Entrepreneurial Activity and Aggregate Employment Performance: Theory and OECD Evidence

Paloma Lopez-Garcia

PhD Thesis, Department of Economics
London School of Economics and Political Science
University of London

ProQuest LLC
789 East Eisenhower Parkway
P.O. Box 1346
Ann Arbor, MI 48106-1346

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1 Introduction

1.1 Earlier studies

The term "entrepreneur," of french origin, appeared first in the writings of Richard Cantillon, a banker of Irish extraction who made fortune in Paris at the beginning of the 18th century. Cantillon saw the entrepreneur as someone with the foresight an willingness to assume risks and to take actions required to make profits. It was precisely that continuous search for profit opportunities what, according to Cantillon, turned the entrepreneur into the equilibrium force in the market.

Adam Smith failed to single out entrepreneurs from what he called in his master work the "industrious people." A later economist, Jeremy Bentham, criticised Smith's laws against usury as discriminating against entrepreneurs undertaking new projects. Bentham argued in his *Defence of Usury*, published in 1789, that new projects were characterised by their riskyness. Therefore, the ceilings imposed upon interest rates by law were difficulting the access to finance of such projects and, therefore, the activity of entrepreneurs.[1]

Frank Knight and Joseph Schumpeter are perhaps the two economists who, already in the 20th century, have made the most valuable contribution to the field of entrepreneurship by defining the role of the entrepreneur within the economic system. Although their points of view about who the entrepreneur is differed, their work was specially important because it placed the entrepreneur at centre stage.

Frank Knight [1921] emphasised the role of the entrepreneur as the bearer of true uncertainty. He distinguished between insurable risks and uninsurable uncertainty. Risks are characterised by a known probability distribution. Uncertainty, on the other hand, is due to outcomes that can be listed but for whom the attached probability is not known. This distinction helps to sort entrepreneurs, as the

[1] For a comprehensive history of entrepreneurship, please refer to the work of Hébert and Link [1982].

ultimate bearers of uninsurable uncertainty, from managers:

> The only risk which leads to entrepreneurial profit is a unique uncertainty resulting from an exercise of ultimate responsibility which in its very nature cannot be insured nor capitalised nor salaried. (Knight 1921, page 310).

Joseph Schumpeter was probably the first economist who put forward that, far from being an equilibrating force in the market after a shock, entrepreneurial activity was the origin of the shock. Schumpeter's starting point is a circular flow: an unchanging economic process which flows on at constant rates in time and merely reproduces itself. In this stationary economy the entrepreneur does not exist. Only managers carrying out input-output calculations have a role to play. In a moment of time, a "revolutionary change" takes place. That change is manifested by the pursue of *new combinations of the factor of production* which, according to Schumpeter, represented an innovation: "if instead of quantities of factors, we vary the form of the production function, we have an innovation" (Hébert and Link 1982, page 78). The individuals whose function was to carry the innovations were called entrepreneurs.

The innovation process was seen by Schumpeter as the precursor of development; the force behind development were the entrepreneurs. He was quite alone in his claim. Since the mid-1930s, the orthodox economic theory had removed the entrepreneur from its explanatory structure. According to Barreto [1989], one reason for this can be found in the development of the modern theory of the firm, best described as a movement toward the integration of the isoquant, output and factor market sides into a cohesive model. The integration of all the three sides required a set of assumptions that effectively excluded the entrepreneurial role.

The three main postulates of the theory were: (1) the existence of a production

function, which gave the firm complete understanding of all the input-output possibilities; (2) rational choice by which the firm rationally pursued its objectives, namely, profit maximisation; and finally, (3) perfect information which meant that each firm was aware of all considerations affecting its decisions. Given these assumptions, it is easy to understand that the role of the entrepreneur as innovator, uncertainty-bearer, coordinator and arbitrageur was effectively removed from the theory.

1.2 The re-emergence of entrepreneurship

The removal of the entrepreneur from the economic analysis was consistent with the conviction of economists that large firms, where the entrepreneurial role is diluted, were the cornerstone of the economic and employment growth. However, since some twenty years, the centre-stage of the economic debate has slowly shifted towards the small business sector, where entrepreneurs and entrepreneurship, understood as the creation and growth of new firms, are at the centre of interest.

This is exemplified in the founding of the Small Business Administration in USA and the launch of the European Commission reports on the status and contributions of European SMEs. It is particularly noteworthy that the OECD Jobs Study [1994] suggested the need of a business climate conducive to encouraging business start-ups, since this was considered an important source of job creation. This suggestion was further emphasised in the 1998 OECD manuscript entitled "Fostering Entrepreneurship". The European Commission issued similar recommendations in its 1998 Action Plan for Employment.

This surge of interest in small business economics and entrepreneurship, particularly among policy-makers, during the 1980s can be largely attributed to two simultaneous and related events: the well-documented shift in economic activity away from large firms to small, predominantly young, enterprises during the 1970s and 1980s; and

David Birch's revolutionary finding that small businesses create a disproportionately large share of new jobs.

1.2.1 The increasing economic importance of small firms

There is ample evidence that economic activity moved away from large firms in the 70s and 80s. The most impressive and cited of it is the drop in the share of the 500 largest American firms (Fortune 500) in employment: from 20% in 1970 to 8.5% in 1996. Table 1, taken from Acs and Audretsch [1993], shows the small firms share of manufacturing employment and its shift over time across a selection of countries (small firms are defined a bit broadly: those with 500 employees or less). The numbers do not reflect the real shift since they show only what has happened in the manufacturing sector, where the average firm size is larger than that in the service sector.

Country	Year	Small firm emp. share	Year	Small firm emp. share	Change
UK	1979	30.1	1986	39.9	+9.8
W.Germany	1970	54.8	1987	57.9	+3.1
USA	1976	33.4	1987	35.2	+1.9
Netherlands	1978	36.1	1986	39.9	+3.8
Italy	1981	52.8	1987	61.8	+9
Portugal	1982	68.3	1986	71.8	+3.5
Netherlands refers to firms with 100 or less employees and Italy to firms with 200 or less Source: Acs and Audretsch [1993], Table 12.1					

Table 1: Small firm share of manufacturing employment

In all countries, without exception, small firms' share of employment has increased over the past decades. What is not so clear is why this shift has taken place. Early works like Carlsson [1992] or Acs [1992] explain it as the result of three major changes in the world economy since the early 1970s. The first one is the intensified

global competition, mainly from low-cost Eastern Europe and Asian countries, resulting from the development in transportation, information and communication technologies. Some firms have responded to this increase in competition shifting production out of high-cost locations to low-cost ones, which can explain the wave of corporate downsizing of the last two decades. Besides, technological changes, such as those that have decreased computer costs, have reduced optimal firm size and the minimum scale of entry.

The second major change has been the increase in the degree of uncertainty, reflected in a significant growth slowdown in all industrial countries triggered by the oil price shocks of the 1970s and exarcebated by the volatility of exchange rates. Piore and Sable [1984] and Brock and Evans [1990] claim that the instability of markets has resulted in the demise of mass production and has promoted flexible production, a comparative advantage of small firms over their large counterparts. Flexible production has also been a crucial advantage of small firms given the third major economic change, namely, the intensified market fragmentation due to growing consumer demand for differentiated products.

More recently, Audretsch [1995], Audretsch and Thurik [2001] and Acs and Audretsch [2001] have suggested that increased globalization and the technological revolution have shifted the comparative advantage towards a knowledge-based economic activity. In such economy, the focus is on the individual as possessor of knowledge rather than on the firm. It is argued that asymmetric information and uncertainty about the future value of the knowledge result in its different valuation by firm and individual. This situation can lead to the departure of the individual from the incumbent firm in order to launch a new firm where her knowledge can be commercialized. That is, entrepreneurship is taking a new importance because it serves as a key mechanism by which knowledge created in one organization (such as a university or an incumbent firm) becomes commercialized in a new firm.

While the causes of the shift of economic activity to small businesses are not very clear, its consequences are. As Acs [1992] puts it, small businesses turn to be agents of change, source of innovative activity and stimulation of industry evolution and, therefore, the source of an important share of newly generated jobs.

1.2.2 The contribution to employment growth of small firms: Birch's revolutionary findings

Prior to 1979, labour economists had analysed published labour statistics for many years and consistently found that most new jobs were created by firms in the largest size classes. The analysis was done by counting the number of jobs in each size class in the current time period and subtracting the number of jobs in the same size class in a previous period. The assumption behind this methodology was that inter-class movement of firms was negligible.

In the mid-1970s David Birch, a young MIT researcher, received a grant from the Economic Development Administration to study how the movement of firms across state boundaries affected employment growth. Birch created a new database from the Dun & Bradstreet records of firms attempting to establish credit with other firms or seeking credit information. He classified firms according to their size and location in the base year, 1969, and measured its individual location and employment behaviour in each succeeding wave of data (four in total) until 1976. The database contained around 80% of all establishments, although the very small and/or young firms were under-represented due to the firm registration criteria. Using this new database, Birch found and reported in 1979 that inter-state movements of firms were not contributing to overall employment change; and that around 80% of net new jobs were created by firms with 100 employees or less (Birch 1979: The Job Generation Process. The main results are also in Birch 1981).

Birch's claim that 8 out of 10 net new jobs were created by small firms prompted the interest of policy-makers who, in the high unemployment days of the early 80s, were interested in new methods for reducing unemployment. In the academic world, Birch' findings where revolutionary at the time. They implied that inter-class movements (small firms growing until they are classified as large firms) were a major factor in determining overall employment growth. Birch also discovered that the rates of job losses across regions were pretty similar. Differences in the net employment change were due to differences in the job gain rates. In other words, rapidly growing areas were replacing lost jobs at 2 or 3 times the rate of the declining ones. More importantly, about 80% of the replacement jobs were created by establishments that were four years or younger. In Birch's words:

> not all small businesses are job creators. The job creators are the relatively few younger ones that start-up and expand rapidly in their youth, outgrowing the "small" designation in the process (Birch 1981, page 8).

Consequently, Birch recommended "changing the regulating environment in ways that the entrepreneurs find attractive." The release of Birch's challenging results and policy recommendations prompted the US Small Business Administration (SBA) to build its own database to test Birch's results and further develop them. The SBA database had data on a representative sample of firms measured at two-year intervals from 1976 to 1990. The first research paper analysing the new database was that of Armington and Odler [1982]. Applying Birch's methodology for the period 1978-1980, they estimated the small firms contribution to net new employment to be around 36%, very far from the sensational 80% found by Birch.

Subsequent research undertaken by Armington and Birch himself uncovered the relationship between the business cycle and the job generation process.[2] They

[2]See Birch [1987].

showed that the share of net job creation of small firms decreased during economic expansions and increased during recessions. The reason was the volatility of large firms' job creation: large firms tend to increase employment in the late stages of expansions and to decrease it in the recessions. The net job creation of small firms is on the contrary quite constant, but their share in total net new jobs changes with the large firms' employment fluctuations. This could explain Armington and Odle [1982] findings since their period of analysis corresponded to the late stages of an expansion. However, the publication of this late explanation of their findings received much less attention than their original ones, therefore casting doubts as to whether or not small firms really were responsible for the bulk of net new jobs.

In 1990, Brown, Hamilton and Medoff published a book entitled "Employers Large and Small" analysing the quality as well as the quantity of jobs created by small firms, when compared to those of large firms. They concluded that:

> *existing* small firms do not grow faster than large ones but by an accident of birth new firms happen to be born small. Since new businesses account for more than 100% of the net increase in employment, and new businesses rarely start out with 100 or more employees, it is almost inevitable that small firms will account for a disproportionate share of new employment (Brown, Hamilton and Medoff 1990, page 24).

Based on this conclusion, which is obviously hard to refute, and on the well established fact that small firms pay lower wages, lower fringe benefits and create jobs of shorter duration than large firms, Brown et al. [1990] recommended policy-makers to concentrate their efforts on the large business sector. But from our point of view, if the great job creators are the new firms and some of the new small firms of today are the large firms of tomorrow, would it not make more sense to help firm creation and survival?

The most important criticism to Birch's findings appeared in a 1996 paper by Steven Davis, John Haltiwanger and Scott Schuh entitled "Small Business and Job Creation: Dissecting the Myths and Reassessing the Facts". They based their analysis on the Longitudinal Research Database on manufacturing firms of the USA Bureau of Census. They claimed that Birch's results rested on "fallacious and misleading interpretations of the data." (Davis et al. 1996, page 10).

Davis et al. [1996] main criticism was what they called the "regression-to-the-mean bias" resulting from the fact that many firms' employment changes are transitory, or in other words, the observed gain or loss is reversed in the short-term.

Hence, at any point in time, the small business sector contains a disproportionate number of business that are less than their equilibrium size, and the large business sector has firms that are greater. Since businesses that are too small expand over time and businesses that are too large contract over time, we might get the impression that small businesses are creating most jobs. What is really happening is that most of these jobs were created by "large" firms that are "temporarily small."

To avoid the bias, Davis et al. [1996] proposed a new method called the "current average size" which took the average size of the firm over a certain period of time (they did it from one firm census to the next, i.e. every five years). With this method, the regression-to-the-mean bias is dampened but a new problem emerges, namely, the outcome variable (employment growth) influences the classification variable (firm size). Therefore there is a tendency for growing firms to be classified as large and for declining ones as small.

Picot, Baldwin and Dupuy [1994] have performed an exhaustive analysis of the small firm job creation using a longitudinal file of Canadian companies from all sectors between 1978 and 1992. They have tried different methodologies to compute job creation and have concluded that methodology matters to the quantitative

results, but not to the qualitative ones: small firms seem to contribute disproportionally to net employment growth.

Picot et al. [1994] acknowledge that some service sectors are experiencing a rapid employment growth which, combined with an above-average share of small firms, could contribute to the view that small firms are dominating employment growth. To test whether this is the case, they perform a simple decomposition exercise and conclude that about one-quarter of the observed change in the distribution of employment by size class is due to an industry effect (i.e., to the shift to industries that are more small-firm intensive).

Another important contribution of the Picot et al. paper is the estimation of the contribution of firm birth to the total small firm sector job creation. They calculate that the employment growth between 1981 and 1984 of Canadian firms already existing in 1981 was of -14% in the group of very small firms, with 20 or less employees, and of -11% in the group of large firms. If the birth of new firms and their contribution to employment growth is added, the employment change among the very small firms is 12% and that among large ones -9%. This results are robust along time. Although Picot et al. [1994] reach a similar conclusion to that of Brown, Hamilton and Medoff [1990], their policy recommendations are not quite the same:

> The results for existing small and large firms are not that dissimilar. It is the fact that new firms tend to be small that makes the difference. This is important when considering policies which are oriented towards existing firms, or the creation of new firms (Picot, Baldwin and Dupuy 1994, page 18).

Methodologies similar to Birch's have been used in the European context to find similar results, see Gallagher and Stewart [1986] and Storey and Johnson [1987]

for the UK, Heshmati [2001] for Sweden, Hohti [2000] for Finland, and Broesma and Gautier [1997] for the Netherlands. Although the evidence was less robust in Germany, recent empirical studies suggest that the job creation potential of small firms is increasing; see for example Haid and Weigand [1998] for a study on the employment generation of family-owned businesses.

In conclusion, the evidence indicates that in the last two decades economic activity has shifted from large to small businesses, where the entrepreneurial phenomenon is most important. One of the results of that shift is the increasing contribution of small firms to job creation. Within the small firm sector, the main source of employment is the group of *new* firms that are born small, but grow rapidly to become large firms.

The fact that they are the main job creators is what makes the analysis of the impact of firm creation upon the macroeconomic performance of a country necessary. That is precisely the objective of this thesis.

1.3 Definition and measurement

Entrepreneurship is a multidimensional concept. Therefore it is difficult to define since its definition will depend on the field of research. The 1998 OECD report on entrepreneurship proposes to group all definitions into the following two broad categories:

- Entrepreneurship as the description of the creation and growth of new and small businesses;
- Entrepreneurship as the description of a more general characteristic, denoting the willingness to take risks, to be innovative and to take initiatives to exploit business opportunities.

We are interested in the aggregate employment performance of a country. Therefore, we will focus on the first category or definition of entrepreneurship: the process of firm creation and growth. But it is important to note that, from a theoretical point of view, firm creation is modelled as the result of the occupational choice of an individual who decides to become self-employed, starting a new business, instead of becoming an employee in an existing firm. That choice depends ultimately on how "entrepreneurial" the individual is, that is, on the individual attitude towards risk, entrepreneurial ability and so on. Hence, although we are interested in the *macro* consequences of firm creation, we have to look at the individual or *micro* level to study the process by which a new firm is created.

The lack of consensus upon the definition and the only very recent surge of interest on the topic makes it difficult to find consistent data on entrepreneurial activity. Indicators such as the self-employment rate or the number of small and medium firms have been commonly used in the entrepreneurship literature. The OECD/ILO defines self-employment, as "persons who during the reference period performed some work for profit or family gain, in cash or in kind." Employers, persons working on own account, unpaid family workers, and members of producers' co-operatives are all counted as self-employed. If we exclude the agricultural sector, only the first two groups are of some importance for most OECD countries. The most borderline definition case is that of the manager of an incorporated business who either owns the business or holds a majority of the shares. In USA, Canada or Japan they are usually treated as employees while in most of the rest of OECD countries they are included in the self-employment count.

The EIM group in the Netherlands, responsible for the Observatory of European SMEs, has constructed the most comprehensive database of business owners building upon the OECD data. It is referred to as "Comparative Entrepreneurship Data for International Analysis." The data shows the number of self-employed, with

or without employees, as a percentage of the labour force. It includes both incorporated and unincorporated businesses, but excludes unpaid family workers and wage earners operating a side-business as a secondary work activity. It also excludes business owners in the agriculture sector.

Yet entrepreneurship, as indicated above, is a dynamic concept; it refers to the creation and growth of firms. Business ownership rates might not approximate correctly that dynamic process. The cases of Spain and Italy appear perfect examples of that. As it can be seen in table 2 below, in spite of having the highest business ownership rates among OECD countries, both countries show below-average firm start-up rates. Most importantly, they both have a low percentage of new firms that intend to grow. One reason can be found in Scarpetta et al. [2002] who, building on a recent OECD database on firm dynamic, institutions and productivity, conclude that existing institutions contribute to the higher business churning in the United States, as compared to Europe. In the United States, there seems to be more trial-and-error (births and deaths) which could explain that surviving firms start in average with less employees but grow much faster than in Europe.

Indicators such as start-up activity, net entry rate or turbulence rate come closer to the idea we have of the entrepreneurial process. Some efforts to collect international longitudinal data sets have been undertaken by Eurostat, in co-operation with national statistical institutes and DG XXIII. Some years ago they launched a periodical study, "Business Demography in Europe," with the aim of improving the information available on entry and exits of firms. But the data are not harmonised since they come from different national institutions such as VAT statistics, business registers or commercial chambers, which have different criteria to count firm entries and exits. Therefore, cross-country comparisons have to be done with a lot of caution.

Perhaps the best source of cross-country data on start-up activity is the Global Entrepreneurship Monitor (GEM), an international initiative led by the London Business School and Babson College. The GEM draws from an extensive population survey carried out simultaneously in different countries. The project started in 1999 with 10 countries, expanded to 29 in 2001 and counted on 37 countries in its last published study, in 2002.

There are two measures of entrepreneurial activity. The narrower one is the estimated percentage of the adult population involved in the process of starting a new business at the moment of the interview (start-ups). A start-up is counted when the respondent declares that (1) she/he alone or with others has already undertaken some steps towards the creation of a new business, (2) the respondent will be the owner or co-owner of the new business and (3), the business has not generated any income yet. The last criterium is to distinguish between start-ups and very young businesses.

