation, with ambiguous effects on unemployment.*

The result of the corollary naturally poses the question on the political economy dimension of an institution like the PES, as well as on the longevity of the Dutch model and its political resilience.

4.5 The Longevity and Resilience of PES

The model provided the economics of the trade off between the court and the PES procedure and rationalizes the sorting of different jobs across the two institutions. As in most search models with risk neutral individuals, the existence of the two institutions is taken as given. Yet, in the spirit of the original contribution of Saint-Paul (1993), the model

can be used to understand the longevity and resilience of institutions in terms of political economy. This section follows this approach and considers the welfare implications of removing the PES, the institution that was established in the Netherlands in the middle of the German occupations, an admittedly crisis situation. Yet, the institution proved to be remarkably resilient to the subsequent seventy years of recurring fierce political debates.[13]

Consider the equilibrium value functions of different individuals. The value functions of unemployed workers, as well as individuals under a firing procedure read

$$rU = b + \frac{\beta c}{1-\beta}\theta \tag{14}$$

Workers employed in good job enjoy the following utility

$$W^g(x+y) = \frac{b(1-\beta) + \beta(x+y+c\theta) + \delta U}{(r+\delta+\lambda)} \tag{15}$$

The welfare of workers in newly employed jobs is more at $\overline{x}+\overline{y}$ is more complicated, but can be compactly written as follows.

$$W(\overline{x}+\overline{y}) = \frac{w(\overline{x}+\overline{y}) + \lambda\frac{(1-\beta)}{\beta}\int_{rU}^{z^u}(1-F_{X+Y}(m))dm + \delta U F_{X+Y}(rU)}{(r+\delta+\lambda)} \tag{16}$$

[13] As of January 1^{st}, 2015 a change in the Dutch dismissal law is effective, putting a €75,000 cap on the maximum severance payment a court can adjudge. The preventive *a priori* dismissal tests performed either by the civil court or by the public employment service remain in place. The employer's choice which of the two established organizations to ask for permission to terminate a permanent worker's contract continues to be based on the grounds for dismissal.

where the wage $w(\overline{x}+\overline{y})$ is given by equation (6). The three values functions allow us to derive the following welfare results.

Result 4.4 *The value functions of the unemployed (rU) and on workers employed in good jobs (rW^g) is strictly increasing in the arrival rate of firing permissions at both institutions (s^{pes} and s^{ct}). Conversely, the speed of firing permission has ambiguous effects on the value function of newly appointed workers ($W(\overline{x}+\overline{y})$).*

Proof. The proof depends directly from Result 4.2. Since $\frac{\partial\theta}{\partial s^i} > 0$, it is sufficient to notice that from the value functions we have that $\frac{\partial rU}{\partial\theta} > 0$, $\frac{\partial W^g}{\partial\theta} > 0$ while it is not possible to unambiguously sign $\frac{\partial W(\overline{x}+\overline{z})}{\partial\theta}$.

The economics of the previous result is fairly simple. First, recall that an increase in the arrival rate s^i is akin to a reduction in firing costs. Unemployed workers favour such reductions since their utility is increasing in the job finding rate. The change in s^i has similar results on workers employed in good jobs, since such workers have already learned their job specific match z and will benefit of a higher job finding rate if their job had to be dissolved. The uncertainty of the policy rests with the newly appointed workers, that face a shorter duration of their employment in the aftermath of the increase in s.

Result 4.5 *If the median voter is employed in a good job, the elimination of the PES is vetoed by the majority of workers and the PES is resilient.*

Proof. If $s^{pes} \to 0$ equilibrium expected firing costs are higher and the value function W^g will be lower since market tightness will be lower.

It is thus in the interest of most agents to keep the PES alive, although during recessions when unemployment rises and more dismissal requests are received by the PES, its political basis is frailer. Hence the recurring political attacks. As we argued in the previous section, the elimination of the PES can be represented by an economy in which there is only a court ruling. In such an economy expected firing costs will be higher, the job finding rate falls, and both unemployed as well as workers employed in good jobs are worse off, in the sense of a lower lifetime utility. Result 4.5 ensures that a coalition formed by workers in good jobs, unemployed workers as well as workers undergoing a firing procedure will form a majority blocking the removal of the PES.[14]

5 Institutional Bias

Institutional bias is defined as *"a tendency for the procedures and practices of particular institutions to operate in ways which result in certain social groups being advantaged or favoured and others being disadvantaged or devalued."*[15].

In the baseline model we assumed that the behavior of the institutions were neutral. While we do not have in mind any clear directions of particular biases, our model is flexible enough to consider the possibility that the PES or the court behave differently for different dismissal cases (*eg.* Ichino *et al.*, 2009). In this section we present a simple extension, based on the assumption that the PES is biased towards certain worker characteristics.[16]

[14]Workers undergoing a firing procedure enjoy the same lifetime utility of the unemployed rU.

[15]Followed by: *"This need not be the result of any conscious prejudice or discrimination but rather of the majority simply following existing rules or norms."* Oxford Reference: http://www.oxfordreference.com/

[16]Of course, a similar specification holds for court biases.

The Model with Institutional Bias

Formally, it holds that the PES is biased whenever $\frac{\partial s}{\partial x} \neq 0 \neq \frac{\partial s}{\partial y}$, so that the the arrival rate depends on the job characteristics faced. In this section we explore the implications of the following bias

$$s^{pes}(x) = \begin{cases} \overline{s} & \text{iff } x < 0 \\ \\ \underline{s} & \text{iff } x \geq 0 \end{cases} \tag{17}$$

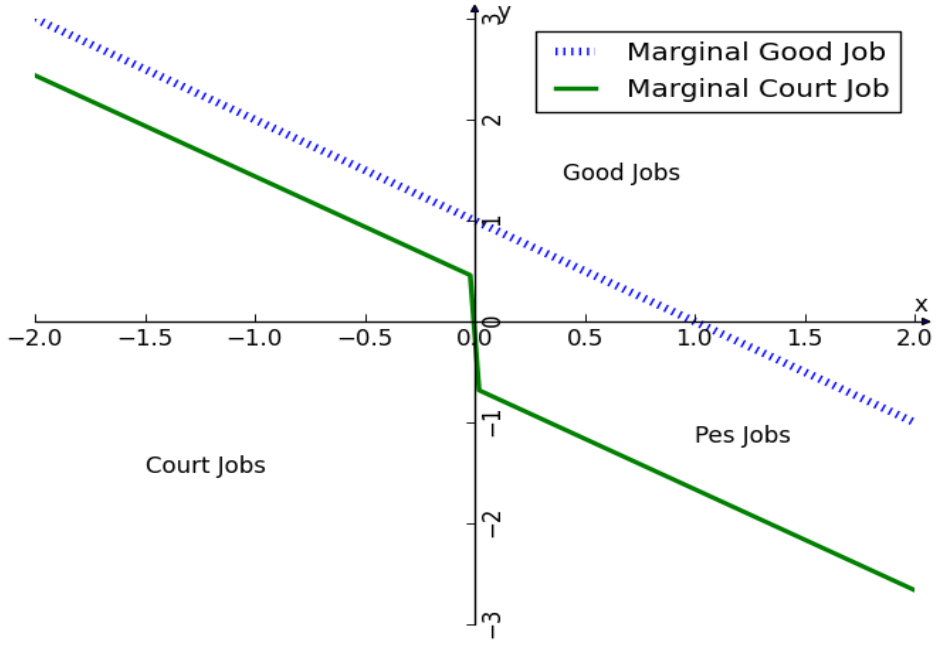
with $\overline{s} > \underline{s}$. Equation 17 suggests that PES procedure takes longer when the dismissal is *worker* dominant. We can thus call such a function a representation of *Pro Worker bias by the PES*.