There is a broader measure of entrepreneurial activity, called Total Entrepreneurial Activity or TEA, which includes those involved in the start-up process and the owners of very young businesses (of less than 42 months). Table 2 shows the TEA and start-up prevalence rates for 2002 for most of the OECD countries. The table also shows the percentage of adults starting a business with clear growth intentions (intending to create 20 or more jobs over the course of 5 years). For the sake of comparison we also include the business ownership rates for 1998 taken from the EIM studies.

Country	Start-ups 02	TEA 02	High-growth SUps 02	B.Ownership rate 98
Australia	3.8	8.7	1.5	15.5
Belgium	2.1	3.0	0.5	11.9
Canada	5.9	8.8	1.8	14.1
Denmark	3.6	6.5	1.1	6.4
Finland	2.7	4.5	0.7	8.2
France	2.4	3.2	0.5	8.5
Germany	3.5	5.2	1.4	8.5
Iceland	5.6	11.3	3.9	13.2
Ireland	5.6	9.1	1.3	11.2
Italy	3.7	5.9	1.6	18.2
Japan	0.9	1.8	0.3	10.0
N.Zealand	9.1	14.0	2.3	14.2
Netherlands	2.6	4.6	1.0	10.4
Norway	5.2	8.7	0.9	7.1
Spain	2.2	4.6	0.7	13.0
Sweden	1.8	4.0	0.6	8.2
Switzerland	4.4	7.1	1.1	9.1
UK	2.5	5.4	1.3	10.9
US	7.1	10.5	2.2	10.3
Average	*3.9*	*6.7*	*1.3*	*10.9*

Notes: Start-up rate is the % of adult population in the process of starting a business. TEA is the % of the adult population starting up or owner of a young business (GEM 2002). Business ownership is the % of the labour force who owns a business (EIM).

Table 2: Entrepreneurship measures

Although, as can be seen in Table 2, start-up rates vary widely across countries, the country ranking has remained relatively stable since the first GEM report in 1999. This stability suggests, along the lines of Scarpetta el at. [2002], that, irrespective of the moment of the cycle or international economic framework, entrepreneurial activity responds to the institutional framework of the country in which the entrepreneurs operate.

1.4 The contribution of this thesis: entrepreneurial activity and employment

We have tried to convince the reader about the importance of the entrepreneurship phenomenon in explaining the aggregate employment performance of the country. Policy-makers can affect employment, and unemployment, by issuing policies able to foster entrepreneurship. That conclusion rises new questions and broadens the debate on the causes of unemployment. This thesis aims to contribute to that incipient discussion. It does so by examining, from an empirical and theoretical point of view, different aspects of the firm creation process, and their impact on aggregate employment performance. The recurring question to be answered in each of the three papers that constitute this thesis is: "what is the impact on aggregate employment?."

At the 18th Annual Congress of the European Economic Association, celebrated on August 2003 in Stockholm, Richard Rogerson presented a paper entitled "The European Employment and Unemployment Experience." He explained that there are two ways within the literature to explain the observed differences between the European and the US unemployment development. The old view studies the factors behind the behaviour of *unemployment*. Such factors included labour market institutions and, possibly, macroeconomic shocks. The new view studies the factors behind the evolution of *employment*.

Contrary to what it might look, both views attempt to explain different phenomena. If, as labour economists, we focus on unemployment, we should try to explain the employment loss in the industrial sector. If we focus instead on employment we should try to answer the question *why Europe has not developed a market service sector able to create as much employment as the US one.*

The special characteristics of the service sector, dominated by small entrepreneurial firms, imply that not only labour market regulations -the usual suspects- but also

barriers to entrepreneurship, such as the administrative burdens on firm creation, might play an important role.

There is very little research exploring the impact of barriers to entrepreneurship on the labour market. Fonseca, Lopez-Garcia and Pissarides [2000] and Pissarides [2003] explore the impact of the administrative burdens on firm creation on the labour market equilibrium in a matching framework. Also, Ebell and Haefke [2003] study in a theoretical model the impact of product market regulations on unemployment although the calibrated contribution of those regulations to unemployment is quite small.

The aim of the second chapter of this thesis is to complement the scarce theoretical literature on the issue by testing empirically the impact of administrative burdens on firm creation on service employment and unemployment. The idea behind the analysis is to answer the question posed by Richard Rogerson at the Stockholm conference: why has Europe not developed a market service sector able to create as much employment as the US one? And we might add, what has been the cost in terms of unemployment?

We argue that the differential productivity growth in the manufacturing and service sector has resulted in a shift of employment towards the service sector in all developed economies. That new supply of labour in the service sector has not been successfully absorbed in some countries, with the result of higher unemployment. In which countries? In those countries where institutions are not friendly to new firm creation. One of those institutions are the administrative burdens on firm creation, or start-up costs.

The chapter is a contribution to the empirical literature explaining the rise of unemployment since the 1970s in western economies by means of interactions between shocks and institutions. Using a panel of 20 OECD countries over 27 years, the chapter aims to add to the traditional explanations of unemployment

the interaction of a shock able to size the employment shift towards the service sector with the administrative burdens on firm creation.

The results appear to support the working hypotheses of the chapter: countries with higher start-up costs have significantly lower service employment, and higher unemployment. When the contribution of each institution to the predicted increase in unemployment is estimated, unemployment benefits and start-up costs emerge as the two largest contributors. On the other hand, employment protection legislation, a usual suspect, appears to have contributed in less than 1 percentage point in average to the overall increase. Hence, policies aimed at decreasing the administrative burdens on firm creation might have a sizeable impact on unemployment.

The administrative burdens on firm creation are one of many arguments entering into the individual decision to become an entrepreneur. We have argued above that the process of firm creation depends ultimately upon the individual balance of risks and rewards associated to entrepreneurship, and its comparison with the possible alternatives. Only when the expected income from entrepreneurship exceeds the expected income from the alternatives will an individual decide to start a new business. Within the economic literature, the prevalent economic framework to study this issue has been the general model of occupational choice. That model dates back at least to Knight [1921] but was more recently updated by Lucas [1978] and Jovanovic [1994], who used it to explain why firms of varying size exist, and by Kihlstrom and Laffont [1979] who incorporated risk-aversion to show that only those individuals more willing to take risks end up being entrepreneurs.

The idea of the third chapter of this thesis is similar to Kihlstrom and Laffont [1979], namely, to analyse the impact of risk-aversion upon the equilibrium supply of entrepreneurs. In contrast to them, we focus on the impact of risk-aversion on the labour market, which they assume to be competitive.

The labour market literature has been dominated so far by the assumption of

risk-neutral firms. But job creation is shifting away from large firms, where that assumption could be justified, to small entrepreneurial firms. The main function of the entrepreneur, according to Knight [1921] in his "Risk, Uncertainty and Profit", is to take decisions and bear "true" uncertainty, that is, not insurable uncertainty. It is that role of the entrepreneur, along with the increasing importance of new firms as source of jobs, what justifies the analysis in the third chapter of the impact of risk-aversion on job creation and aggregate unemployment.

In the model of chapter 3, vacancies co-exist with unemployed in a matching framework where wages are posted optimally by risk-averse firms. Firms have to decide whether to start operating -which is risky- or to invest their assets in something riskless. Risk-aversion increases equilibrium unemployment for two reinforcing reasons. First, the risk-premium associated to the gamble of starting a new business increases. Second, risk-averse firms post higher wages to reduce the risk of not finding the appropriate worker for the post, which decreases further the expected utility from entrepreneurship. Calibrations show that some kind of risk-sharing between potential entrepreneurs and public institutions could have an important effect on the labour market, decreasing both the equilibrium level of wages and unemployment.

An alternative strategy to affect the risk-reward balance associated to entrepreneurship, other than a risk-sharing scheme, is to decrease the cost of entrepreneurial failure. European respondents to the Eurobarometer identified the risk of going bankrupt as one of the most feared risks associated to entrepreneurship.[3] Hence, one possibility is to soften the bankruptcy law. The idea is that long discharge periods after bankruptcy, or some other punishment to failed entrepreneurs, prevent capable and willing individuals to exploit a business opportunity. The fourth chapter of

[3]Flash Eurobarometer 134 "Entrepreneurship". Realised by EOS Gallup Europe upon request of the European Comission (Directorate General "Enterprise"), 2000, 2001 and 2002.

the thesis uses a general equilibrium framework to analyse the impact that such a change in the bankruptcy law has on the equilibrium supply of entrepreneurs and on aggregate employment.

To start a new venture the potential entrepreneur needs some seed capital, which can only be provided by banks. Banks have imperfect information about the true probability of success of start-ups and therefore set the interest rates according to the expected probability of success of the entrepreneur. When the government softens the bankruptcy law, failure becomes less costly. Individuals who, given their entrepreneurial ability did not consider entrepreneurship an option before, might try to start their own company. Banks observe a decrease in the expected probability of success of entrepreneurs and rise their interest rates.

That negative impact of the bankruptcy law reform on the cost of finance affects not only the equilibrium number of entrepreneurs, but also the employment creation of each of them. Assuming that firm size in terms of employment depends on the capital cost, and therefore on the interest rate, we find that aggregate employment and bankruptcy cost are related "á la Laffer." Initial reductions of the cost of failure encourages entrepreneurship and increases aggregate employment. However, further reductions have a negative effect on employment because, even with more entrepreneurs in equilibrium, each of them is creating little employment.

2 Labour market performance and start-up costs: OECD evidence

Labour economists in search for policies to decrease unemployment have traditionally focused on institutions that affect the expansion of firms. But another important source of jobs, specially in service-dominated economies, is the creation of new firms. That notion has been ignored so far in the unemployment literature. In this chapter we start filling that gap. We do so by including, along the traditional explanations of unemployment, an institution able to affect firm creation, namely, the administrative burdens of firm creation.

Robert Solow once said that one of the few good ways to test analytical ideas is to see whether they can make sense of international differences in institutional structure and historical development. This chapter follows that advise, as do most of the large literature aimed at explaining the unusual and persistent increase in the unemployment rate .

In the 1970s the discussion was dominated by a shock story. Supply shocks of the 1970s and 1980s and the contractional macroeconomic policies to fight inflation were blamed for unemployment. But shocks across countries are not likely to vary enough to explain the observed differences in labour market performance. And the effect of shocks on unemployment is, in any case, temporary. Then, how can one explain the persistence on the one hand and the different unemployment experiences across countries on the other?

The focus moved to labour market institutions, ignoring shocks all together sometimes. But the "usual suspects", the unemployment insurance system, the employment protection legislation or the union power, were already in place when European unemployment was below the North-American one. There are three possible answers to that. First, labour market rigidities have become worse over

time. It is true that some institutions, as the benefit insurance system or the tax wedge, have grown consistently in most OECD countries.[4] But others such as employment protection legislation or union density have decreased in the last decade (after an initial period of increase). The second way out could be that labour market rigidities impact on labour performance with a lag. The rise of unemployment in the early 70s could be then the result of rigidities introduced in the market ten years before.

The third answer, however, is lately the most popular: labour market rigidities were not so important in the past because there were no adverse shocks. Differences in labour market outcomes must be due to differences in the way that countries respond to similar shocks, which depends ultimately on the country specific institutions. It is the interaction of shocks with institutions what can explain the persistence of the shocks and the different labour market performance evolution across economies, after being hit by similar shocks. The first economists in picking this idea up were Michael Bruno and Jeffrey Sacks in their 1985 book *The Economics of Worldwide Stagflation* where they focused on the interaction of the 1970s oil price shocks with the nature of collective bargaining.

This paper is intended to make a contribution to this line of research. The contribution is twofold. First, the impact of a general feature of developed economies that has been surprisingly neglected in the literature is analyzed, namely, the employment shift from industry and agriculture to services. The second contribution of the paper is the focus on the interaction of that shock with one important barrier to entrepreneurship, the administrative burdens on firm creation, start-up costs from now on.

The idea is that the shift of employment towards the service sector has generated

[4]By "increase" or "growth" of institutions it is meant a change that makes labour markets more "rigid" as could be an extension of the time unemployed receive benefits or an increase in the tax wedge. The opposite holds with "decrease".

a large increase in the service labour supply in all developed economies. That new supply of labour has not been successfully absorbed in countries where the high administrative burdens on new firm creation impeded potential entrepreneurs to undertake the new business opportunities. The result has been higher unemployment.

The employment shift towards the service sector is a very well documented fact. Viktor Fuchs published in 1968 his path-breaking study *The Service Economy.* Around that time, Baumol published in the American Economic Review his paper "Unbalanced Growth," where the possible causes of the wide-spread shift of labour from industry and agriculture to the service sector were laid out.[5]

Baumol sorted economic activities into two groups: technologically progressive activities in which innovations, capital accumulation and economies of scale lead to increases in labour productivity (production sector); and constant productivity activities where labour is not a mean but the end so innovation can hardly increase productivity (service sector). The increase in labour productivity in the former sector brings about an increase in wages that is then spread to the overall economy. The constant productivity sector cannot compensate the rise in wages so production costs and prices increase. There are several effects at stake. First, the labour productivity growth is generating wealth that will be spent in services and non-services. Second, the relative increase in the service prices is inducing people to substitute away from services. As long as the substitution effect is not "too large" (the service demand is price-inelastic), the overall demand for services will not decrease. To keep production in a sector with constant or decreasing productivity, labour has to be shifted from the high productivity sector.

Figure 1 shows the unweighted OECD average of manufacturing to service labour productivity and manufacturing to service price deflator. The pattern

[5]See also Baumol et al. [1985] where a third sector of "asymptocally stagnation", with a mix of progressive and stagnant inputs, was introduced. In Kongsamut et al. [2001] Baumol's unbalanced growth and Kaldor's balanced growth are reconcile.

shown, which reproduces nicely Baumol predictions, is a feature of every country in the sample.

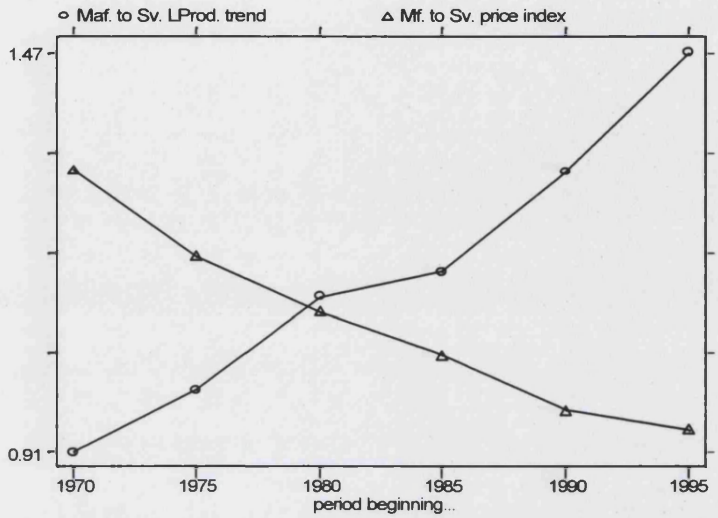


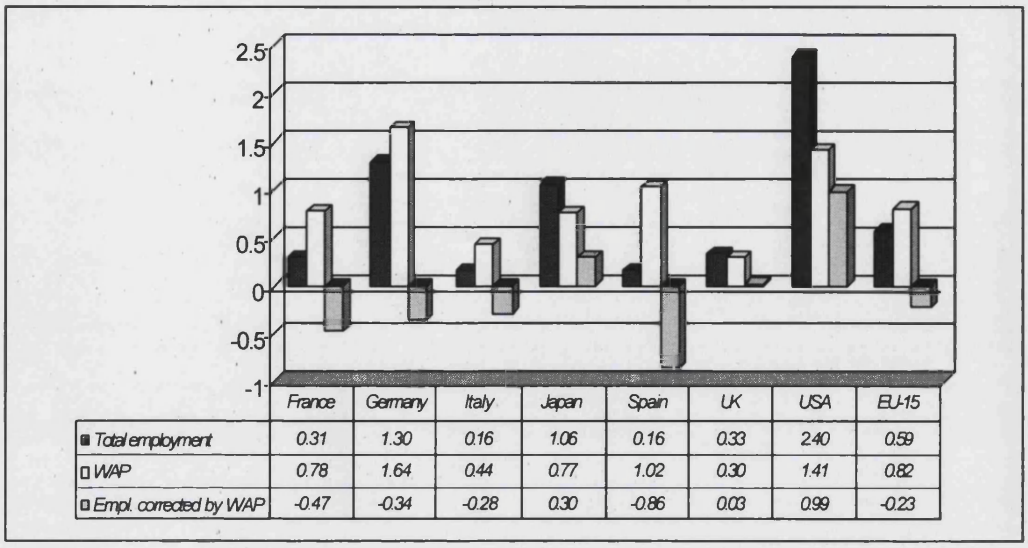
Figure 1: Manufacturing to service labour productivity and price index

Following Baumol we claim that the employment shift into services was the outcome of an exogenous shock: the slower productivity growth in services relative to non-service sectors. This approach is consistent with the arguments linking total factor productivity growth slowdown with unemployment but it emphasizes the differential productivity growth in services and the rest of the economy.[6] Rather than on the overall fall in the supply or demand of jobs, the focus is on the shift of jobs and workers from non-service to service activities.

Figure 2 shows the annualized growth from 1970 to 1997 of total employment compared to the annualized growth of working age population (WAP) in seven OECD countries and the EU average.

Only Japan, the UK and USA were able to create enough jobs to compensate for

[6]See Phelps [1994] and more recently Blanchard and Wolfers [2000]. The argument is that the slowdown in total productivity growth has not been matched with a slowdown of wages and therefore unemployment has increased.



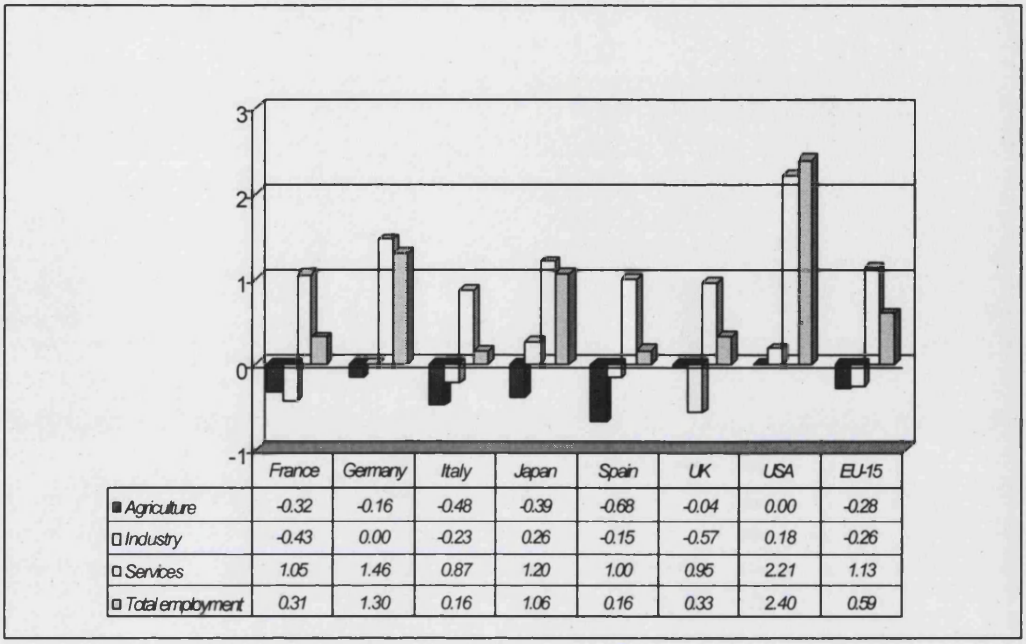
	France	Germany	Italy	Japan	Spain	UK	USA	EU-15
Total employment	0.31	1.30	0.16	1.06	0.16	0.33	2.40	0.59
WAP	0.78	1.64	0.44	0.77	1.02	0.30	1.41	0.82
Empl. corrected by WAP	-0.47	-0.34	-0.28	0.30	-0.86	0.03	0.99	-0.23

Figure 2: Employment and working age population annualised growth in %: 1970-97

the increase in working age population. Spain had an unfortunate combination of very poor employment growth and rather high increase in working age population. The question is, what is behind those differences in employment growth? Figure 3 shows the annualized contribution of each economic sector to total employment growth. The sector contributions are calculated as the annualized sector employment growth weighted by the sector's initial share of total employment.