The solution of the model, with the particular bias assumed in equation (17), is not too different from the baseline model. The job contour is identical to that of equation (8). The marginal contour for the court job reads

$$y^{ct} = -x^{ct} - rU - \frac{s^{ct} F(r + \delta + s^{pes}(x^{ct}))}{s^{ct} - s^{pes}(x^{ct})} \tag{18}$$

Using the specification of the bias of equation (17), the marginal contour is described by Figure 4. The contour is a step-wise downward sloping function with positive intercept in the second quadrant and negative intercept in the fourth quadrant. The job creation condition is similar to the baseline case and it is reported in the appendix. The main result of the extension is the following

Figure 4: The Job Space with Institutional Biases



Result 5.1 *When the PES is biased in a Pro Worker form, or along the rule specified in equation (17) the following is true: i) the job space is complete, ii) PES specializes in firm dominant dismissal cases and iii) all uncertain cases go to court.*

This result and the specification of equation 17 suggest a simple empirical implication, namely that the duration of the PES procedure takes longer when the cases are *worker* dominant. Such implication can be easily taken to the data, as we do in the following subsection. Obviously, a similar argument to that described in equation (17) can be applied to the behaviour of the court. We do not formalize such a bias in this section, but we do assess its empirical evidence.

Empirical Evidence of Institutional Bias

Institutional bias is thus linked to specific characteristics of a worker or groups of workers. If the PES and the court would use different decision rules, the first obvious way to test that is to analyze possible differences in procedural duration with the PES as a modifying variable. Equation (4) is then adjusted as follows

$$Duration = \beta_0 + \beta_1 X + \beta_2 Y + \beta_3 PES + \beta_{12} PES \times Y + \boldsymbol{\gamma\Gamma} + \boldsymbol{\gamma^w}(PES \times \boldsymbol{\Gamma^w}) + \varepsilon \quad (19)$$

where $\boldsymbol{\gamma^w}$ denotes the vector of bias parameters associated with $\boldsymbol{\Gamma^w} \subseteq \boldsymbol{\Gamma}$ of worker characteristics. Table 5 reports parameter estimates when interaction terms are included to investigate the influence of worker and job characteristics on procedural differences between the two institutions. The F-test of added variables is $F(5, 2149) = 8.51$ with $p = .000$. The results are remarkable. They show a clear difference between the PES and the court in various dimensions. The average PES procedure takes 9.7 days longer for women than for men. The marginal effect of one hour per week more work extends the PES procedural duration with 3.7 days (see also footnote 8). Earning one Euro per hour more lengthens the PES procedure with 4.6 days. Variations in court duration are insignificant along all these three dimensions. How to interpret these results? One way to think about this is that in case of longer durations the PES shows *Pro Worker Bias* of job exit arrival times. Then the institutional bias is such that the PES favors female workers, full-time positions, and higher wages. In our model, the match reacts to such biases by sorting firm dominant cases into PES.

6 Concluding Remarks

The economics of dismissal disputes is part of life of all labor markets. Yet, little is known about how firms and workers act, choose, and sort within a country's specific legislation. This paper has opened the black box. To begin with, a simple theory-oriented taxonomy has been proposed that corresponds with general dismissal legislation. It distinguishes firm from worker dominant dismissal disputes by the responsibility of the cause of the disputed employment contract termination. Naturally, uncertain cases in which both parties are to blame are also accounted for. Such classification is often used by labor market institutions and is encoded in existing law. The taxonomy has sufficient flexibility to accommodate country-specific legislation.

Empirically, the paper studied 2,191 dismissal disputes that took place in the period between 2006 and 2009. The Dutch labor market, where our observed disputes took place, turned out to be home to a unique employment protection legislation. Alongside a civil court, firms are entitled to get firing permission by the public employment service, an institution that was imposed by the Nazi's and survived for 70 years. The unique feature is that PES dismissals can take place without severance payments and other mandated firing costs, provided the firm is willing to undertake a lengthy procedure and obtain formal authorization. Court ruling, conversely, is much quicker but more expensive. An endogenous sorting between the two institutions emerges in the labor market, with worker dominant cases being examined proportionally more by the PES. Court ruling specializes in cases where both parties are to blame. We showed that such endogenous sorting is

coherent with an equilibrium matching model with timing restrictions to fire a worker. In this model, heterogeneous matches optimally weigh the trade off between costly court rulings and time-consuming PES procedures.

Dismissal disputes can be looked upon in many other dimensions. The strategic behavior conducted by both firms and workers forms an interesting ground for investigation, particularly within imperfect information and moral hazard settings. This paper highlighted the economics of dismissal disputes in some dimensions. Future studies and micro data from other labor markets can certainly throw lights on more key dimensions.

References

Acemoglu, Daron (2001), "Good Jobs versus Bad Jobs." *Journal of Labor Economics*, Vol.19, pp. 1-21.

Alvarez, Fernando, and Marcelo Veracierto (2012), "Fixed-term Employment Contracts in an Equilibrium Search Model." *Journal of Economic Theory*, Vol. 147(5), pp. 1725-1753.

Blanchard, Olivier , and Jean Tirole (2008), "The Joint Design of Unemployment Insurance and Employment Protection: A First Pass." *Journal of the European Economic Association*, Vol. 6(1), pp. 45-77.

Boeri, Tito; Pietro Garibaldi, and Espen Moen (2014), "Financial Constraints in Search Equilibrium."CEPR Discussion Paper 10266.

Emerson, Michael (1988), "Regulation or Deregulation of the Labour Market: Policy Regimes for the Recruitment and Dismissal of Employees in Industrialised Countries." *European Economic Review*, Vol. 32(4), pp. 775-817.

Frenk, Myrthe (2013), "*Job Security in the Netherlands.*"Maastricht University Press.

Fuchs, Wliliam and Andrzei Skrzypacz (2013) "Bargaining with Deadlines and Private Information " *American Economic Journal: Microeconomics*, Vol. 5(4): 219-243.

Gáldon-Sánchez, José E., and Maia Güell (2003), "Dismissal Conflicts and Unemployment." *European Economic Review*, Vol. 47, pp. 323-335.

Garibaldi, Pietro (1998), "Job Flow Dynamics and Firing Restrictions." *European Economic Review*, Vol. 42(2), pp. 245-275.

Garibaldi, Pietro, and Giovanni L. Violante (2005), "The Employment Effects of Severance Payments with Wage Rigidities." *Economic Journal*, Vol. 115, pp. 799-832.

Ichino, Andrea; Michele Polo, and Enrico Rettore (2003), "Are Judges Biased by Labor Market Conditions?" *European Economic Review*, Vol. 47(5), pp. 913-944.

Jacobs, Antoine T.J.M. (2004), "Part I. The Individual Employment Relationship and Labour Market Regulation."In Roger Blanpain (Ed.): *International Encyclopaedia for Labour Law and Industrial Relations, Netherlands.* Kluwer Publishers.

Kennan, John (1986), "The Economics of Strikes."In: Orley C. Ashenfelter and Richard Layard (Eds.) *Handbook of Labor Economics*, Vol. II, Chapter 19, pp. 1091-1137.

Koopmans, Tjalling C. (1947), "Measurement Without Theory." *The Review of Economics and Statistics*, Vol. 49(3), pp. 161-172.

Lazear, Edward P. (1990), "Job Security Provisions and Employment." *The Quarterly Journal of Economics*, Vol. 105(3), pp. 699-726.

Millard, Stephen P., and Dale T. Mortensen (1997), "The Unemployment and Welfare Effects of Labor Market Policies: A Comparison of the USA and the UK."In Dennis J. Snower and Guillermo de la Dehesa (Eds.): *Unemployment Policy: Government Options for the Labour Market*. Cambridge University Press.

Pfann, Gerard A. (2006), "Downsizing and Heterogeneous Firing Costs." *The Review of Economics and Statistics*, Vol. 88, pp. 158 - 170.

Ross, Sheldon M. (2002). "*Introduction to Probability Models*. Academic Press.

Saint-Paul, Gilles (1993). "On the Political Economy of Labor Market Flexibility, "NBER Chapters, in: *NBER Macroeconomics Annual 1993*, Volume 8, pages 151-196 National Bureau of Economic Research, Inc.

Appendix 1: Data Availability and Confidentiality

Aggregate data for Figure 2 and the STATA programs used to create the final results will be made available for publication in the journal's online data-base.