Service employment growth accounts for most of the employment growth. The poor employment performance of Spain is the result of a very large release of workers from the agriculture, and to a lesser extent from the industry sector, along with a below average service job creation. The impressive performance of the USA is due to an incredible ability to create jobs in the service sector and of a very limited loss of employment in the non-service sectors.

The inability of the major European economies to create enough jobs to absorb the increasing supply of labour has been well documented. Krueger and Pischke [1997], for example, decompose the growth of employment between population



	France	Germany	Italy	Japan	Spain	UK	USA	EU-15
Agriculture	-0.32	-0.16	-0.48	-0.39	-0.68	-0.04	0.00	-0.28
Industry	-0.43	0.00	-0.23	0.26	-0.15	-0.57	0.18	-0.26
Services	1.05	1.46	0.87	1.20	1.00	0.95	2.21	1.13
Total employment	0.31	1.30	0.16	1.06	0.16	0.33	2.40	0.59

Figure 3: Annualised sector contribution to employment growth in %: 1970-97

growth and other reasons and show that population growth in Europe does not create jobs at the same rate as it does in USA. They go further in the paper and claim that the reason for this is not, as usually believed, Europe's wage rigidity. That explanation would imply that unemployment would have to increase most in Europe among groups whose wages have fallen most in USA. But that is not the case: the unemployment rate of the low-skilled group of workers (relative to the high-skilled one) is roughly the same in Europe and the United States. Krueger and Pischke rather suggest that the problem is the existence of restrictions on bringing new products to the market or on starting new businesses. When these restrictions are in place, the increase in labour supply is not translated into an equivalent increase in the number of employers, and unemployment results.

This brings us to the second contribution of this chapter, which is to relate the inability to create "enough" service jobs in some countries to their institutions governing firm creation and other product market regulations.

The 1994 McKinsey Global Institute report "Employment Performance" was perhaps the first study which claimed that product market regulations, as opposed to labour market regulations, were very important in explaining poor job creation in the service sector in Europe. Also in 1994, the OECD Jobs Study affirmed that "new jobs are likely to appear in the service sector, which already accounts for more than half of total employment in most OECD countries (...). New jobs must certainly be generated by the private sector, because in nearly all countries budget deficits and resistance to tax increases rule out significant expansion of the public sector (...). Efforts to improve the capacity of economies to create jobs should focus on *facilitating the development and use of technology; working time flexibility; encouragement of entrepreneurship and a general review of policies that may be hampering job creation.*"[7]

The OECD went further in this direction publishing in 1998 a monograph titled "Fostering Entrepreneurship." They also have very recently published comparable data on product market regulations (details are given in the next section) and consistent data on firm dynamics for 10 OECD countries. The paper by Scarpetta et al. [2002] is a recent application of both data-sets. In that paper the authors test the role that policy and institutional settings in product and labour markets play for productivity and firm dynamics. They find that industry productivity performance is negatively affected by strict product market regulations. The second important finding is that more cumbersome regulation on entrepreneurial activity and costs of adjusting the workforce seem to negatively affect the entry of new small firms and their posterior expansion.

We claim that countries which suffered the biggest rise in unemployment are the ones that failed to provide policies and institutions that were conductive to the employment in services. A key policy in this respect is the regulation of

[7]The italics are mine. See OECD Jobs Study [1994].

business openings. Service employment occurs on average in smaller and more decentralized establishments than manufacturing and successful new job creation in services requires the setting up of new companies.[8] Countries where starting a business is cumbersome have failed to accommodate the employment shift from manufacturing and agriculture into services, at the cost of higher unemployment.

The paper follows very closely the methodology used by Blanchard and Wolfers in their highly acknowledge paper of 2000 (that paper will be referred as B&W from now on). In that paper the authors use a panel of 20 countries to explain the evolution of unemployment in the OECD from the 1960s via the interaction of shocks and institutions. The shocks included are the decrease in annual TFP growth, the increase in long-term interest rate, and the shift in labour demand. The institutions include the unemployment insurance system, the cost of hiring and firing, wage bargaining characteristics and active labour market policies.

Taking as a starting point the B&W model, we substitute the aggregate TFP growth by the differential productivity growth in manufacturing and services, and add one institution, namely, start-up costs. The purpose is to test whether start-up costs, when interacted with the shift of employment from non-services to services, can explain the poor service employment performance and high unemployment rate of some countries.

The next section describes with some detail the data used in the estimations. Section two of the chapter explains the methodology and empirical results. Section three concludes.

[8] In 1995 the European Observatory of SMEs reported that the average service firm size in the European Union was of 5 employees, as compared to 16 employees in industry and energy. The data for United States, from the SBA, is in 1997 of 21 and 56 employees respectively. As Scarpetta et al. [2002] confirm in their paper, American entrant firms are smaller than European ones but then expand much more.

2.1 Data description

A panel data-set building on the one constructed and analyzed by B&W has been put together.[9] We drew data from B&W for unemployment, labour market institutions and shocks. Product Market Indicators from the OECD were added. The three macroeconomic shocks of B&W were complemented with a fourth shock intended to capture the sectorial shift from non-service to service activities over the last decades. An unbalanced data-set is available for 20 OECD countries along 27 years, from 1970 to 1997.[10] The countries included in the analysis are Australia, Austria, Belgium, Canada, Denmark, Finland, France, Germany, Ireland, Italy, Japan, the Netherlands, Norway, New Zealand, Portugal, Spain, Sweden, Switzerland, United Kingdom and United States.

There are three dependent variables: the unemployment rate on the one hand, and the service and manufacturing employment ratios on the other. All data come from the OECD Annual Labour Force Survey. Unemployment numbers are those gathered in the National Labour Force surveys. Service employment comprises civilian employment employed in sectors such as wholesale and retail trade; restaurants and hotels; transport, storage and communications; financing, insurance, real state and business services; and community, social and personal services. We have also carried out the regressions using industry civilian employment instead of manufacturing employment; the results are very robust.

Table 3, shows the change from 1970 to 1997 of unemployment and service employment in the United States, Japan and five large European countries: France,

[9] Both the data-set and the original Stata program are available in Olivier Blanchard's or Justin Wolfer's web-page. Please refer to their work for technical details concerning the construction of the variables.

[10] Blanchard and Wolfers [2000] work with a data-set that covers the period 1960-1997. However, the unavailability of data on sector employment, production and price indexes in earlier years made it advisable to reduce the observation period to 1970-1997.

Germany, Italy, Spain and UK.

Countries	Change in unemployment: 1970-97	Change in service employment: 1970-97
France	7.37	8.73
Germany	8.79	8.88
Italy	7.77	8.62
Spain	19.99	6.23
UK	5.35	11.19
USA	.09	14.45
Japan	1.94	11.40

Source: OECD Annual Labour Force
Note: Unemployment is expressed in % of labor force.
Service employment is in % of working age population

Table 3: Change in unemployment and service employment

Countries that experienced the most limited increases in service employment over the period 1970-97, like Spain or Italy, are also the ones that suffered the largest increases in unemployment in the same period. Indeed, the correlation between both growth rates (using all countries in the panel) is of (-0.7). That correlation encourages further research to understand why service employment did not increase as much in some countries and to what extent that explains the different unemployment experiences across countries.

2.1.1 Institutions

Labour Market institutions

Time-constant institutions

Data for labour market institutions come originally from Nickell [1997]. Nickell presents averages of eight labour market institutions for 1983-1988 and for 1989-1994. B&W use the average of both periods as the time-constant value of each

labour market institution. They argue that institutions change only very slowly so the average value of the institution over the period gives a sense of the ability of the countries to deal with the shocks. We discuss briefly the definitions.

- Employment Protection Legislation (EPL): The source of the index is the OECD Jobs Studies published in 1994. The OECD ranked countries according to the legal framework governing firing and hiring. The index is the ranking of 20 countries, 20 indicating the most strictly regulated country. The OECD measure comprises characteristics both of the individual and collective contract termination. That includes features as notice time and financial compensation, rights to appeal against termination or administrative procedures.

- Benefit Replacement Rate: Gross benefits for a single person under 50, expressed as percentage of the most relevant wage (normally gross wage).

- Benefit Duration: It captures how long the unemployed are entitled to receive unemployment insurance. It is expressed in years. Four or more years are considered infinite duration.

- Active Labour Market Policies (ALMP): It refers to expenditures on activities for the unemployed that are aimed at helping them back into work. The numbers are expenditure per unemployed person taken as percentage of GDP per member of the labour force.

- Union Density: It shows the proportion of trade union members as percentage of total wage and salary earners. This variable alone does not give a good idea of the union influence in a country, though, since in many countries wage negotiations affect workers who are not union members. That is why we need to include as well the next variable.

- Union Coverage: This variable shows the share of workers actually affected by union bargaining. It takes three values. 1 means that only under 25% of workers is covered. 2 means that the percentage of covered employees is between 25 and 70%. Lastly, 3 means that more than 70% of workers are effected by union negotiation on wages.

- Wage Bargaining Coordination: In each country the degree of employer and worker wage bargaining coordination is ranked from a low coordination index of 1 to a high coordination value of 3.

- Tax burden on labour: This is a crude measure of the tax wedge between real labour costs and take home pay. It is the sum of the average payroll, consumption and income tax rates.

Table 4 shows the average values over the period 1983-1994 of all eight labour market institutions for the 20 OECD countries included in the study.

Countries	EPL	B.R. Rate	Benefit Duration	ALMP	Union Density	Union Coverage	Co-ordination	Tax Wedge
Australia	4	37.5	4	3.0	42.55	3	3	29.8
Austria	16	55	3	13.4	48.70	3	6	54.1
Belgium	17	60	4	9.5	52.4	3	4	48.7
Canada	3	59.5	.8	7.7	35.9	2	2	40.3
Denmark	5	90	2.5	12.9	72.6	3	6	47.6
Finland	10	69	3	12.3	71-5	3	5.5	62.8
France	14	57	3.4	9.24	11.8	3	4	63.3
Germany	15	63	4	16.2	33.6	3	5	52.8
Ireland	12	43.5	4	11.6	51.6	3	2	34
Italy	20	11	.5	9.5	41.5	3	3.5	60.1
Japan	8	60	.5	6.6	26.9	2	4	34.7
Nether.	9	70	3	4.3	28	3	4	57.9
Norway	11	65	1.5	12.3	56.3	3	6	49.3
NZ	2	34	4	9.7	47.6	2	3	35.1
Portugal	18	62.5	.7	9.28	39.1	3	4	35.6
Spain	19	75	3.5	7.5	14.5	3	3	52.2
Sweden	13	80	1.2	59.3	81.8	3	6	69.8
Switzerland	6	70	1	14.8	27.6	2	4	39.3
UK	7	37	4	8.8	42	2.5	2	42.7
USA	1	50	.5	2.6	17.3	1	2	43.2

Source: Nickell [1997]

Table 4: Labor market institutions, average 1983-94

The first column presents the OECD employment protection legislation index (EPL). The countries of southern Europe have the stricter regulation and Switzerland, Denmark and the United Kingdom have regulation comparable to the one in place in USA.

The benefit system shows great variation across countries. On the top one finds the Nordic countries, Denmark, Finland and Sweden (not so much Norway) with over 70% of the gross wage in the first year of unemployment. However, these countries have strictly time-limited systems. Italy barely had an unemployment

benefit system at all for most of the postwar period. The next column shows the active labour market policies such as training or assistance with job search. The clear outlier is Sweden with an impressive expenditure per unemployed of 60% of GDP per potential worker. Far away follow the rest of the countries with numbers around 10%. USA and Australia are at the tail in this particular ranking. In these two countries the activities to become more employable are left to the individuals, with no government intervention.

The next three columns intend to describe the wage setting system of the countries. It is remarkable that countries with the lowest union membership, as it is the case of France and Spain, present the largest union coverage, or in other words, percentage of workers affected by union agreements. In countries of central and north Europe, wage bargaining is most coordinated. Overall tax wedge does not present large differences across countries, although that would not be the case if we were to look at each of its components.

The first inspection of the data seems to indicate the existence of large institutional differences across countries.

Although the quality of time-varying data on labour market institutions is still far from optimal, we will also carry out the analysis with time-variant data. Thus a brief analysis of the time evolution of the institutions for which data is available is presented below.

Time-varying institutions

B&W offer in their article time-varying series of employment protection legislation and benefit replacement rates. The employment protection legislation index resulted from chaining Lazear [1990] data (from 1960-85) to OECD data (1985-95). The OECD data is constructed on the basis of a more extensive collection of employment protection dimensions, compared to the data used by Lazear. The data on benefit

replacement rates refer to the first year of unemployment benefit, averaged over family types of recipients. The benefits are expressed as a percentage of average earnings before tax.

Nickell and Nunziata [2002] have completed the data-set adding four more time-varying labour market institutions: benefit duration, union density, wage bargaining coordination and tax wedge. The definitions are the same as before although the sources and construction change in some cases. One of those cases is the benefit duration index. Nickell and Nunziata [2002] have constructed a more elaborated index than that provided by the number of years of benefit entitlement, trying to capture both the change in replacement rate over the years and the number of years one can receive unemployment insurance. They take the weighted average of the second and third year of benefit replacement rate and the fourth and fifth year, both normalized by the first year replacement rate. More weight is given to the replacement rate received at the beginning of the unemployment period. The index takes a maximum value of 1 if replacement rate is constant indefinitely (over four years) and a minimum value of 0 when benefits stop after the first year.

The common wisdom is that, after being introduced in the early 60s when equity considerations gained prominence in the public debate, labour market institutions have not varied substantially within countries. The next paragraphs will be dedicated to assess whether the data shows fundamental movements over time of the institutions.

Figure 4 shows the time-evolution of six labour market institutions over the period 1970-1995. The solid line is the unweighted average of all OECD countries. We have checked the significance of the time trend at the individual level as well as at the OECD level as a whole.

Starting by the benefit duration, the time trend is positive in all countries with the exception of Belgium, where it dropped at the beginning of the period

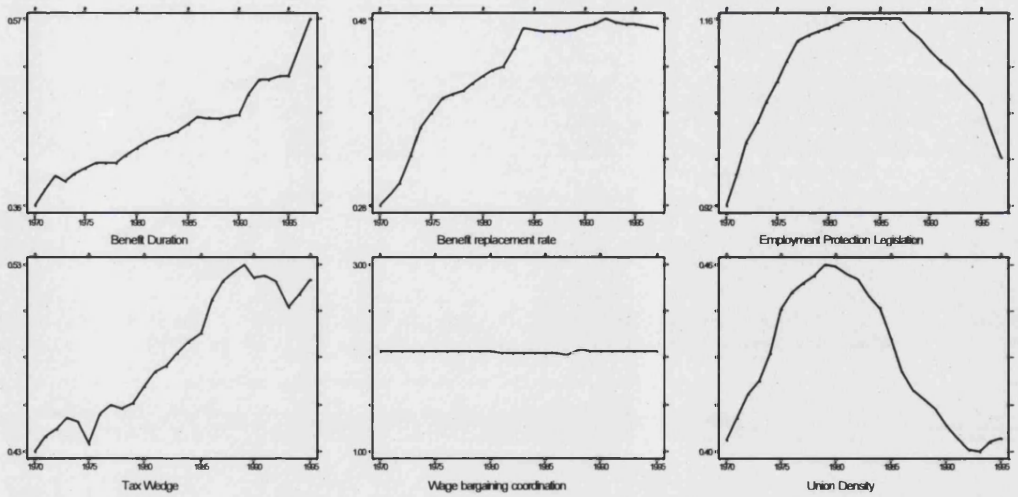


Figure 4: Time evolution of labour market institutions, 1970-1995. Average OECD countries

and then remained stable thereafter. Ireland presents an almost perfect U-shaped curve, with strong decreases at the beginning of the period and increases at the end. Netherlands and Finland have reduced in the last years their benefit duration. The benefit replacement rate has also increased over time in most OECD countries. The exceptions are Germany and UK, where replacement rates have steadily declined, and in smaller scale, Belgium and Japan. The overall time-trend in both cases, benefit duration and replacement rate, is positive and significant.

Employment protection regulation shows an inverted U-shape, with increases in regulation at the beginning of the period and a tendency towards deregulation at the end. This averaged effect over all countries hides, however, significant positive increases in protection legislation in Austria, France, which presents a

steady increase over the period, and Portugal with large increases at the beginning of the period and stable values thereafter. Spain and Italy started with very regulated firing and hiring rules and then moved towards deregulation. The 1970s strikes in Italy tightened employment protection regulation until it was virtually impossible to fire a worker. As unemployment stayed high, temporary contracts were introduced in 1977, layoffs for economic reasons were authorized in mid-80s and fired restrictions were eased for large firms in the 90s.[11] In Spain, during the Franco period workers were granted greater job security in exchange for the removal of collective rights. During the transition to democracy, emphasis was put on the change in collective labour law while there was continuity in all regulations concerning individual employment relationships. The sustained increase in unemployment rate justified the introduction of fixed-term contracts with lower severance payments in 1984 and then again in mid-1990s.[12] Sweden, and to a lesser extent Germany, increased employment protection at the beginning of the period to decrease it at the end. The overall trend, with the exceptions mentioned above, is towards deregulation.

The only institution whose value has increased over time for all countries appears to be the tax wedge. This can be explained by the need to finance increasingly generous social insurance benefits in all OECD countries. The individual regressions confirm this general upward trend with the only exception of the Netherlands. The Netherlands and the UK are indeed the two countries who have significantly overhauled labour market institutions. Since mid-80s, Netherlands implemented wage restraints which decreased real labour cost per unit of output which is what shows up in the individual regression. The time trend for the UK is

[11] See Siebert [1997] for a nice review of the time-evolution of labour market institutions in Europe.

[12] See Milner et al. [1995] for a discussion on employment protection legislation and labour market outcomes in Spain.

only significant at the 10% of significance level since there was a sharp increase in the tax wedge previous to the, also sharp, decrease of the Thatcher era.

Wage bargaining coordination has not changed substantially in most countries over the last three decades. Some exceptions are the increase in bargaining coordination in France, Portugal and Italy, and the decrease in Denmark, Sweden, UK and New Zealand. Overall, the time trend is non-significant.

Union density shows a similar shape to that of EPL. The Nordic countries, Denmark, Finland, Norway and Sweden are the exception with strong increases in union density over the period. The only other country with a strong unionization movement is Spain, which again is related to the recovery of collective rights during the democratic transition, although the level is much lower than that in the Nordic countries. Overall, however, union density has a negative non-significant trend over the period.

To summarize, tax wedge, benefit replacement rates and duration exhibited a wide-spread increase over the period of analysis in almost all OECD countries. Employment protection legislation and union density showed in average an inverted U-shape with a late tendency towards deregulation. There are, however some exceptions as the increase in protection of France and the increase in unionization of the Nordic countries. Employers and workers coordination in wage bargaining has remained fundamentally stable.