Non-Disclosure Agreements

For security and privacy reasons, in the Netherlands the Civil Court does not store employers' and employees' information electronically. The Public Employment Service does this only in part. Most information on dismissal disputes is kept in hard copy files stored in archives at the local courts and at the PES central data storage in the city of Almere. To protect confidential information and due to the privacy rights of employers and employees involved, access to the documentation centres to collect data from the paper files has been allowed under strict non-disclosure agreements between the Netherlands Supreme Court and the Public Employment Service on the one hand, and Gerard Pfann and Myrthe Frenk on the other hand. Clear and precise documentation on how the micro-data on dismissal dispute cases have been collected is presented in Chapter 3 of Frenk (2013), which is available online through open-source at:

http://digitalarchive.maastrichtuniversity.nl/fedora/get/guid:6d70a3f3-d4eb-48b5-8536-840248787e70/ASSET1.

In order to comply with the journal's requirements of availability of the confidential micro-data used in this paper, any researcher who wishes to use these data for purposes of replication or otherwise need to address a request of the data usage to the Ministry of Economic Affairs through the Public Employment Service (*Uitvoeringsinstituut Werknemersverzekeringen - UWV*) and to the Netherlands Supreme Court (*Hoge Raad der Nederlanden*).

Gerard Pfann will provide help and advice regarding the correspondence with the Netherlands Supreme Court and the PES, and − when the requests of data usage have been granted − with making the data readily available on site at Maastricht University.

Appendix 2: Theoretical Annex

The equilibrium exists and it is unique.

Proof. Using the fact that $\tilde{z} = rU(\theta)$ and $z^{ct} = rU - \frac{s^{ct}F(r+\delta+s^{pes})}{s^{ct}-s^{pes}}$, equation 13 becomes an equatiion in θ

$$\frac{c(r+\lambda+\delta)}{q(\theta)} = (\overline{x}+\overline{y})(1-\beta)-\beta c\theta+\lambda(1-\beta)\int_{rU(\theta)}^{z^u}(1-F_{X+Y}(m))dm-\lambda(1+\beta)S^{ct}(\theta,z^{ct})-\lambda(1+\beta)S^{pes}(\theta,z^{ct},\tilde{z})$$

The left hand side is increasing in θ since $q\prime(\theta) < 0$. Differentiating the r.h.s with respect to θ yields

$$\frac{\partial J}{\partial \theta} = -\beta c - \lambda(1-F_{X+Y}(rU(\theta))\frac{\partial rU}{\partial \theta} - \frac{\lambda(1+\beta)}{r+\lambda+\delta+s^{pes}}\left[F_{X+Y}(rU^{ct}) - F_{X+Y}(z^{ct})\right]\frac{\partial rU}{\partial \theta}$$

$$-\frac{\lambda(1+\beta)}{r+\lambda+\delta+s^{ct}}F_{X+Y}(z^{ct}(\theta))\frac{\partial rU}{\partial \theta} < 0$$

where the negative slope depends on the fact that $rU = b + c\theta\frac{\beta}{1-\beta}$ so that $\frac{\partial rU}{\partial \theta} > 0$

Balance Flow Conditions

To obtain the balance flow we need some accounting and definitions. Let's say that the total number of jobs is n, a variable that will be endogenous in general equilibrium. It is true that

$$n = n^g + n^{pes} + n^{ct}$$

where n^g, n^{pes} and n^{ct} are the number of jobs in good conditions, in PES procedure and in court ruling. The measure of jobs that is seeking a permision to fire is

$$\text{Total jobs willing to separate} = \lambda F_{X+Y}(\tilde{z})n^g$$

where F_{X+Y} is the convolution of X and Y and $\tilde{z} = \tilde{x} + \tilde{y}$ is the marginal good job of equation (8). Similarly, the applications to the court are

$$\text{Applications to Court permissions} = \lambda F_{X+Y}(z^{ct})n^g$$

where z^{ct} is the marginal court job. Finally, the applications to the PES offices are

$$\text{Applications to PES permissions} = \lambda(F_{X+Y}(\tilde{z}-z^{ct}))n^g$$