We have added to the labour market institutions presented above a proxy for the minimum wage level in the country. The idea is that the same argument that applies to start-up costs governs wage floors. That is, the failure to create enough jobs in the service sector could be due to the existence of wage floors, which prevented small firms from hiring more people. The proxy is the ratio of the first percentile of earnings distribution to the fifth percentile or median. The earnings dispersion data come from the OECD Employment Outlooks of 1993 and 1996.

There is no data for Spain and Ireland, and data for the rest of the countries is very incomplete. Therefore, any comment has to be done with caution.

Start-up costs

The OECD has recently published an indicator of product market regulations for 21 OECD countries (excluding the new central and eastern European members, Korea, Mexico and Turkey); unfortunately, only for one year: 1998.[13] The data come from responses of OECD countries to an ad hoc questionnaire and other sources. The information was grouped in the following regulatory domains:

- State control over business enterprises: Overall size of the public enterprise sector; existence and extent of special rights over business enterprises; legislative control over public enterprises; existence of price controls; and use of command and control regulations.
- Barriers to entrepreneurship: Features of the licensing and permit system; communication and simplification of rules and procedures; administrative burdens of corporate and sole-proprietors start-ups; industry specific administrative burdens; scope of legal barriers to entry and existence of antitrust exemptions for public enterprises.
- Barriers to international trade and investment: Barriers to share-ownership for non-resident operators; discriminatory procedures in international trade and competition policies; regulatory barriers to trade; and average tariffs.

To calculate the overall product market regulation index, each coded indicator was re-scaled to be between 0 and 6. Then the indicators were aggregated into the summary indicators and finally into the overall indicator weighting each component

[13] For a full description of the data-set see Nicoletti et al. [2000].

according to its contribution to the overall variance in the data (factor analysis methodology).

The "barriers to entrepreneurship" indicator has three sub-domains: Regulatory and administrative opacity, barriers to competition, and administrative burdens on start-ups. The variable "administrative burdens on start-ups" is defined as "administrative burdens for corporations, for sole-proprietorship and sector specific burdens," such as those present in the retail sector. The latter is a variable of interest regarding the current analysis because it includes administrative burdens, not only of corporations but also of sole-account proprietors, which is the legal form that most start-ups assume. This is an advantage over other possible data sources such as the one offered by Djankov et al. [2000]. In that paper the authors gather data on required procedures governing entry regulation as well as the cost in time and monetary terms of following those procedures. However, data refer only to limited liability companies, which is a handicap if one wants to study the impact of those procedures on firm creation.

Hence, the OECD sub-domain "administrative burdens on start-ups" will be used in the analysis to proxy institutions governing firm creation. Recall that it is our claim that countries with large administrative burdens on firm creation were not able to create enough service jobs to absorb displaced workers from other economic sectors. However, and for the sake of comparison, the analysis will also be done using the overall index of product market regulation.

Figure 5 shows start-up costs in 1998 across OECD countries. Leading the classification is Italy, followed by France and Spain. The countries where opening a new business is easiest are UK, USA and Denmark.

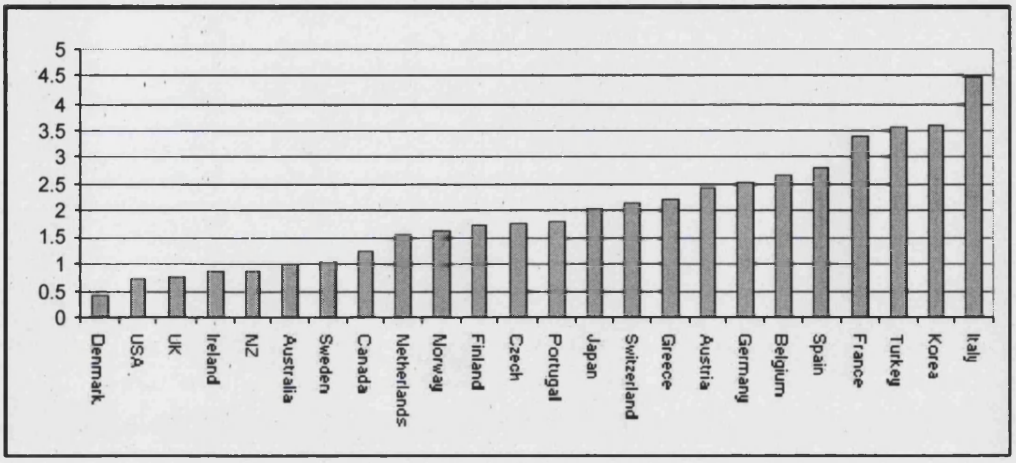


Figure 5: Administrative burdens on start-up costs, 1998

2.1.2 Macroeconomic Shocks

B&W identify three negative macroeconomic shocks that might have contributed to the increase in unemployment over the last decades: the decline in total factor productivity growth, the shift in labour demand, or equivalently, the increase in the capital share and, finally, the increase in long-term interest rate.

The Total Factor Productivity growth is calculated as the growth of the Solow residual for the business sector scaled by the labour share. From the early 70s, the TFP growth, specially in Europe, has slowed down. If workers and firms are slow to adapt to the slower growth of productivity, profits will decrease, and so will capital accumulation and employment. Capital shares started increasing in the 1980s in most European countries. There are two possible reasons. The first possibility ventured by Blanchard [1999] is a technological change biased to capital. The second one is a decrease in firms' labour hoarding (when firms employ too much labour at a given wage), maybe fostered by the historical lose of power of unions within Europe. Both possibilities lead to a decrease in labour demand and, therefore, to an increase in unemployment. Finally, the real interest rate,

calculated as the long-term nominal rate on government bonds minus a five-year average of lagged inflation, has increased steadily since the beginning of the 80s.

Baumol [1967] claimed that the employment shift from non-service to services observed in the last decades was the result of the differential productivity growth in the different economic sectors. To be accurate, one should focus on the differential *total factor productivity growth* in manufacturing and services, rather than on the differential *labour productivity growth.* It is only total factor productivity changes that one can assume exogenous since labour productivity depends, among other things, on capital accumulation which is an endogenous variable.[14] Using the OECD International Sector Database to construct sector TFP rates we have been able to put together an unbalanced panel of 13 countries, out of the 20 countries under analysis.[15] That comes to around 50 observations when we run the regressions with five-year averages. Taking into account that there are at least 24 explanatory variables in the regression, that panel is clearly not sufficient to yield something meaningful about the impact of shocks and institutions.

Since capital stock changes only slowly, labour productivity is much more cyclical than total factor productivity. Hence one possible way of proceeding is to use a smoothed version of labour productivity as a proxy to total factor productivity.[16] Figure 6 shows the ratio of manufacturing to service smoothed labour productivity and manufacturing to service total factor productivity evolution over time. The former is the average of 18 countries and the later is the average of 13 countries.

In spite of the different number of countries included, the evolution along time

[14] We thank Marc Mündler for intensive discussions about this point.

[15] We followed the methodology of Bernard and Jones [1996a] and [1996b] to construct sector TFP rates. They first calculate a base year manufacturing and service TFP, and then estimate the rest of the years using a Divisia-Tornquist multifactor productivity rate.

[16] The variable was smoothed using a Hodrick-Prescott filter. We used a lambda equal to 100 because the data have annual frequence. We also tried with other values such as 10 or 400, also used in the literature, and results did not differ.

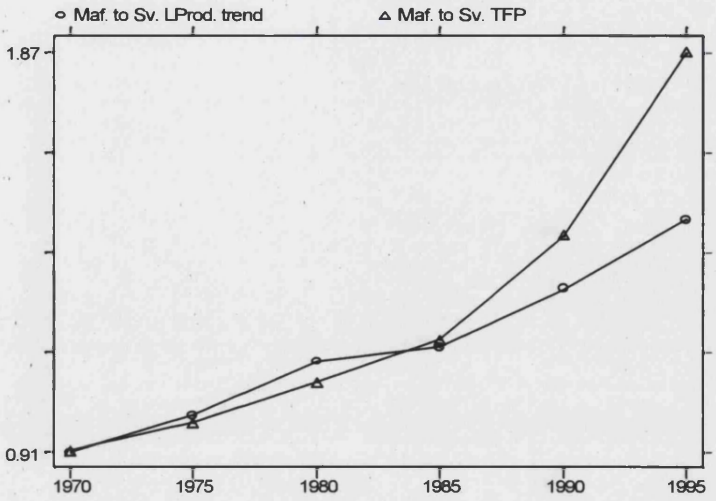


Figure 6: Manufacturing to service labour and total factor productivity

of both variables is similar; hence the regression with the labour productivity trend instead of the total factor productivity will point approximately in the right direction. However, we are aware of potential identification problems. To construct a better panel data-set of sector total factor productivity will be the next step in our research.

2.2 Results

The model to be estimated was first suggested by Blanchard [1999] in a Baffi Lecture in Rome titled "European Unemployment: the Role of Shocks and Institutions." In the lecture he defended the interaction between macroeconomic shocks with various labour market institutions as the best way to explain, first the persistence of the impact of shocks on unemployment, and second, the diverse impact of similar shocks in the OECD countries.

2.2.1 Common unidentified shocks: a benchmark

Time-constant institutions

To capture those interactions, the simplest model is as follows:

$$u_{it} = \sum_i \alpha_i c_i + d_t + \sum_j \gamma_j (d_t * X_i^j) + \epsilon_{it} \quad (1)$$

where u_{it} is the dependent variable (unemployment, service or manufacturing employment rates) in country i at time t, c_i are 20 country dummies, d_t are time dummies, that is, common unidentified shocks[17], and X_i^j is the time-constant value over the period of the institution j in country i. What matters in the estimation is not the value of the shock or the institution but the interaction between both of them. This is the most general specification since no specific shocks are imposed; it allows to isolate the impact of the institutions from that of the shocks on the dependent variables. Hence it will be used as a benchmark.

Notice that each institution is allowed to interact separately with the same linear combination of shocks. The model is therefore non-linear in parameters.[18] B&W estimate the model using non-linear least squares and do not correct for heteroscedasticity present in the regression. Although the coefficients are consistent, and therefore it is legitimate to use them to make estimations, they are not efficient, that is, with minimum variance, so the standard errors are not correct. In this paper the model will be estimated using an equivalent maximum likelihood function which allows for White's heteroscedasticity-consistent variances and standard errors.

Autocorrelation is only a problem in the regressions with common shocks, proxied by time dummies. The deviation from the average of the dependent

[17] The first period is left out so it becomes the constant. Therefore the country dummies can be interpreted as the unemployment (or sector employment rates) in the first period.

[18] Rewriting the expression to be estimated:

$u_{it} = \sum_i \alpha_i c_i + d_t + \gamma_1\beta_1(d_1 * X_i^1) + \gamma_1\beta_2(d_2 * X_i^1) + \gamma_2\beta_1(d_1 * X_i^2) + \gamma_2\beta_2(d_2 * X_i^2) + ... + \epsilon_{it}$

where we have written the example for two time dummies or shocks (d_1 and d_2 with coefficients β_1 and β_2) and two institutions (X_i^1 and X_i^2 with coefficients γ_1 and γ_2). But we would then have to impose non-linear restrictions on the coefficients, so $\frac{\gamma_1\beta_1}{\beta_1} = \frac{\gamma_1\beta_2}{\beta_2}$.

variable, unemployment rate or sector employment rates, is clearly cyclical. In the first set of regressions time dummies are used, so there is nothing in the right-hand side of expression 1 to account for that cyclical behavior, hence the error term is autocorrelated. However, autocorrelation is corrected for when identified shocks instead of time dummies are introduced in the regression.

Tables 5, 6 and 7 show respectively the results for the unemployment, service and manufacturing regression. Five year averages have been taken (with the exception of the last period which only comprises 1995-1997) to smooth out short-term fluctuations. All institutions are expressed in deviations to the cross-country mean. Wage bargaining coordination and active labour market policies have been multiplied by (-1) so the expected impact of all institutions on unemployment is positive. Country and time dummies were included in all regressions.

Dependent variable: Unemployment rate

	1	2	3	4	5
B. Duration	.23 (.04)	.26 (.05)	.29 (.05)	.19 (.04)	.29 (.06)
B.R.Rate	.02 (.00)	.02 (.01)	.03 (.01)	.00 (.00)	.02 (.00)
EPL	.05 (.02)	.01 (.02)	-.01 (.02)	.02 (.02)	.03 (.02)
U.Density	.01 (.01)	.02 (.01)	.02 (.01)	.02 (.01)	.01 (.01)
Tax Wedge	.02 (.01)	.01 (.01)	.00 (.01)	.02 (.01)	.02 (.01)
Coordination	.26 (.06)	.33 (.06)	.38 (.05)	.12 (.07)	.32 (.05)
U.Coverage	.07 (.19)	.04 (.19)	.01 (.19)	-.07 (.20)	.04 (.21)
ALMP	.02 (.01)	.01 (.01)	.01 (.01)	.02 (.01)	.01 (.01)
Start-up costs		.38 (.12)			
SUC*initial nsv			.73 (.16)		
Minimum Wage				1.4 (.9)	
Product Market Regul.					.49 (.17)
Observations	117	117	117	105	117

Notes: Standard errors in brackets.
When minimum wages are introduced, Ireland and Spain drop.

Table 5: Common shokcs: unemployment

Dependent variable: Service employment ratio

	1	2	3	4	5
B. Duration	-.10 (.03)	-.12 (.03)	-.13 (.03)	-.10 (.03)	-.10 (.03)
B.R.Rate	-.00 (.00)	-.01 (.00)	-.01 (.00)	-.00 (.00)	-.00 (.00)
EPL	-.03 (.01)	-.01 (.01)	-.01 (.01)	-.03 (.01)	-.04 (.01)
U.Density	-.01 (.00)	-.01 (.00)	-.01 (.00)	-.01 (.00)	-.01 (.00)
Tax Wedge	-.01 (.01)	-.00 (.01)	.00 (.01)	-.00 (.01)	-.01 (.01)
Coordination	-.13 (.04)	-.17 (.04)	-.17 (.04)	-.08 (.06)	-.13 (.04)
U.Coverage	.19 (.14)	.19 (.13)	.21 (.13)	.15 (.12)	.19 (.14)
ALMP	-.00 (.01)	.00 (.01)	.00 (.01)	.00 (.01)	-.00 (.01)
Start-up costs		-.21 (.09)			
SUC*initial nsv			-.32 (.13)		
Minimum Wage				.87 (.83)	
Product Market Regul.					.01 (.12)
Observations	117	117	117	105	117

Notes: Standard errors in brackets.

When minimum wages are introduced, Ireland and Spain drop.

Table 6: Common shocks: service employment

Dependent variable: Manufacturing employment ratio

	1	2	3	4	5
B. Duration	.19 (.06)	.24 (.05)	.26 (.05)	.19 (.06)	.24 (.07)
B.R.Rate	-.01 (.00)	.00 (.00)	.00 (.00)	-.01 (.01)	-.01 (.00)
EPL	-.02 (.02)	-.08 (.02)	-.09 (.02)	-.01 (.02)	-.03 (.02)
U.Density	-.02 (.01)	-.00 (.01)	-.00 (.01)	-.01 (.01)	-.02 (.01)
Tax Wedge	.01 (.01)	-.00 (.01)	-.01 (.01)	.01 (.01)	.01 (.01)
Coordination	-.17 (.07)	-.05 (.06)	-.07 (.06)	-.04 (.06)	-.12 (.07)
U.Coverage	.02 (.22)	.00 (.18)	-.03 (.19)	-.10 (.19)	.01 (.21)
ALMP	-.02 (.01)	-.02 (.01)	-.03 (.01)	-.01 (.01)	-.02 (.01)
Start-up costs		.61 (.13)			
SUC*initial nsv			.86 (.2)		
Minimum Wage				2.6 (.85)	
Product Market Regul.					.41 (.25)
Observations	117	117	117	105	117

Notes: Standard errors in brackets.
When minimum wages are introduced, Ireland and Spain drop.

Table 7: Common shocks: manufacturing

Five different regressions have been run with each dependent variable. The first one replicates that of B&W. The results are very similar although not exactly the same since the observation period differs. The second regression adds to the eight labour market institutions the administrative burdens on start-ups provided by the OECD (more concretely, the data is from 1998, which is taken as the time-constant value of the institution). The third regression substitutes start-up costs by the interaction between start-up costs and the initial non-service employment share of the working age population. We claim that the combination of large shifts of employment from non-service to service sector with administrative barriers to firm creation hampers employment creation, or equivalently, fosters unemployment. In the fourth regression start-up costs have been substituted by minimum wages (proxied by the first percentile of the earnings distribution to the median wage). Regression five includes the overall product market regulation index.

There is a lot of information in the three tables shown above so let us take you slowly through the most interesting results. The first important remark is that the unemployment and the service results look like two sides of the same coin. When benefit duration, replacement rate, employment protection legislation and wage bargaining coordination are positive and significant in the unemployment regression, they show as negative and significant in the service regression. This result confirms what the first look at the data suggested.

Benefit duration is very robust and significant in all regressions. Countries where unemployed receive long benefits experience more unemployment. More interesting may be the service and manufacturing regressions. Countries with longer benefits than average are countries with less service and more manufacturing employment.

The positive sign of benefit duration, the case is the same for the minimum wage, in the manufacturing regression is a very robust, and interesting, result. It has been reported before that high and long unemployment benefits increase the reservation wage of workers. A high reservation wage means that workers are less willing to accept low-paid jobs in the service sector and prefer instead to queue in the manufacturing sector. Thus, the shift from non-service to service economy is delayed.

Consequently the negative sign of benefit duration in the service regression is not surprising. However, there could be something else to the negative impact of benefits on service employment. The report of the Global Entrepreneurship Monitor of 2001 found that countries with generous unemployment insurance systems were systematically less "entrepreneurial".[19] This was explained because there are two types of start-ups. One type pursues a business opportunity, and

[19]The Global Entrepreneurship Monitor is an international project led by Paul Reynolds (Babson College and the London Business School) aimed at measuring entrepreneurship across countries in a comparable way. See www.gemconsortium.org.

the other type is the result of desperation, of the need to make a living. Generous benefit systems are taking away part of the desperation of the unemployed and, therefore, decreasing the second type of start-ups. Hence, if we accept the intimate connection between firm creation and service sector job creation, generous benefit systems can be expected to decrease service employment.

Long unemployment benefits and high wage floors are normally the result of strong union power in the country. The regressions include three bargaining related variables: union density, union coverage and wage bargaining coordination. The first remarkable fact is the lack of significance over all specifications of union coverage. The second remark is that both union density and wage bargaining coordination affect significantly service employment and unemployment, and are relatively unimportant in explaining manufacturing employment. This result is consistent with the observed impact of benefits and minimum wages: unionized countries have higher union premium, i.e. the relative wage in manufacturing is higher, which means that migration to the service sector has been slower.

Start-up costs, and the overall index of product market regulations, have a consistent positive and significant sign in the unemployment regression. The variable star-up costs is also negative in the service regression and positive in the manufacturing regression. Countries where starting a business is cumbersome have paid in terms of service employment, and of unemployment. The results are reinforced when instead of start-up costs we run the regression with the interaction of start-up costs with initial non-service employment. Start-up costs have a higher impact when the 1970 share of population of working age outside the service sector is larger. In other words, countries that had to go a long way from non-service to service economies paid a higher price in terms of unemployment for institutions that delayed the sectorial shift.