The unemployment flow condition is $\theta q(\theta)u = s^{pes}n^{pes} + s^{ct}n^{ct}$, while the balance flows in the two intitutions are respectively governed by

$$\lambda F_{X+Y}(z^{ct})n^g = s^{ct}n^{ct}$$

and

$$\lambda(F_{X+Y}(\tilde{z}-z^{ct}))n^g = s^{pes}n^{pes}.$$

TABLES

Table 1: Sorting By Reasons for Dismissal Requests

Reasons:	*Worker Dominant* $x < 0$ *and* $y > 0$	*Firm Dominant* $x > 0$ *and* $y < 0$	*Both-to-blame* $x < 0$ *and* $y < 0$	*All Reasons*
COURT				
# of obs.	**77**	**242**	**710**	**1,029**
% of COURT obs.	7.5	23.5	69.0	100.0
% of ALL obs.	*3.5*	*11.0*	*32.4*	*47.0*
PES				
# of obs.	**309**	**843**	**10**	**1,162**
% of PES obs.	26.6	72.5	0.9	100.0
% of ALL obs.	*14.1*	*38.5*	*0.5*	*53.0*
COURT & PES				
# of obs.	**386**	**1,085**	**720**	**2,191**
% of ALL obs.	*17.6*	*49.5*	*32.9*	*100.0*

Notes: Worker dominant reasons for requesting a dismissal include absence from work due to long-term sickness; disciplinary reasons related to conduct, ability or capability, and other substantial reasons; *Firm* dominant reasons include redundancy, relocation or reorganization; *Both-to-blame* reasons contain those cases where it is doubtful which party is responsible most for making the separation compulsory. These include fairness issues, disputes and other disturbed relationships between an employee and an employer.

Table 2: Summary Statistics of Dismissal Requests During The Period 2006 - 2009

COURT # obs: 1,029	Duration (in days)	Tenure (in years)	Age (in years)	Gender (♀ = 0; ♂ = 1)	Hourly wage (in 2006 €)	Hours worked
mean	11.17	9.84	42.20	.63	16.23	33.55
st.dev.	19.28	9.60	10.01	.48	8.49	7.78
1% percentile	0	.30	22	0	7.53	8.00
50% percentile	3	6.45	42	1	13.91	36.10
99% percentile	76	40.35	62	1	47.42	42.99
PES # obs: 1,162	Duration (in days)	Tenure (in years)	Age (in years)	Gender (♀ = 0; ♂ = 1)	Hourly wage (in 2006 €)	Hours worked
mean	42.20	10.82	44.45	.60	13.46	31.79
st.dev.	32.52	8.77	10.11	.49	5.22	9.85
1% percentile	1	.31	22	0	7.82	5.24
50% percentile	36	7.79	45	1	12.35	36.41
99% percentile	167	36.52	63	1	32.18	40.67
mean difference	-31.03	-.99	-2.24	.03	2.77	1.77
$t-test^{\dagger}$	-27.52	-2.50	-5.21	1.60	9.08	4.69
$p-value$	*.00*	*.01*	*.00*	*.11*	*.00*	*.00*

†Two-sample *t-test* with unequal variances.

Notes: Duration is defined as the time in days that passes between the submission of a permanent contract termination request and the final ruling; tenure is the time that a worker is employed measured in years at the moment of request submission; age of a worker is measured in years at the moment of request submission; hourly wage is the contract wage per hour worked measured in 2006 € at the time of request submission excl. bonuses, holiday payments, and other fees. Hours worked is contract working hours per week

Table 3: Duration Differences By Reasons for Dismissal Requests

Reasons:	*Worker Dominant* $x < 0$ *and* $y > 0$	*Firm Dominant* $x > 0$ *and* $y < 0$	*Both-to-blame* $x < 0$ *and* $y < 0$
COURT	33.23	10.39	9.04
(*st.dev.*)	(*3.93*)	(*1.19*)	(*.58*)
PES	57.78	36.44	46.40
(*st.dev.*)	(*2.91*)	(*.67*)	(*7.98*)
Difference	-24.55	-26.05	-37.36
p-value[†]	*.00*	*.00*	*.00*

[†]Two-sample *t-test* with unequal variances.