The impact of the overall index of product market regulations, however, differs

from the one of start-up costs in both sector employment regressions. It is not significant in the service regression and it is significant only at 11% significance level (although positive, as the start-up costs) in the manufacturing one. Recall that the overall OECD index groups regulations that cover a much wider range of economic activities than start-up costs, such as state control over the private sector, barriers to international trade or existence of anti-trust exemptions for public enterprises. Some of those domains are not, or negatively, correlated to start-up costs so they are capturing different phenomena.[20] Since service employment takes place at small local firms, some of the regulations included in the overall index do not apply to them, which could explain the non-significance of the variable in the service regression.

When start-up costs (or the interaction term) are included in the unemployment regression, several labour market institution variables drop. Most dramatic is the effect of start-up costs on employment protection legislation. Once start-up costs are introduced, EPL does not show up as significant again. This is so in almost all specifications we tried and therefore very robust, and is consistent with evidence based on job flows. The high correlation between start-up costs and EPL (correlation coefficient of 0.73) may explain the significance of EPL in other aggregate studies. When minimum wages are included, instead of start-up costs, EPL reappears as significant, which seems to confirm the previous remark.

To give an idea of the magnitude of the coefficients, Table 8 reproduces in its second column the estimation results for the model of unemployment with start-up costs (Table 5, regression 2). The third column of the table shows the variation range of each independent variable. The variation is in terms of deviations to the cross-country mean, which is taken as reference point. The fourth column shows

[20] For example, barriers to trade and start-up costs have a correlation coefficient equal to (-.03). The two sub-domain of barriers to entrepreneurship, "administrative opcity" and "administrative burdens on start-ups," have a correlation coefficient of (-.17).

the impact of the same shock on the country with the "best" and the "worst" institutional setting, i.e. on the countries with the largest -negative and positive- deviations to the cross-country mean. For example, Denmark is the country with the lowest start-up costs and Italy the one with the "worst" or largest value of the institution among all countries in the sample. The estimations indicate that the time dummy would increase unemployment by 7% in a country with the average value of all institutions. The country with the highest start-up costs would have an additional -relative to the country with average start-up costs- increase in unemployment of 1.07%. Denmark, however, would see an increase in unemployment 0.57% smaller than the country with the average value of start-up costs.

	Coefficients from Table 5,	Range of variation of institution		Implied range of effect of shock	
Variable	column (2)	minimum	maximum	minimum	maximum
Time effect	.07				
B. Duration	.26	-1.93	1.57	-.50	.41
B.R. Rate	.02	-46.35	32.65	-1.11	.78
U.Density	.02	-30.98	39.02	-.52	.65
Coordination	.33	-2.05	1.95	-.68	.65
Start-up costs	.38	-1.49	2.80	-.57	1.07
Note: Only coefficients significant at 10% are included in table					

Table 8: Estimated impact of institutions after a common shock

Take the case of a particular country, for example Italy. The average unemployment rate in the first period of analysis, 1970-1975, was of 4%. During the last period, 1995-1997, the average rate was 12%. Hence unemployment increased 8 percentage points over the period of analysis. The model with common shocks and time-constant institutions predicts an unemployment increase of 6.1% in that same period. As the table above shows, 7 percentage points of that predicted increase

are due to time shocks. The remaining responds to the Italian specific institutional framework. Table 9 shows the contribution to the predicted change in unemployment of each of the institutions analyzed in the paper for Italy and other four OECD countries.

Unemployment: common shocks	Belgium	Italy	Japan	UK	USA
Actual increase, 1970-97	12%	8%	2%	5%	0%
Predicted increase, 1970-97	14.7%	6.1%	1.7%	7.8%	0.1%
Percentage explained by time (given average institutions)	7%	7%	7%	7%	7%
Percentage explained by institutions	7.7%	-0.9%	-5.3%	0.8%	-6.9%
Benefit system	3.3%	-11.3%	-3.1%	-0.6%	-4.7%
EPL	0.5%	0.8%	-0.2%	-0.3%	-0.8%
Union activity	1.1%	1%	-2.2%	4.4%	1.1%
Tax Wedge	0.1%	0.9%	-0.9%	-0.3%	-0.3%
ALMP	0.2%	0.2%	0.5%	0.3%	0.8%
Start-up Costs	2.4%	7.5%	0.5%	-2.7%	-3%

Table 9: Contribution of institutions

Benefit duration and replacement rates have been merged into "Benefit system" and union coverage, union density and wage bargaining coordination conform the institution "Union activity." Following with the example of Italy, it is known that Italy barely had an unemployment benefit system at all for most of the postwar period, hence the negative contribution to the unemployment increase over the period. Union activity, employment protection legislation, the tax wedge and active labour market policies have all marginally contributed to the unemployment rise in Italy, according to our estimations. The single institution that can explain a substantial increase in Italian unemployment is start-up costs.

Turning to the remarkable unemployment performance of the United States, very well predicted by the model, we can see that it is almost entirely due to the

lower than average benefit system and start-up costs. Belgium is the opposite case: its bad unemployment records are due to unemployment benefits and start-up costs well above the OECD average.

Hence, according to the model with common shocks and time-constant institutions, the two single institutions that have contributed the most to the explanation of the diverse OECD unemployment evolution are the benefit system (benefit duration and replacement rate) and the start-up costs of firms.

Time-varying institutions

All regressions have also been run with time-varying institutions. The data come from Nickell and Nunziata [2002].[21] There are at least three problems with those regressions, though. First, there are comparable start-up cost data across OECD countries for one year only, 1998. Moreover, there are so many missing values in the measure of minimum wages that it would be advisable to use the time-constant value of minimum wage instead of the time-varying one. Therefore, start-up costs and the wage floor are time-constant while all the rest of the variables are time-varying (although some do not vary that much). The second, smaller, drawback is that time-varying data are available only for six labour market institutions, instead of the eight used above. Union coverage and active labour market policies are left out of the time-varying analysis. Given that the explanatory variables are not entirely independent one of another, this omission could affect the results.

Last but not least, institutions change very slowly over time so the value of one institution in a country at a certain period is certainly correlated with the value of the same institution at the previous or posterior period. This means that the institutions' coefficients could be biased. Indeed, one general feature

[21] We have run the regressions with yearly data (485 observations) and five-year average periods as before. The results are very similar in both cases.

of all regressions using time-varying data on institutions is that the estimated coefficients are larger, sometimes much larger, than those estimated with time-constant institutions. We suspect that this problem could be behind some change of signs. Hence, all interpretations have to be done with caution.

The tables can be found in the appendix 1. The unemployment and manufacturing regressions replicate in general terms those using time-constant institutions. The service regression presents some changes. The benefit replacement rate and EPL, which were significantly decreasing service employment with time-constant institutions, are now positive and, in some regressions, significant. There are three possible explanations to the positive sign of EPL and benefit replacement rate: the time evolution of both variables has been favorable to service job creation; there is a spurious relationship between the rise in service employment and the rise in both institutions; or there is a problem of biased coefficients.

To include in the analysis the variation over time of labour and product market institutions is necessary. This is only a first attempt in that direction, which shows that the main results obtained with time-constant institutions are robust. But better data and further econometric work are called for.

2.2.2 Identified shocks

We now turn to identify those shocks that before were left unidentified and captured by time dummies. The model to be estimated is as follows:

$$u_{it} = \sum_i c_i + \sum_k \beta_k S_{kit} + \sum_j \gamma_j (\sum_k \beta_k S_{kit} * X_i^j) + \epsilon_{it} \qquad (2)$$

where S_{kit} is shock k in country i at time t. One can think about a composite of shocks that interacts with the labour market institutions. There are several candidates for "bad" shocks that might be responsible for the observed increase in unemployment in the OECD countries in the last three decades.

Blanchard [1999] and then B&W identify three of those shocks: a slowdown in the total factor productivity growth; an increase in the long-term real interest rate; and finally, an increase in the capital share, or equivalently, a negative shift of labour demand. The focus of this chapter is on sector differential productivity growth rather than on aggregate productivity slowdown. It is argued that manufacturing and service differential productivity growth is behind the observed employment shift to the service sector in developed economies. We claim that countries that did not have friendly institutions to service job creation were not able to absorb displaced workers from other sectors which resulted in higher unemployment.

To test that claim, the first of B&W shocks, aggregate TFP growth, is substituted by the manufacturing to service TFP. Then the interaction of shocks with the labour market institutions and start-up costs is used as explanatory variables in the unemployment and sector employment regressions.

Sector TFP is proxied by the "filtered" sector labour productivity or labour productivity trend, as we explained with some detail in the section dedicated to the description of the data. In general terms the first and last period of data are missing for all countries, Ireland and Switzerland drop totally and Spain has only two periods of data available. Our data set is therefore badly reduced (from 106 to 78 observation in the best case) so the results of the estimations have to be taken with caution.

Tables 10, 11 and 12 show the estimation results of the model with three identified shocks, labour demand shift, long-term interest rate, and manufacturing to service labour productivity, and time-constant institutions. Column (1) shows the estimation of the model only with labour market institutions, column (2) includes start-up costs, column (3) substitutes start-up costs by minimum wages, and column (4) includes the OECD overall index of product market regulation, in place of the administrative burdens on start-ups.

Dependent variable: Unemployment rate

	1	2	3	4
Labour Demand Shift	.09 (.07)	.07 (.05)	.09 (.06)	.05 (.06)
LR interest rate	.04 (.09)	.04 (.09)	.03 (.09)	.05 (.09)
Manufacturing to service L.Prod.	.07 (.01)	.07 (.01)	.07 (.01)	.08 (.01)
B. Duration	.26 (.11)	.35 (.11)	.29 (.11)	.44 (.12)
B.R.Rate	-.02 (.01)	-.00 (.01)	-.01 (.01)	-.02 (.01)
EPL	.02 (.04)	-.12 (.08)	.04 (.04)	-.09 (.06)
U.Density	.04 (.01)	.05 (.01)	.05 (.01)	.02 (.01)
Tax Wedge	-.03 (.02)	-.05 (.02)	-.03 (.02)	-.03 (.01)
Coordination	.09 (.21)	.19 (.19)	.10 (.18)	.04 (.18)
U.Coverage	-.26 (.42)	-.32 (.43)	-.07 (.44)	-.11 (.38)
ALMP	-.00 (-01)	-.03 (.01)	-.00 (.01)	-.03 (.01)
Start-up costs		.97 (.52)		
Minimum Wage			-4.2 (2.1)	
Product Market Regulation				1.5 (.68)
Wald Test (3 shocks)	83	74	83	92
Observations	78	78	76	78

Notes: Standard errors in brackets.

- When minimum wages are introduced, Ireland and Spain drop.

Table 10: Identified shocks: unemployment

Dependent variable: Service employment ratio

	1	2	3	4
Labour Demand Shift	.16 (.07)	.26 (.13)	.15 (.07)	.20 (.09)
LR interest rate	.29 (.11)	.30 (.14)	.28 (.11)	.29 (.12)
Manufacturing to service L.Prod.	.16 (.01)	.16 (.01)	.17 (.02)	.15 (.02)
B. Duration	-.09 (.04)	-.12 (.04)	-.07 (.05)	-.14 (.05)
B.R.Rate	.00 (.00)	-.01 (.01)	.00 (.02)	.00 (.00)
EPL	-.03 (.02)	.07 (.03)	-.03 (.02)	.00 (.04)
U.Density	-.01 (.01)	-.01 (.00)	-.00 (.01)	-.00 (.01)
Tax Wedge	-.01 (.01)	.00 (.01)	-.01 (.01)	-.01 (.01)
Coordination	.09 (.11)	.00 (.09)	.08 (.13)	.07 (.11)
U.Coverage	-.11 (.29)	-.05 (.29)	-.02 (.32)	-.18 (.32)
ALMP	.00 (.01)	.02 (.01)	.00 (.01)	.01 (.01)
Start-up costs		-.66 (.26)		
Minimum Wage			-2.0 (2.6)	
Product Market Regulation				-.50 (.39)
Wald Test (3 shocks)	278	328	183	278
Observations	78	78	76	78

Notes: Standard errors in brackets.

When minimum wages are introduced, Ireland and Spain drop.

Table 11: Identified shocks: service employment

Dependent variable: Manufacturing employment ratio

	1	2	3	4
Labour Demand Shift	.03 (.05)	.04 (.05)	.03 (.05)	.05 (.05)
LR interest rate	-.05 (.08)	-.05 (.08)	-.06 (.09)	-.05 (.08)
Manufacturing to service L.Prod.	-.12 (.01)	-.12 (.01)	-.12 (.01)	-.12 (.01)
B. Duration	.11 (.06)	.13 (.07)	.11 (.06)	.17 (.07)
B.R.Rate	-.02 (.01)	-.01 (.01)	-.02 (.01)	-.02 (.01)
EPL	-.03 (.01)	-.07 (.03)	-.04 (.01)	-.07 (.03)
U.Density	.00 (.01)	.00 (.01)	-.00 (.01)	-.00 (.01)
Tax Wedge	-.02 (.01)	-.02 (.01)	-.02 (.01)	-.02 (.01)
Coordination	.07 (.13)	.11 (.10)	.09 (.14)	.07 (.12)
U.Coverage	.22 (.19)	.22 (.18)	.24 (.23)	.24 (.19)
ALMP	-.03 (.01)	-.03 (.01)	-.03 (.01)	-.04 (.01)
Start-up costs		.21 (.22)		
Minimum Wage			.29 (1.1)	
Product Market Regulation				.41 (.36)
Wald Test (3 shocks)	165	162	143	164
Observations	78	78	76	78

Notes: Standard errors in brackets.
When minimum wages are introduced, Ireland and Spain drop.

Table 12: Identified shocks: manufacturing

All the three shocks are entered in levels and can be interpreted as deviations to the value in the first period of analysis, or as deviations to the country average. A Wald test to test for their joint significance has been performed and in all cases we can reject the hypotheses of all coefficients being zero.

The first remarkable thing is that the labour demand shift and the long-term interest rate are not significant in the unemployment and manufacturing regressions when sector labour productivity is controlled for.[22] On the other hand, the manufacturing to service labour productivity is always very significant (t-

[22]When aggregate TFP growth is included instead, the long-term interest rate is significant in all regressions. Labour demand shift is close to significance at 10% level in the unemployment regression. B&W found the labour demand shift to be significant. However when heteroscedasticity is controlled for, the labour demand shift loses its significance.

statistics of about 10 in absolute value). That shock is positive in the unemployment regression, positive in the service regression and negative in the manufacturing regression. All signs are as expected since, according to Baumol [1967], the increase in manufacturing productivity relative to service caused the shift of employment from non-service to service sectors. Hence it explains the increase in service employment and the decrease in manufacturing employment. The second remarkable issue is to be found in the service regression. It has been mentioned that the increase in manufacturing to service labour productivity increases significantly service employment, as expected. The striking thing is that the two other shocks included in the analysis, labour demand shift and increase in the interest rate, also increase significantly service employment. The most likely explanation is the existence of a spurious relationship between the growth in service employment and the growth in the capital share and interest rate.

Turning directly to the administrative burdens on start-ups, the focus of this chapter, we observe the following. The coefficient of start-up costs is higher than with unidentified shocks in all regressions. It is positive and significant at 10% significance level in the unemployment regression, very significant and negative, in the service regression, and positive but non-significant in the manufacturing regression. What these results are telling us is that the shift of employment from non-service to service activities had a very high cost in terms of service employment, reflected in overall unemployment, in countries where starting a business is more cumbersome than average.

The beauty is that when the regression is run with the *aggregate* TFP growth, as in Blanchard and Wolfers [2000], there is no evidence that countries with more administrative burdens on firm creation than the average have a worse service employment performance.[23] Burdens on firm creation become significant only when

[23]The estimations with aggregate TFP growth, instead of sector differential labour productivity

interacted with a shock that caused the relocation of large numbers of workers in the service sector.

When the overall product market regulation index is included instead of start-up costs, the results change slightly. Product market regulations, when interacted with the sector differential productivity, increase significantly unemployment (this result is more significant than when start-up costs were included). The difference, as it was the case when regressions were run with time dummies, is to be found in the service regression, where product market regulations have a non-significant negative coefficient.

Countries with longer benefits than average create less jobs in the service sector (where the private initiative is very important), have a larger share of the working age population employed in the manufacturing firms and experience, in general, higher unemployment than an average country.

With respect to the rest of the institutions, the most remarkable changes from before are as follow. First, EPL is non-significant from the beginning in the unemployment regression (before it was significant when start-up costs were excluded). In the service regression, EPL goes from being negative and significant without start-up costs to positive and significant when they are included. When minimum wages are controlled for instead, the sign is again negative (although non-significant). Therefore the behavior observed before, when the EPL index systematically dropped out when start-up costs were introduced, is here amplified.

To get a feeling of the contribution of the three shocks analyzed in the section to the increase in unemployment, let us take a look in more detail to Italy –a country that has experienced a large relocation of workers into the service sector. The predicted rise of Italian unemployment over the period is of 7.25%, much closer to the actual 8% than the predicted increase of the model with common unidentified

growth, are available in the appendix 1.

shocks. Of those 7.25 percentage points, shocks (given average institutions) can explain a rise equal to 5.7% and institutions explain the remaining 1.5%. The shift of employment to the service sector explains alone 5% points of the 5.7% corresponding to the shocks.

The large contribution of that shock is a feature of every country; in average it accounts for around 60% of the total predicted change in unemployment. That figure is quite close to the one given by Marimon and Zilibotti [1998], who calculated that almost 80% of the long-run employment differential growth across countries and industries is accounted by different initial distribution of labour across industries and only 20% by country effects.

We turn now to the contribution of the different institutions to the unemployment increase over the period, for Italy and five other OECD countries. Table 13 shows that the predictive power of the regression with identified shocks and time-constant institutions is generally better than the one with common shocks.

Unemployment: Identified shocks	Belgium	Italy	Japan	UK	USA
Actual increase, 1970-97	12%	8%	2%	5%	0%
Predicted increase, 1970-97	10%	7.3%	1%	4.4%	-0.2%
Percentage explained by shocks (given average institutions)	5.2%	5.7%	1.5%	2.8%	3%
Labour Demand Shift	-0.3%	0.4%	-0.1%	-0.3%	0.4%
Long-term Interest Rate	0.1%	0.2%	0.1%	0.1%	0.1%
Manufacturing to service productivity	5.4%	5.1%	1.5%	3%	2.5%
Percentage explained by institutions	4.8%	1.5%	-0.5%	1.7%	-3.2%
Benefit system	2.8%	-3.2%	-1.1%	1.6%	-2%
EPL*	-4.1%	-6.6%	0.5%	1.1%	3.4%
Union Activity*	2.3%	-0.3%	-1%	1.2%	-1.3%
Tax wedge	-0.2%	-3.4%	1%	0.7%	0.7%
ALMP	-0.3%	-0.4%	-0.2%	-0.2%	-0.7%
Start-up costs	4.4%	15.3%	0.3%	-2.8%	-3.3%
Institutions with * are non-significant at 10% significance level					

Table 13: Contribution of shocks and institutions

The figures in the table have to be taken with extreme caution: employment protection legislation is non-significantly different from zero and has reverse sign. So are two of the three variables included in the union activity group. Of the rest of significant variables, ALMP and the tax wedge have a negative sign in the regression, instead of the expected positive one.

There is a general decrease in the contribution to the unemployment change of the benefit system (i.e. in Italy, now the figure is -3.2%, compared to the -11.28% in the regression with common unidentified shocks) now that shocks have been identified. Secondly, the contribution of start-up costs, now that are interacted with identified shocks, to the unemployment rise is very large. That contribution is two times as large as the already important contribution of start-up costs when shocks were not specified in Italy and Belgium, and approximately the same in Japan, UK and USA.