Table 4: OLS Estimates of Procedural Duration

	Dependent Variable: Procedural Duration in Days	
	Baseline Model	Extended Model
Constant	9.04***	-13.55*
	(*.972*)	(*8.09*)
X ($x > 0$)	1.35	.745
	(*1.93*)	(*1.95*)
Y ($y > 0$)	24.18***	24.09***
	(*3.11*)	(*3.12*)
PES	26.05***	25.48***
	(*1.89*)	(*1.99*)
PES*Y	-1.50	-.959
	(*3.80*)	(*3.86*)
Worker characteristics[1]	No	
Age		.036
		(*.065*)
Tenure		.085
		(*.072*)
Male		-1.47
		(*1.47*)
Hours		.177**
		(*.083*)
Wage		.172**
		(*.088*)
Firm characteristics[2]	No	
Small : (< 10 empl.)		1.109
		(*1.80*)
Medium: ([10; 100] empl.)		2.277*
		(*1.39*)
Industry dummies	No	Yes
Monthly unemployment rate[3]	No	Yes
# of obs.	2181	2181
R^2	.313	.326

Notes: Robust standard errors are reported in parentheses. $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$. Process duration is defined as the time in days that passes between the submission of a permanent contract termination request and the final ruling. [1]Tenure is the time that a worker is employed measured in years at the moment of request submission; Age of a worker is measured in years at the moment of request submission; Wage is the contract wage per hour worked measured in 2006 € at the time of request submission excl. bonuses, holiday payments, and other fees. Hours worked is contract working hours per week. [2] Reference category is large firms with more than 100 employees. [3]The monthly unemployment rate is a business cycle indicator for the Netherlands' economy. The 10 observations for PES with x>0 and y<0 are not included in the regression.

Table 5: Institutional Biases

	Dependent Variable: Process Duration in Days
Constant	-2.05
	(*9.05*)
X ($x > 0$)	1.08
	(*1.95*)
Y ($y > 0$)	23.38***
	(*3.10*)
PES	5.01
	(*7.50*)
PES*Y	.717
	(*3.81*)
Interaction effects	
PES*Age	-.184
	(*.129*)
PES*Tenure	.135
	(*.137*)
PES*Male	-9.68***
	(*2.91*)
PES*Hours	.646***
	(*.167*)
PES*Wage	.810***
	(*.188*)
Worker characteristics	Yes
Firm characteristics	Yes
Monthly unemployment rate	Yes
# of obs.	2181
R^2	.339

Notes: Robust standard errors are reported in parentheses. $^{*}p < .10$, $^{**}p < .05$, $^{***}p < .01$. Process duration is defined as the time in days that passes between the submission of a permanent contract termination request and the final ruling. The 10 observations for PES with x>0 and y<0 are not included in the regression.

Table 6: Firing Costs Differences Between Court and PES Procedural Outcomes

COURT # obs: 1,029	Court fee	Wage costs during process	Wage costs until job ends	Severance payments	Total avg. firing costs
mean	102	765	3,496	26,619	30,982
median	104	216	2,213	10,159	13,708
st.dev.	7	1,791	4,315	52,370	54,808

PES # obs: 1,162	Wage costs during process	Wage costs until time to notice	Wage costs notice period	Total avg. firing costs
mean	2,964	787	3,728	7,480
median	2,347	583	2,458	6,054
st.dev.	3.098	685	3,102	5,648

Notes:
This table shows the composition of firing costs during the lay-off procedure. The duration time can be divided into the procedural time, the time to notice, and the period of notice. The procedural time is the time between submission and the pronouncement.The time to notice is the period between the pronouncement and the start of the notice period.The notice period is defined by the employees years of tenure, and equals 1 month for tenure less than 5 years, 2 months for tenure less than 10 years, 3 months for tenure less than 15 years, and 4 months for tenure of 15 years or longer. Costs are in 2006 €.