Taking the results with caution due to the numerous missing values in the data-set, start-up costs emerge as a relevant variable to explain unemployment given the shift of employment from non-services to services experienced by most western economies over the last decades.

2.3 Conclusion

This paper argues that countries that had unfriendly institutions to service job creation were not able to have a smooth transition towards a service economy, with the result of higher unemployment. Given the characteristics of the service employment, created in small firms at the local level, one institution that possibly hampered service employment is the administrative burdens on firm creation.

The estimations seem to support the working hypotheses of the paper: countries with higher start-up costs have significantly lower service employment and higher unemployment.

The first set of regressions use time dummies instead of fully specified shocks to be able to isolate the impact of the institutions from that of shocks on unemployment. The time dummies alone would be able to explain an increase in unemployment of 7 percentage points in a country with the cross-country average value of institutions. The country with the highest start-up costs among all OECD countries, Italy, would be penalized with an additional increase in unemployment of 1.07%. When the contribution of each institution to the predicted increase in unemployment is estimated for the case of Italy, start-up costs emerge as the largest contributor to the unemployment rise. On the other hand, employment protection legislation, one of the traditional main suspects, appears to have contributed in less than 1 percentage point to the overall increase.

When institutions are interacted with identified shocks, start-up costs emerge again as the institution that has contributed the most to the predicted unemployment

increase. In the case of Italy, that contribution is now twice as large as it was when no shocks were specified and time dummies were used instead.

In spite of the incomplete data on sector labour productivity, the analysis shows that the administrative burdens on firm creation and other product market regulations can be blamed for part of the increase in unemployment experienced by most western economies in the last three decades. That impact is specially important when the size of the employment shift from the agriculture and industry sector into the service sector is taken into account.

2.4 Appendix 1

2.4.1 Time-varying institutions

Tables 14, 15 and 16 show the results of the regressions for unemployment, service and manufacturing employment respectively with common unidentified shocks (time dummies) and time-varying institutions. Please keep in mind that we do not have time-varying data for start-up costs and minimum wages. The first column of the table includes only labour market institutions (there are no data for ALMP and union coverage); the second column adds to the six labour market institutions the start-up costs; the third column substitutes start-up costs by the interaction of start-up costs with the initial non-service employment rate; column four substitutes start-up costs by the wage floor; and finally, column five includes the overall OECD product market regulation index. All regressions include time and country dummies.

Dependent variable: Unemployment rate

	1	2	3	4	5
B. Duration	.69 (.24)	.87 (.19)	.87 (.19)	.77 (.24)	.62 (.27)
B.R.Rate	.55 (.45)	1.2 (.47	1.4 (.51)	-.55 (.44)	.61 (.49)
EPL	.33 (.20)	-.15 (.25)	-.29 (.24)	.12 (.14)	.45 (.28)
U.Density	-.17 (.56)	1.0 (.56)	1.2 (.51)	.63 (.63)	-.26 (.61)
Tax Wedge	.08 (.65)	-1.4 (.57)	-1.7 (.57)	.69 (.70)	.35 (.73)
Coordination	-.20 (.13)	-.22 (.12)	-.19 (.12)	-.14 (.13)	-.22 (.13)
Start-up costs		.48 (.10)			
SUC*initial nsv			.74 (.13)		
Minimum Wage				.62 (1.31)	
Product Market Regul.					-.29 (.29)
Observations	106	106	106	94	106
Notes: Standard errors in brackets.					

Table 14: Common shocks and time-varying institutions: unemployment

Dependent variable: Service employment ratio

	1	2	3	4	5
B. Duration	-.00 (.15)	-.08 (.13)	-.06 (.13)	-.07 (.14)	.03 (.16)
B.R.Rate	.77 (.29)	.43 (.38)	.38 (.39)	1.0 (.19)	.69 (.32)
EPL	.02 (.11)	.27 (.17)	.32 (.16)	.02 (.12)	-.06 (.14)
U.Density	-.27 (.37)	-1.1 (.39)	-1.2 (.42)	-.82 (.47)	-.20 (.38)
Tax Wedge	-.53 (.41)	.56 (.58)	.74 (.62)	-.48 (.54)	-.72 (.45)
Coordination	-.06 (.07)	-.02 (.07)	-.03 (.07)	-.10 (.07)	-.06 (.07)
Start-up costs		-.27 (.08)			
SUC*initial nsv			-.39 (.12)		
Minimum Wage				1.1 (.93)	
Product Market Regul.					.19 (.20)
Observations	106	106	106	94	106
Notes: Standard errors in brackets.					

Table 15: Common shocks and time-varying institutions: services

Dependent variable: Manufacturing employment ratio

	1	2	3	4	5
B. Duration	.23 (.25)	.41 (.18)	.39 (.18)	.06 (.24)	.28 (.22)
B.R.Rate	-.48 (.48)	.19 (.39)	.21 (.40)	-1.5 (.42)	-.57 (.41)
EPL	.05 (.22)	-.51 (.23)	-.55 (.25)	-.46 (.23)	-.07 (.28)
U.Density	-.24 (.38)	.97 (.36)	.91 (.38)	-1.1 (.40)	-.16 (.39)
Tax Wedge	1.5 (.73)	.08 (.63)	.17 (.66)	1.9 (.58)	1.3 (.77)
Coordination	-.05 (.15)	-.05 (.13)	-.02 (.14)	.09 (.14)	-.04 (.15)
Start-up costs		.50 (.10)			
SUC*initial nsv			.64 (.13)		
Minimum Wage				5.2 (.99)	
Product Market Regul.					.26 (.27))
Observations	106	106	106	94	106

Notes: Standard errors in brackets.

Table 16: Common shocks and time-varying institutions: manufacturing

2.4.2 Blanchard and Wolfers' identified shocks

Table 17, 18 and 19 show the results of the regressions using the shocks identified by B&W, i.e. labour demand shift, long-term interest rate and aggregate TFP growth. The first column shows the results of the model only with labour market institutions; column two includes start-up costs; column three substitutes start-up costs by the wage floor; and finally, the fourth column includes the overall OECD product market regulation index.

Dependent variable: Unemployment rate

	1	2	3	4
Labour Demand Shift	.18 (.12)	.18 (.11)	.20 (.12)	.18 (.12)
LR interest rate	.43 (.12)	.43 (.12)	.43 (.11)	.43 (.12)
Annual TFP growth	.51 (.24)	.51 (.22)	.43 (.30)	.50 (.24)
B. Duration	.38 (.09)	.41 (.09)	.37 (.11)	.39 (.10)
B.R.Rate	.02 (.01)	.04 (.01)	.01 (.02)	.02 (.01)
EPL	.07 (.04)	.00 (.04)	.06 (.09)	.07 (.04)
U.Density	.04 (.02)	.05 (.02)	.04 (.03)	.04 (.02)
Tax Wedge	.06 (.02)	.03 (.02)	.04 (.02)	.05 (.02)
Coordination	.50 (.15)	.57 (.15)	.14 (.31)	.52 (.17)
U.Coverage	-.36 (.37)	-.22 (.37)	-.34 (.57)	-.34 (.38)
ALMP	.02 (.02)	.01 (.03)	.05 (.04)	.02 (.02)
Start-up costs		.68 (.26)		
Minimum Wage			-2.9 (2.4)	
Product Market Regulation				.09 (.34)
Wald Test (3 shocks)	103	109	47	83
Observations	113	113	80	113

Notes: Standard errors in brackets.

When minimum wages are introduced, Ireland and Spain drop.

Table 17: Blanchard and Wolfers' shocks: unemployment

Dependent variable: Service employment ratio

	1	2	3	4
Labour Demand Shift	.04 (.11)	.05 (.13)	.56 (.15)	.06 (.15)
LR interest rate	1.1 (.16)	1.1 (.18)	.74 (.15)	1.1 (.18)
Annual TFP growth	.67 (.32)	.66 (.32)	.69 (.27)	.71 (.35)
B. Duration	-.12 (.06)	-.14 (.06)	.05 (.06)	-.14 (.06)
B.R.Rate	.00 (.01)	-.01 (.01)	.00 (.00)	.00 (.01)
EPL	-.05 (.03)	-.02 (.04)	-.02 (.03)	-.04 (.03)
U.Density	-.01 (.01)	-.02 (.01)	-.01 (.01)	-.01 (.01)
Tax Wedge	.01 (.01)	.02 (.02)	.01 (.01)	.01 (.02)
Coordination	-.09 (.13)	-.14 (.14)	-.13 (.18)	-.14 (.15)
U.Coverage	.10 (.31)	.02 (.30)	-.16 (.32)	.05 (.31)
ALMP	-.01 (-02)	-.00 (.02)	.02 (.01)	-.01 (.02)
Start-up costs		-.30 (.31)		
Minimum Wage			.39 (2.3)	
Product Market Regulation				-.23 (.49)
Wald Test (3 shocks)	149	159	89	128
Observations	113	113	80	113

Notes: Standard errors in brackets.
When minimum wages are introduced, Ireland and Spain drop.

Table 18: Blanchard and Wolfers' shocks: service employment

Dependent variable: Manufacturing employment ratio

	1	2	3	4
Labour Demand Shift	.08 (.10)	.09 (.08)	-.14 (.12)	.07 (.12)
LR interest rate	-.61 (.09)	-.60 (.08)	-.60 (.10)	-.61 (.09)
Annual TFP growth	-.42 (.18)	-.42 (.17)	-.53 (.18)	-.43 (.19)
B. Duration	.19 (.08)	.22 (.08)	.28 (.08)	.18 (.10)
B.R.Rate	-.01 (.01)	.01 (.01)	.00 (.01)	-.01 (.01)
EPL	-.01 (.03)	-.07 (.04)	.01 (.04)	–.00 (.04)
U.Density	-.01 (.01)	-.00 (.01)	-.01 (.01)	-.01 (.01)
Tax Wedge	.02 (.01)	.00 (.02)	.03 (.01)	.02 (.01)
Coordination	-.03 (.13)	.10 (.14)	.09 (.14)	-.06 (.14)
U.Coverage	-.36 (.37)	.28 (.37)	.05 (.38)	.04 (.31)
ALMP	.08 (.35)	-.05 (.02)	-.00 (.02)	-.03 (.02)
Start-up costs		.53 (.28)		
Minimum Wage			.43 (1.8)	
Product Market Regulation				-1.5 (.54)
Wald Test (3 shocks)	83	137	55	137
Observations	110	110	80	110

Notes: Standard errors in brackets.
When minimum wages are introduced, Ireland and Spain drop.

Table 19: Blanchard and Wolfers' shocks: manufacturing

All the three shocks are entered in levels and can be interpreted as deviations to the value in the first period of analysis, or as deviations to the country average. All shocks are imputed so their expected impact on unemployment is positive, which means that TFP growth has been multiplied by (-1).

Let us start with the three identified shocks of B&W. We have performed a Wald test to test for their joint significance and in all cases we can reject the hypotheses of all coefficients being zero. The shock "shift in labour demand" is in the unemployment regression close to be significant only at 10% significance level. In the rest of the regressions it is not significant. B&W do find that the labour demand shift is significant in their unemployment regressions. We also did

so when heteroscedasticity was not controlled for. Once robust standard errors are estimated, the significance of the labour demand shift disappears.

The other two shocks included in the specification, change in the long-term real interest rate and decrease in the TFP growth, are always significant. They increase unemployment, as expected, they decrease manufacturing employment, also as expected, and they increase service employment... not quite as expected. The positive impact on service employment of the secular increase in long-term interest rates could be the result of the existence of a spurious relationship.

The positive coefficient of annual TFP growth in the service regression becomes non-significant when the manufacturing to service labour productivity is controlled for. That is, the overall decrease in total factor productivity is picking up the decrease in service labour productivity (relative to manufacturing productivity). Hence, it makes sense that the sign of the shock is negative in the manufacturing regression and positive in the service one.

3 Daring to invest in job creation? The impact of risk-aversion on unemployment

Entrepreneurial activity is ultimately determined at the individual level. Start-up costs are one of the variables the individual takes into account when assessing the risks and rewards associated to entrepreneurship. But risk-aversion, or how much the individual weights the expected loss with respect to the possible revenue, is decisive for the outcome of such an assessment. This chapter addresses the impact of risk-aversion on the individual decision to become an entrepreneur, as well as on equilibrium unemployment and wages.

Knight in 1921 viewed entrepreneurs as the ultimate bearers of uncertainty. Either by financing a start-up with her own assets or by resorting to credit under full liability, the wealth of an entrepreneur is subject to substantial risk (in the middle ages it was not only the wealth of the entrepreneur but also her life what was at stake). If the entrepreneurial risk is not fully insured, the common assumption of risk-neutrality on firms might not be justified and, more importantly, might be missing part of the story.

Table 20 shows the percentage of respondents in different countries who answered affirmatively when asked whether the fear of failure would prevent them from starting a business.[24]

[24]The survey was commanded by the Global Entrepreneurship Monitor (GEM). It covered a random representative sample of 2000 adults in each country. The GEM is one of the few projects aiming at measuring entrepreneurship across countries. For more information please refer to www.gemconsortium.org.

Would the fear of failure prevent you from starting a business?	
Country	% YES
USA	19.1
Canada	23.7
UK	26.4
India	28.2
Finland	28.4
Australia	33.1
Spain	33.1
Japan	39.0
France	41.2
Italy	42.1
Germany	44.5
Source: GEM 1999	

Table 20: Fear of failure

The numbers of the table above can reflect one of two things, or, most likely, a combination of both: if risk-aversion is assumed, individuals are expressing their fear of failure because they weight more the expected losses than the expected gains, even if they are the same; if risk-neutrality is assumed instead, individuals are expressing their fear of failure because the expected losses are larger than the gains. Examination of the table suggests that, in either case, the fear of failure is preventing many potential entrepreneurs from starting a business. And given that firm creation has been found to be an important source of new jobs, we expect the fear of failure to have a sizeable effect on the employment performance of a country.

In this chapter we will explore the first possibility hinted above, i.e., we will assume that individuals are risk-averse and then explore the implications that such an assumption has on the labour market equilibrium. The next chapter will

assume instead risk-neutrality along with the existence of a cost of failure. Then we will analyse how changing the failure cost affects the supply of entrepreneurs and aggregate employment.

The basic ingredients required for the current analysis are three: (1) a model of equilibrium unemployment; (2) risky new business creation; and (3) risk-averse individuals.

With respect to the first ingredient, we model a labour market with frictions which is characterized by the coexistence of vacancies and unemployment. The heterogeneities are not modelled explicitly but through a matching function. Therefore the model owes much to Pissarides [2000]. However, the wage setting mechanism is not a Nash-bargain between the firm and the worker but wage posting prior to the search, in the spirit of Peters [1991], Montgomery [1991], Moen [1997] and Acemoglu and Shimer [1999, 2000]. In contrast to these papers, we assume that both workers and entrepreneurs are risk-averse (see in particular Acemoglu and Shimer [1999], who assume risk-averse workers but risk-neutral firms).

It is often said in business schools that successful new ventures require two things: a good idea and a good team. Following that spirit, we model the creation of new businesses as a two-stage process. During the first stage the firm tests the market for the business idea. This trial period requires an initial investment, that seed capital will come from the entrepreneur's own savings, and does not yield output or profits. The 1995 Eurostat study on "Enterprises in Europe" estimated the rate of failure of new entrants in the European Union to be 20% after the first year, going up to 35% after three years. Therefore, there is a substantial risk of the business failing before it makes a start. That risk will be called in this paper the *new entrant risk.* If the idea proves to be workable, the firm posts a vacancy to hire a worker and start production. The existence of labour market frictions introduces the uncertainty about the arrival of good workers to hiring firms. In

case of match failure the firm loses its initial investment. The risk due to the labour market frictions is associated to the production phase of the start-up and will be called *labour market risk.*

Both types of risks can be calculated by the entrepreneur, hence we are not before true and uninsurable uncertainty in the Knight sense. Therefore we need to assume that, even in that case, insurance markets are not complete. Then the assumption of risk-averse individuals can be justified.

One of the few models where firms are assumed risk-averse is Kihlstrom and Laffont [1979], who model the occupational choice of risk-averse individuals. In equilibrium, those more risk-averse choose optimally to be workers while those less risk-averse choose to become entrepreneurs. In this paper we do not model occupational choice, focusing instead on the labour market, which Kihlstrom and Laffont [1979] assume to be competitive. However, we will assume the same ranking of risk preferences that characterises their equilibrium for our calibrations.

The supply side of this paper bears similarities to the literature on portfolio choice with multiple assets under imperfect insurance: a risk-averse agent will have the choice to invest her initial assets in something risky, like starting a new business, or in something riskless. Costain [1999] is a good example of a paper of this body of literature that uses a similar set of assumptions -imperfect insurance and multiple assets- to study something totally different, namely, a business cycle propagation mechanism.

The stress on entrepreneurship, understood as the willingness to take risks or entrepreneurial spirit, as a key element of the macroeconomic performance of countries is to be found in the growing literature on entrepreneurship. Some articles measuring cross-country variations of entrepreneurship are Reynolds et al. [1994, 1995], Blanchflower [1998], and OECD Employment Outlook of July 1992, and July 2000. Empirical papers testing what might foster entrepreneurship

are Blanchflower and Oswald [1990], Alba-Ramirez [1994], Acs and Evans [1994], Evans and Leighton [1989], and Evans and Jovanovic [1989].

When entrepreneurs are assumed risk-averse, instead of risk-neutral, the labour market equilibrium is characterized by higher wages and fewer vacancies, that is, higher unemployment. Risk-aversion has two different, but reinforcing, effects on the equilibrium. First, it impacts on the wage decision of entrepreneurs. Risk-averse entrepreneurs will post higher wages in order to enhance the probability of finding a suitable worker for the post, or in other words, in order to reduce the *labour market risk*. Second, for every wage level, the risk-premium associated to the opening of a vacancy is now higher so the entrepreneurial option will be relatively less attractive. The result is an equilibrium with higher wages, fewer active firms, and more unemployment.

The following section of the paper describes the economy, workers and firms, the matching technology and the equilibrium. Section 2 of the chapter solves the model and section 3 demonstrates some comparative static results. In section 4 the model is calibrated and, finally, section 5 concludes.

3.1 The model

The model is static with a single matching round between firms and workers. As demonstrated by Acemoglu and Shimer [1999], this simple framework is able to capture important results about risk-aversion.

There is a continuum $[0, 1]$ of identical workers, in terms of productivity and reservation wage, all endowed with one unit of labour.[25] There is also a large number of identical potential firms endowed with some initial assets. We do not consider the existence of any financial institution in this chapter. There are two reasons for that. The first one is because we will introduce banks and study their

[25] Workers' heterogeneity is not modelled explicitely but implicitely in the matching function.

optimal behaviour with great detail in the next chapter. The second reason is because we want to capture the fact that the main source of capital of start-ups is the entrepreneur's own assets (or those of friends and family).

The value of production is assumed to be equal across firms, therefore, entrepreneurs' ability is assumed homogeneous. Under these simplifying assumptions there will be a unique wage in equilibrium.

Workers and firms have a continuous strictly increasing concave utility function over final consumption $u(x)$. Individuals consume an homogeneous good with price normalized to one.

3.1.1 Firms

All firms start off with the same level of initial assets A.[26] That level is assumed to be the same for all although that is not crucial for the analysis; an exogenous distribution of wealth could also be assumed.

Potential firms can become active, in which case they pay a cost, exogenously fixed at c, to enter the market with a new idea. That initial investment can be thought of as the cost of trying the market for the new idea before deciding to post a vacancy and start production. We could also think of it as the administrative cost of starting a new firm.

Only a proportion λ of new ventures go successfully through that initial period, which for convenience is assumed not to yield any output or profits. The remaining start-ups fail, which implies the loss of the initial investment c. Successful firms will hire a worker to start production. It is assumed that firms are small, each has one vacancy that is posted in the labour market with an associated wage.[27] Once the

[26] We do not model explicitly the financial sector so the only source of capital available to firms is their own initial endowment. Even if we modelled the financial sector, unless it was assumed perfect, the initial endowment of firms would be important. Banerjee and Newman [1993], Boadway et al. [1998] and Chamley [1983] show that under capital market imperfections only individuals with assets above a certain threshold become entrepreneurs.

[27] The number of active firms is equal to the number of vacancies open and each firm is

vacancy is in the market, it is matched with a suitable worker with probability η and it remains idle with probability $1-\eta$. In the latter case the start-up investment is lost. If the vacancy is filled, and therefore the job is created, production takes place. All potential firms have access to the same technology which requires one worker to produce p units of the consumption good.

Potential firms could also remain inactive from a productive point of view, investing in a riskless area yielding a known gross return ρ.

Figure 7 is intended to clarify the different possibilities open to the potential firm.

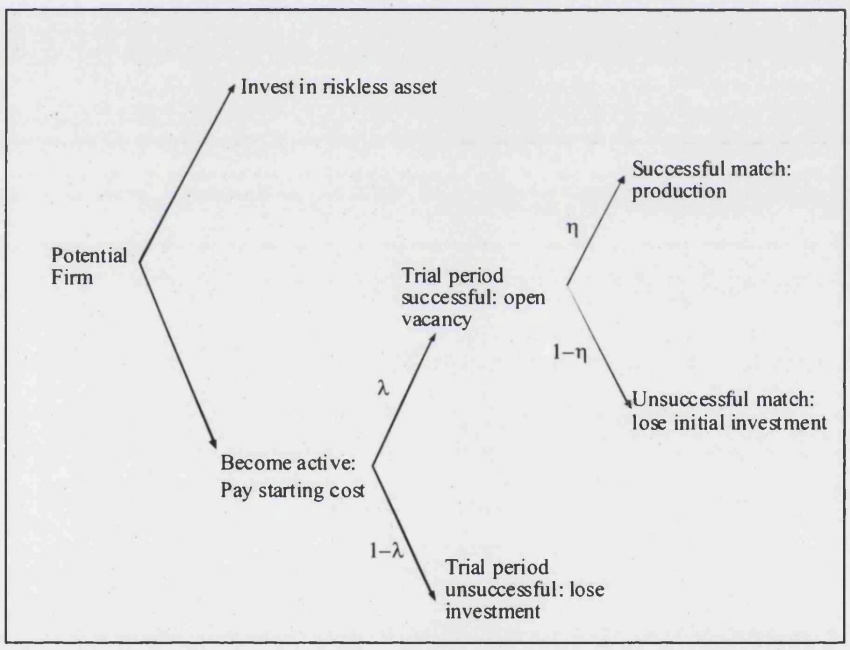


Figure 7: Alternatives open to the potential firm

The probability of successful business creation is the probability that the idea proves to be good times the probability that the entrepreneur finds a good team.

headed by one entrepreneur. Hence we will refer interchangeably to active firms, entrepreneurs or vacancies.

In that case, the payoff will be the profit after wages and start-up costs have been paid Thus, the expected utility from business creation is

$$E(\text{business creation}) = \eta\lambda u\,(A - c + p - w) + (1 - \eta\lambda)u\,(A - c) \qquad (3)$$

The absence of a capital market implies that wealth should be non-negative in all states of nature. That restriction imposes a lower bound on the initial level of wealth: $A \geq c$, i.e., the initial endowment is required to cover the initial opening cost of the firm.

3.1.2 Workers

There is a pool of identical workers, all of which are unemployed and searching for a job at the beginning of the period. We assume that when unemployed, a worker's consumption is equal to zero. Workers observe wages offered in the economy and apply for jobs on the basis of expected utility maximization. Depending on the application decisions of workers, there might be more competitors for some vacancies (with a certain wage associated) than others. The number of applicants for a certain vacancy will be the only determinant of the probability of being hired for that vacancy, which we denote by μ. Given that probability of exiting the unemployment pool, the expected utility of a searcher who applies to a wage w can be written as follows:

$$E(\text{worker}) = \mu u(w) + (1 - \mu)u(0) \qquad (4)$$

3.1.3 Matching

Firms and workers come together through search. There is a variety of arguments able to explain the coexistence of vacancies and unemployed in the market in a wage posting framework. Moen [1997] argues that the labour market is segmented

in sub-markets composed of a set of vacancies offering a certain wage and a set of searchers applying to that wage. The coexistence of vacancies and unemployed in the sub-markets is explained via standard search frictions. In the papers of Montgomery [1991] and Peters [1991] unemployment results from an uncoordinated application process by workers which leads to overcrowding in some jobs and no applications to others.

The number of matches is given by the matching function $m = m(u_j, v_j)$, where u_j is the number of searchers applying to the wage w_j and v_j is the number of vacancies offering that wage. The matching function is assumed to be homogenous of degree one, increasing in both arguments and concave.

In order to capture the fact that some vacancies might receive multiple applications within the period while others might receive none, the concept of "*expected queue length associated to a wage* w_j", denoted by q_j, is introduced. The expected queue is an endogenous measure of competition. It is defined as the ratio of applicants to the wage w_j to vacancies offering that wage:

$$q_j = \frac{u_j}{v_j} \in [0, \infty] \tag{5}$$

A vacancy will be matched to a worker and become a job with probability $\frac{m(u_j,v_j)}{v_j}$. Using the homogeneity assumption, and 5,

$$\frac{m(u_j, v_j)}{v_j} = m(q_j, 1) \equiv \eta(q_j) \tag{6}$$

with $\eta'(q_j) \geq 0$. Similarly, the probability at which the unemployed change status to become employed is $\frac{m(u_j,v_j)}{u_j}$, which, as above, can be rewritten as

$$\frac{m(u_j, v_j)}{u_j} = m(1, \frac{1}{q_j}) \equiv \mu(q_j) = \frac{\eta(q_j)}{q_j} \tag{7}$$

with $\mu'(q_j) \leq 0$.

The transition probabilities from vacancy to job, and from unemployment to employment, are therefore dependent on the expected queue associated to the wage.

The longer the expected queue, the higher the chances of finding a candidate for the post. On the other hand, if many applicants compete for the same post, the probability to be hired for each of them decreases.

3.1.4 Equilibrium

Definition

An *allocation* is a tuple $\{W, Q, U, V\}$ where $W \in R_+$ is a set of posted wages; $Q \equiv Q(W) : R_+ \longrightarrow R_+$ is the set of associated queues; $U \in R_+$ is workers' utility level and $V \in R_+$ is the expected utility from a vacancy opening..

An *equilibrium* is an allocation $\{W^*, Q^*, U^*, V^*\}$ such that:

- Given the expected queues associated to wages, $q^e(w)$, the expected utility from a vacancy is maximized:[28] $\forall w$,

$$V^* \geq \eta(q^e(w))\lambda u(A - c + p - w) + (1 - \eta(q^e(w))\lambda)u(A - c)$$

with equality if $w \in W^*$ and

- $V^* \equiv \sup\left[\eta(q^e(w))\lambda u(A - c + p - w) + (1 - \eta(q^e(w))\lambda)u(A - c)\right]$;

- The existence of a large number of potential firms ensures free-entry, which drives the utility gains from opening a vacancy to zero in equilibrium (*Vacancy Equilibrium Condition or VEC*):

$$\eta(q(w))\lambda u(A - c + p - w) + (1 - \eta(q(w))\lambda)u(A - c) \geq u(A\rho)$$

with equality if $w \in W^*$ and $q \in Q^*$;

- All wage offers deliver the same expected utility to workers: $\forall w, q(w)$,

$$U^* \geq \mu(q(w))u(w) + (1 - \mu(q(w)))u(0)$$

with equality if $w \in W^*$ and $q \in Q^*$ where

[28] Rational expectations imply that expectations are correct in equilibrium, $q^e(w) = q(w)$

$$U^* \equiv \sup\left[\mu(q(w))u(w) + (1-\mu(q(w)))u(0)\right].$$

Firms have to choose wages so, given the expected queue lengths, the expected utility from the vacancy is maximized. Free-entry drives the utility gains to zero. The optimal choice of firms is subject to each wage offer delivering the same expected utility to all workers. This sub-game equilibrium also implies that firms do not have any incentive to deviate from the profit-maximizing wage level.

Equilibrium unemployment is calculated as the number of workers not matched at the end of the period, which will depend on the equilibrium wage and associated queue:[29]

$$u^* = 1 - \mu(q^*)) \tag{8}$$

Characterization

The firms' maximization problem subject to all wage offers delivering the same expected utility to workers yields the same solution as its dual problem, the maximization of workers' utility subject to the Vacancy Equilibrium Condition.

We will solve the model by means of the second alternative, the optimal application problem of the workers. Thus the equilibrium will be characterized as follows:

If $\{W^*, Q^*, U^*, V^*\}$ is an equilibrium, then any $w \in W^*, q \in Q^*$ will solve the following constrained maximization problem

$$Max_{w,q}\mu(q)u(w) + (1-\mu(q))u(0)$$

$$s.t$$

$$\begin{aligned} \eta(q(w))\lambda u(A-c+p-w) + (1-\eta(q(w))\lambda)u(A-c) &= u(A\rho) \\ w &\geq 0 \end{aligned}$$

[29] To simplify notation we will omit the argument of the queue length and write q instead of $q(w)$.

Conversely, if some w', q' solve this program, then there exits an equilibrium $\{W^*, Q^*, U^*, V^*\}$ such that $w' \in W^*, q' \in Q^*, U^* = \mu(q')u(w') + (1 - \mu(q'))u(0)$ and

$$V^* = \eta(q')\lambda u(A - c + p - w') + (1 - \eta(q')\lambda)u(A - c)$$

An equilibrium always exists, as demonstrated by Acemoglu and Shimer (1999). Uniqueness follows from the curvature assumptions.

Montgomery [1991] and Moen [1997] prove that if firms were assumed heterogeneous in the value of production, then each would find it optimal to offer a different wage and there would be a distribution of wages in equilibrium. Acemoglu and Shimer [1999] show that if workers are different in terms of reservation wage or risk-aversion, the market gets segmented and each segment caters with the preferences of each type of workers. Even with identical workers but different search intensities there would be a distribution of wages in equilibrium. In this model, firms and workers are homogeneous so there will be only one equilibrium wage and associated queue.

3.2 Solving the model

A constant absolute risk aversion utility function for both firms and workers is assumed,

$$u(x) = -e^{-\gamma_s x}, s = f, \varpi \tag{9}$$

where γ_f is the coefficient of absolute risk-aversion of potential firms and γ_ϖ the coefficient corresponding to workers.

The optimal application problem of workers can be written as

$$Max_{w,q} \ -\mu(q)e^{-\gamma_\varpi w} - (1 - \mu(q)) \text{ s.t.} \tag{10}$$

$$\eta(q)\lambda e^{-\gamma_f(A-c+p-w)} + (1-\eta(q)\lambda)e^{-\gamma_f(A-c)} = e^{-\gamma_f A\rho}$$
$$w \geq 0$$

Denoting by Γ the Lagrange multiplier and recalling that $\eta(q) = \mu(q)q$, the three first-order conditions are given by

$$\gamma_\varpi e^{-\gamma_\varpi w} = -\Gamma q\lambda\gamma_f e^{-\gamma_f(A-c+p-w)} \tag{11}$$

$$1 - e^{-\gamma_\varpi w} = -\Gamma\lambda\left[e^{-\gamma_f(A-c+p-w)} - e^{-\gamma_f(A-c)}\right]\left[q + \frac{\mu(q)}{\mu'(q)}\right] \tag{12}$$

$$\mu(q)q\lambda e^{-\gamma_f(A-c+p-w)} + (1-\mu(q)q\lambda)e^{-\gamma_f(A-c)} = e^{-\gamma_f A\rho} \tag{13}$$

Dividing 12 by 11 and rearranging 13 we obtain

$$\frac{e^{\gamma_\varpi w^*} - 1}{e^{\gamma_f(p-w^*)} - 1} = \frac{\gamma_w}{\gamma_f}\left[\frac{1}{abs(\varepsilon_\mu)} - 1\right] \tag{14}$$

$$\mu(q^*)q^* = \frac{e^{-\gamma A\rho} - e^{-\gamma(A-c)}}{\lambda\left[e^{-\gamma(A-c+p-w^*)} - e^{-\gamma(A-c)}\right]} \tag{15}$$

where ε_μ is the elasticity of the transition probability from unemployment to employment with respect to the queue length.

Empirical work has shown that a log-linear approximation to the matching function fits the data well.[30] In that case, the functional relation between the number of matchings per period and the stock of unemployed and vacancies would be

$$m = u_j^\alpha v_j^{1-\alpha} \tag{16}$$

with transition probabilities

$$\mu(q_j) = q_j^{-(1-\alpha)} \tag{17}$$
$$\eta(q_j) = q_j^\alpha$$

[30] See Petrongolo and Pissarides [2001].

Given that matching function, the elasticity of the employment probability with respect to the queue length would be constant and equal in absolute value to the elasticity of matching to vacancies: $\varepsilon_\mu = -(1-\alpha)$. That is, given a certain stock of unemployment, 1% increase in the number of vacancies posting a certain wage (which is equivalent to 1% decrease in the queue associated to that wage) results in $(1-\alpha)\%$ increase in matchings. The fact that ε_μ is constant is a very convenient feature of the log-linear matching function because it implies that the equilibrium wage in this model does not depend on the expected queue length but on exogenous parameters.

If we assumed another matching function, that would not be the case anymore. To see that, let's assume that the only labour market frictions are lack of coordination of workers' actions. Then the number of matches that takes place at each application round can be written simply as

$$m = v_j \left[1 - (1 - \frac{1}{v_j})^{u_j}\right] \tag{18}$$

which for large v_j is well approximated by

$$m = v_j \left[1 - e^{-q_j}\right] \tag{19}$$

The elasticity of the employment probability with respect to the queue length can now be written as $\varepsilon_\mu = \frac{e^{-q_j} q_j}{1-e^{-q_j}} - 1$ with $\left\{ \begin{matrix} Limit_{q\to 0}\varepsilon_\mu = 0 \\ Limit_{q\to\infty}\varepsilon_\mu = -1 \end{matrix} \right\}$. One can see from expression 14 that the equilibrium wage would in that case decrease with the expected queue length. The way of understanding that negative relationship is the following. From the expression for the elasticity given above, $Limit_{q\to 0}\varepsilon_\mu = 0$. In that situation a worker will find it optimal to apply to the highest possible wage vacancy because the associated high queue will not have an impact on the employment probability. As the queue increases so does the elasticity of employment to the queue in absolute value, and the optimal wage decreases.

With either matching function the main qualitative results of the model are the same.

The system of equations 14 and 15 determine together the equilibrium values of the wage and queue length. Figure 8 shows graphically the equilibrium as the intersection of two curves in the (w, q) space. The first equation shows the equilibrium wage level which, assuming a Cobb-Douglas matching function, depends on the exogenous parameters of risk-aversion, productivity and elasticity of matching with respect to unemployment. On the other hand, 15 or the Vacancy Equilibrium Condition is upward-sloping. The reason is that, in equilibrium, a higher wage has to be associated with a longer queue so the expected utility gains from opening a vacancy are zero.

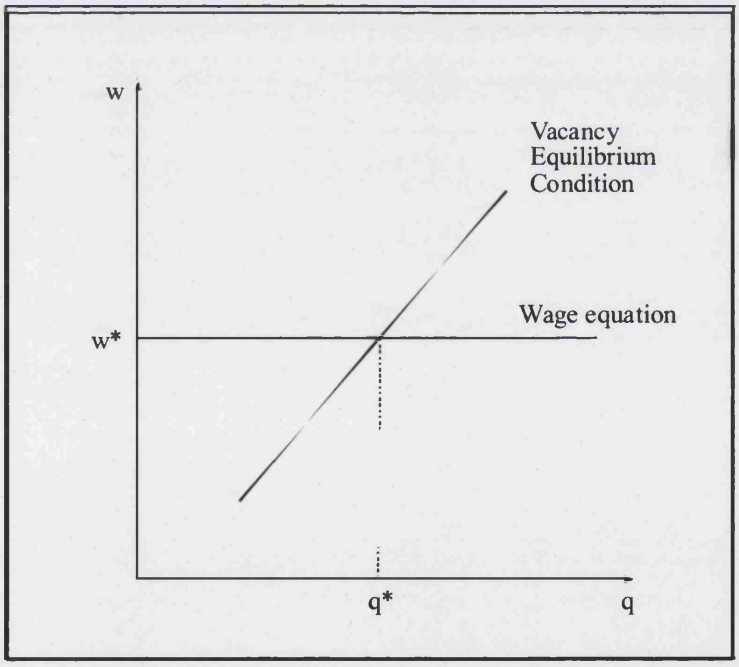


Figure 8: Equilibrium of the labour market

Given the parameters of the model, workers apply for a given wage. The

Vacancy Equilibrium Condition determines the equilibrium number of active firms associated to that wage level, and therefore the equilibrium unemployment.

3.3 Comparative Statics

The idea of this section is to examine how a change in parameters, specially of risk-aversion, affects the equilibrium wage and queue (and unemployment).

The section starts with the impact of workers' risk-aversion on equilibrium wages and unemployment.

Proposition 1 *Workers' risk-aversion decreases equilibrium wages and reduces equilibrium queues, which results in lower unemployment.*

Proof. See appendix 2. ■

Both entrepreneurs and workers face the *labour market risk*, that is, the risk of not being matched with an appropriate worker or vacancy because of the existence of labour market frictions. Risk-averse workers will try to avoid the risk of unemployment by applying to low wage vacancies, because their chances of being employed in them are higher. That is the explanation for the negative impact of workers' risk-aversion on equilibrium wages.

Workers' risk-aversion does not impact directly on equilibrium queues and unemployment. Equilibrium queues will only change as a response to the change in wages. Intuitively, as wages decrease, the expected utility from entrepreneurship increases so more firms will decide to become active. The equilibrium is restored because more vacancies imply shorter queues to every wage, which decreases the chances of firms to hire an appropriate worker for the post and, therefore, decreases the expected utility from the entrepreneurial venture back to the equilibrium level.

Acemoglu and Shimer [1999] find the same result in their model with risk-averse workers and risk-neutral firms. They go one step further and claim that firms respond to the wish of workers for low-wage jobs by creating low-quality

vacancies and therefore under-investing. That is why unemployment insurance might be efficient in this context.

Figure 9 shows graphically the impact of workers' risk-aversion on equilibrium.

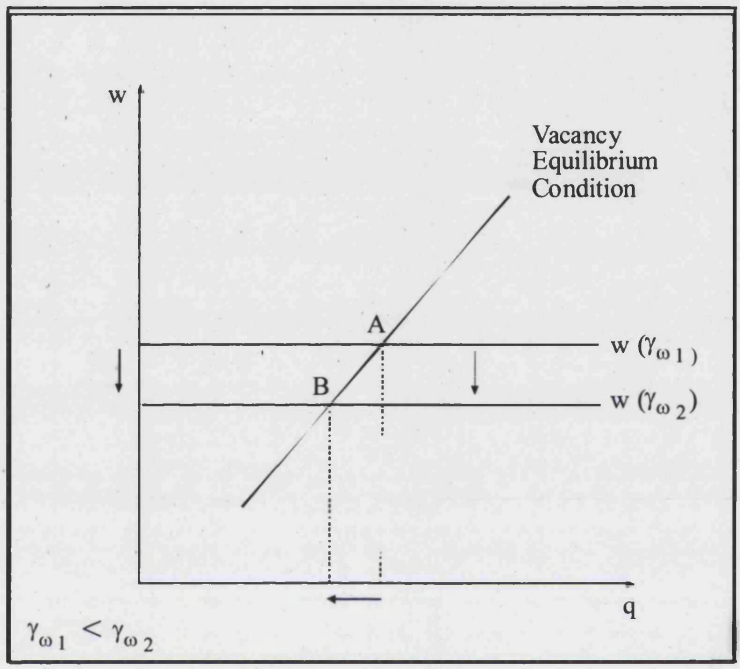


Figure 9: Impact of workers' risk-aversion on equilibrium

Starting from the equilibrium A, workers' risk-aversion decreases equilibrium wages. The new equilibrium is at B with a lower wage and a shorter queue (and therefore lower unemployment).

The contribution of this paper is, however, the analysis of how entrepreneurs' risk-aversion impacts upon the labour market equilibrium, which is what is analyzed next.

Entrepreneurs' risk-aversion affects the equilibrium unemployment in two reinforcing ways: first, it increases equilibrium wages, which in turn affects the queue length. Second, it increases the risk premium associated to the entrepreneurial venture for

every wage level, which decreases further the number of active firms in equilibrium.

Proposition 2 *Entrepreneurs' risk-aversion increases equilibrium wages and queues, which results in higher unemployment.*

Proof. See appendix 2. ■

For every wage level, an increase in risk-aversion will cause the risk-premium associated to entrepreneurship to increase, so there will be less active firms in the equilibrium. But the wage level is also affected by entrepreneurs' risk-aversion. The reason is the same as in the case of workers' risk-aversion, i.e. to reduce the *labour market risk*. Risk-averse entrepreneurs will try to reduce the risk of not being matched with a worker in a labour market with frictions by posting higher wages. Higher wages reduce the expected utility from opening a vacancy so the equilibrium number of active firms will decrease further, and correspondingly, unemployment will increase.

Figure 10 shows graphically the impact of entrepreneurs' risk-aversion upon equilibrium.

•

Once again, the departing point is at A. Entrepreneurs' risk-aversion increases equilibrium wages on the one hand. On the other hand, it shifts the Vacancy Equilibrium Condition to the right because now for every wage level the expected utility associated to opening a firm is lower.

Risk-sharing could have potential important effects on the labour market. According to the model, insuring entrepreneurs against the *labour market risk* would decrease equilibrium wages and make the entrepreneurial venture more attractive for risk-averse individuals. Insuring entrepreneurs against the *new entrant risk* would not affect directly wages but still encourage more individuals to become entrepreneurs. Fan and White [2002] propose in their paper to increase the bankruptcy exemption levels to provide partial wealth insurance to risk-averse entrepreneurs.

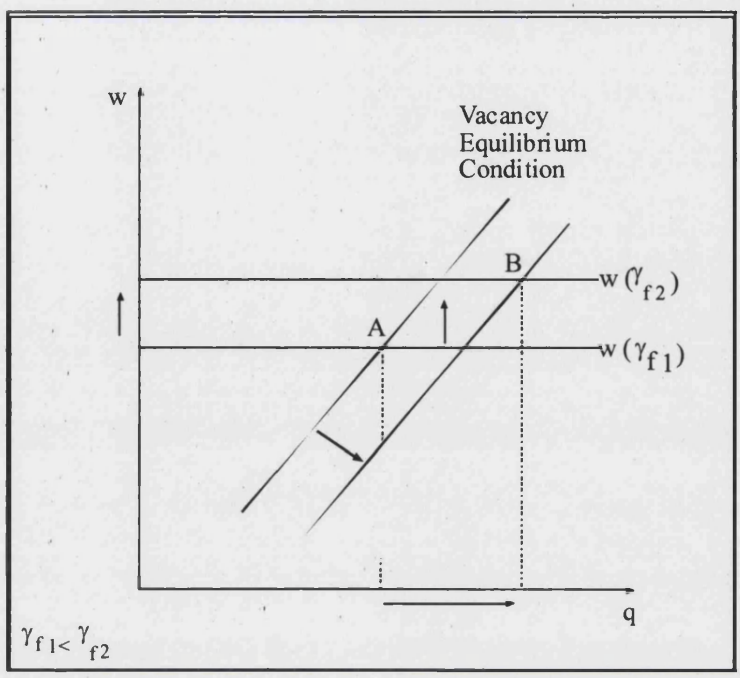


Figure 10: Impact of entrepreneurs' risk-aversion on equilibrium

We will come back to the potential benefits of changing the bankruptcy law in the next chapter.

Apart from the risk-aversion coefficients, the paper considers other parameters of interest, such as the start-up cost, the interest rate or the entrepreneurs' wealth. The next proposition explores briefly the impact of each of such parameters on equilibrium.

Proposition 3 *Productivity increases the equilibrium wage and reduces equilibrium queues and unemployment. An increase in the initial level of assets, riskless return, starting cost, and new entrant risk increases equilibrium queues and unemployment but does not change the equilibrium wage.*

Proof. See appendix 2. ■

Productivity increases equilibrium wages, which impacts negatively on employment. However, productivity has also a direct impact on the expected utility from a

vacancy. It can be proven that the latter effects dominates. Hence the effect of productivity is to increase equilibrium wages and to reduce queues and unemployment.

The impact of an increase in the initial assets of potential firms will be to decrease the number of firms in equilibrium. Therefore the equilibrium queue and unemployment will increase. This result holds only under constant absolute risk-aversion utility function. If we assumed instead a constant relative risk-aversion function, an increase of assets would reduce relative risk-aversion and, therefore, increase the number of vacancies in equilibrium.

An increase in the riskless gross return and the *new entrant risk* (that is, a decrease in λ) will discourage potential firms and result in an increase in equilibrium queue length and unemployment. Increasing the start-up cost will unambiguously increase unemployment, which is consistent with the empirical evidence given in the previous chapter. Under the assumption of a log-linear matching function, all those parameters will not change the equilibrium wage. They will only affect the equilibrium number of active firms. If another matching function, like the one given in 19 was assumed, an increase in the parameters would increase the equilibrium queue and decrease the wage.

3.4 Calibration

To get an idea of the impact on equilibrium of the two main parameters, workers' and entrepreneurs' risk-aversion, the model has been calibrated. The equilibrium wage, queue and unemployment are given respectively by 14, 15 and 8. The assumed matching function is the one in 19, which has the advantage of delivering properly bounded transition probabilities.

The table below gives the values of the parameters used in the calibration:

Parameter values	
Productivity (p)	4
Initial assets (A)	1
Gross riskless return (ρ)	1.1
Starting cost (c)	0.1
New entrant success (λ)	0.9

Table 21: Parameter values

The assumed parameters are a bit extreme in order to deliver reasonable unemployment rates in a model without job destruction (and still the unemployment rates are very high).

3.4.1 Impact of workers' risk-aversion on equilibrium

Table 22 gives the equilibrium values of the wage, queue and associated unemployment as the workers' absolute risk-aversion parameter changes from 1 to 4. Entrepreneurs' risk-aversion coefficient is assumed to be equal to 1.[31]

	$\gamma_w = 1$	$\gamma_w = 2$	$\gamma_w = 3$	$\gamma_w = 4$
w^*	2.72	2.15	1.74	1.46
q^*	0.33	0.27	0.25	0.25
unemployment rate	14%	12%	11%	11%

Table 22: Workers' risk-aversion

Risk-averse workers apply for lower wage jobs to avoid the unemployment risk. The only impact of workers' risk-aversion on the equilibrium queue and unemployment rate is through that effect on wages. Lower wages increase the expected utility from opening a business and therefore the equilibrium will be

[31] According to Kihlstrom and Laffont [1979], we assume that the absolute coefficient of risk-aversion of entrepreneurs is smaller than the corresponding to workers.

characterized by more firms, and less unemployment. However the effect of risk-aversion on queues and unemployment seems to fade out soon.

3.4.2 Impact of entrepreneurs' risk-aversion on equilibrium

Table 23 shows the impact on equilibrium of the entrepreneurs' risk-aversion. Workers' risk-aversion is assumed to be 4.

	$\gamma_f = 1$	$\gamma_f = 2$	$\gamma_f = 3$	$\gamma_f = 4$
w^*	1.46	1.66	1.87	2.05
q^*	0.25	0.46	0.69	0.95
unemployment rate	11%	19%	27%	35%

Table 23: Entrepreneurs' risk-aversion

The impact of entrepreneurs' risk-aversion on unemployment is much larger. The reason is that the absolute coefficient of risk-aversion affects both the wage level and the risk-premium from entrepreneurship. Both effects reinforce each other and increase the equilibrium queue and unemployment. Recall that there is not job destruction so the unemployment rates are disproportionately large. In spite of that, the table shows that assuming risk-averse entrepreneurs, instead of the traditional risk-neutrality assumption can explain a large rise in the equilibrium unemployment rate. And contrary to what happened with workers' risk-aversion, further increases in entrepreneurs' risk-aversion continue having an important impact on the unemployment rate.

3.5 Conclusion

The aim of this chapter was to examine the impact of risk preferences on labour market performance when, not only workers, but also firms are assumed risk-averse. Small and entrepreneurial firms are becoming the main source of new jobs

in developed economies. The main role of the entrepreneur, according to Knight [1921], is to be the bearer of true or uninsurable uncertainty. Hence the interest of examining how changing the traditional risk-neutrality assumption by the, perhaps more realistic, risk-aversion one impacts upon the equilibrium of the labour market.

We model a labour market where unemployment coexists with vacancies due to the existence of frictions, and where opening a vacancy is a risky business. Risk-averse entrepreneurs post higher wages in order to reduce the labour market risk, or in other words, to enhance the probability of match with an appropriate worker. That increase in wages harms employment by reducing expected profits from entrepreneurship. Besides, risk-aversion increases the risk-premium associated to starting a business. Both effects result in an equilibrium with less active firms, and more unemployment. The calibrations suggest that the impact on the labour market equilibrium of moving away from risk-neutrality is large. Hence, risk-sharing policies could have important implications for unemployment.

3.6 Appendix 2

3.6.1 Proof of proposition 1

We start from expression 14 which gives the equilibrium wage as an implicit function of the risk-aversion parameters, productivity and elasticity of the matching function. Reordering we get the following expression:

$$F(w,\gamma_\varpi,\gamma_f,p,\alpha)=\frac{\gamma_\varpi}{\gamma_f}\overline{\alpha}\left(e^{\gamma_f(p-w)}-1\right)+1-e^{\gamma_\varpi w}=0 \tag{20}$$

where $\overline{\alpha}\equiv\left(\frac{\alpha}{1-\alpha}\right)$. The partial derivative of $F(w,\gamma_\varpi,\gamma_f,p,\alpha)$ with respect to γ_ϖ is given by

$$\frac{\partial F}{\partial\gamma_\varpi}=\frac{\overline{\alpha}}{\gamma_f}\left(e^{\gamma_f(p-w)}-1\right)-we^{\gamma_\varpi w}$$

Using the equilibrium expression for wages, 14 and the first order linear approximation to $e^{\gamma_\varpi w}$ around $w=0: e^{\gamma_\varpi w}\approx 1+\gamma_\varpi w+R_2$ we get

$$\frac{\partial F}{\partial\gamma_\varpi}=-\gamma_\varpi w\leq 0 \tag{21}$$

- The derivative of $F(w,\gamma_\varpi,\gamma_f,p,\alpha)$ with respect to the wage is

$$\frac{\partial F}{\partial w}=-\gamma_\varpi\left[\overline{\alpha}e^{\gamma_f(p-w)}+e^{\gamma_\varpi w}\right] \tag{22}$$

Using the implicit function rule, we can now write the partial derivative of equilibrium wages with respect to workers' risk-aversion:[32]

$$\frac{\partial w^*}{\partial\gamma_\varpi}=\frac{-w}{\overline{\alpha}e^{\gamma_f(p-w)}+e^{\gamma_\varpi w}}\leq 0 \tag{23}$$

The next step is to explore how workers' risk-aversion affects equilibrium queues through the impact on wages. Assuming a Cobb-Douglas matching function, the

[32]The implicit function rule states that given the implicit function $F(y,x_1,x_2,...)=0$, whenever the explicit function $y=f(x_1,x_2,...)$ exists, the partial derivatives of f will be given by $\frac{\partial y}{\partial x_i}=-\frac{F_i}{F_y}$. The requirement for existence is the continuity of the derivatives F_i with $F_y\neq 0$.See Chiang [1987] , page 210.

equilibrium queue is given by:

$$q^* = \left\{ \frac{e^{-\gamma_f A\rho} - e^{-\gamma_f (A-c)}}{\lambda \left[e^{-\gamma_f (A-c+p-w^*)} - e^{-\gamma_f (A-c)} \right]} \right\}^{\frac{1}{\alpha}} \tag{24}$$

The change in the queue as the workers' risk-aversion and equilibrium wage varies is then

$$\frac{\partial q^*}{\partial \gamma_\varpi} = -\Lambda q^\alpha \left(\gamma_f \frac{\partial w^*}{\partial \gamma_\varpi} \right) \frac{e^{-\gamma_f (A-c+p-w^*)}}{e^{-\gamma_f (A-c+p-w^*)} - e^{-\gamma_f (A-c)}} \leq 0 \tag{25}$$

where $\Lambda = \frac{1}{\alpha} \left\{ \frac{e^{-\gamma_f A\rho} - e^{-\gamma_f (A-c)}}{\lambda \left[e^{-\gamma_f (A-c+p-w^*)} - e^{-\gamma_f (A-c)} \right]} \right\}^{\frac{1-\alpha}{\alpha}} > 0.$

3.6.2 Proof of proposition 2

The partial derivative of $F(w, \gamma_\varpi, \gamma_f, p, \alpha)$ with respect to γ_f is given by:

$$\frac{\partial F}{\partial \gamma_f} = \frac{\gamma_\varpi}{\gamma_f} \overline{\alpha} \left[\frac{1 - e^{\gamma_f (p-w)}}{\gamma_\varpi} + (p-w) e^{\gamma_f (p-w)} \right] \tag{26}$$

We can use a first order linear approximation to $e^{\gamma_f (p-w)}$ around the point $p - w = 0 : e^{\gamma_f (p-w)} \approx 1 + \gamma_f (p-w) + R_2$. Substituting back into 26 we obtain

$$\frac{\partial F}{\partial \gamma_f} = \gamma_\varpi \overline{\alpha} (p-w) \geq 0 \tag{27}$$

The partial derivative of equilibrium wages to entrepreneurs' risk-aversion is then

$$\frac{\partial w^*}{\partial \gamma_\varpi} = \frac{\overline{\alpha}(p-w)}{\overline{\alpha} e^{\gamma_f (p-w)} + e^{\gamma_\varpi w}} \geq 0 \tag{28}$$

Hence, entrepreneurs' risk-aversion increases equilibrium wages.

We turn now to show the impact, for every wage level, of risk-aversion on the risk-premium associated to entrepreneurship. The proof is based on a textbook graphical representation of choice under uncertainty. We are considering a model in which both entrepreneurs and workers are risk-averse, that is, their utility function is increasing with consumption and concave. Equivalently, the certainty equivalent

of the gamble always lies to the left of the expected value of it, the difference being the risk premium. At the initial equilibrium the Vacancy Equilibrium Condition is holding, that is, the certainty equivalent of the gamble of opening a vacancy is equal to the return from the riskless asset. Entrepreneurs' risk-aversion implies, given the level of wages, an increase in the risk premium. The result is that the certainty equivalent of the gamble falls now below the riskless investment return. Rational entrepreneurs will prefer to invest their money in the riskless alternative so fewer vacancies are open. The equilibrium is restored because fewer vacancies imply longer expected queues associated to the posted wages and, therefore, higher chances of match which increase the expected utility from opening a vacancy. The process continues until the expected utility from the risky asset is again equal to the one from the riskless alternative and a new equilibrium is reached, with fewer vacancies in the market.

In figure 11 the certainty equivalent of the gamble is denoted by I^*. At the initial equilibrium $I^* = A\rho$, where $A\rho$ is the outside option. When risk-aversion increases, the utility function becomes more concave and therefore the certainty equivalent falls to $I^{*'}$ which is below $A\rho$. Now the utility associated to the riskless asset, $u(A\rho)'$, is above the one associated to the gamble of opening a vacancy. Entrepreneurs will invest their wealth in the riskless asset and therefore less vacancies will be open.

3.6.3 Proof of proposition 3

We consider here the impact of productivity, wealth, riskless return, starting cost and new entrant risk on the labour market equilibrium. Of all the parameters, only productivity affects equilibrium wages. Assuming a Cobb-Douglas matching function, all the rest of parameters will impact only on equilibrium queues.

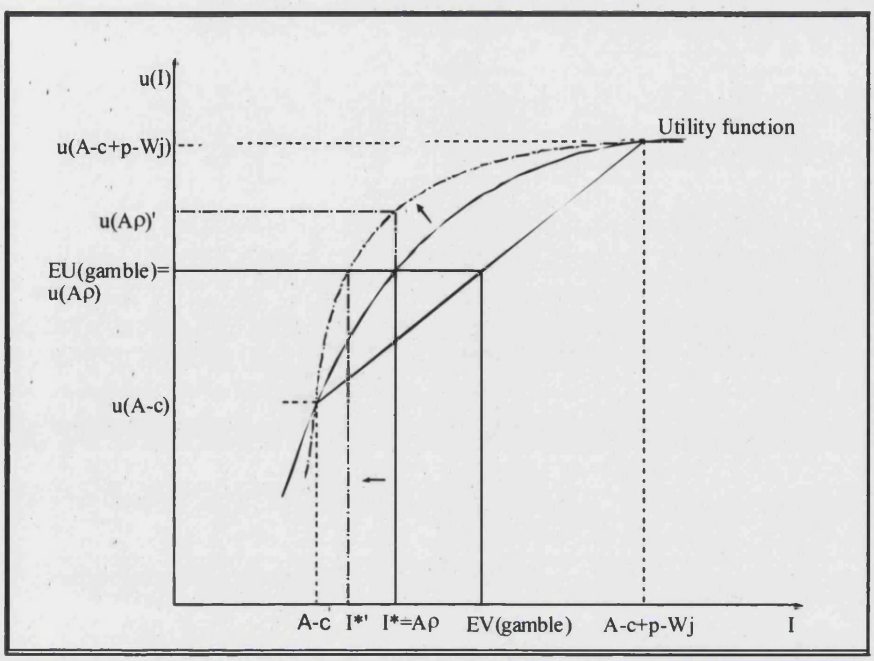


Figure 11: Impact of risk-aversion on the equilibrium number of active firms, holding wages constant

Starting from expression 20 and using again the implicit function rule, the derivative of equilibrium wage with respect to productivity is

$$\frac{\partial w^*}{\partial p} = \frac{\overline{\alpha} e^{\gamma_f (p-w)}}{\overline{\alpha} e^{\gamma_f (p-w)} + e^{\gamma_\varpi w}} 0 \leq \frac{\partial w^*}{\partial p} \leq 1 \tag{29}$$

that is, an increase in productivity affects positively wages, but less than proportionally.

The derivative of the equilibrium queue with respect to productivity can now be written as

$$\frac{\partial q^*}{\partial p} = \Lambda q^{\alpha} \gamma_f \left(1 - \frac{\partial w^*}{\partial p}\right) \frac{e^{-\gamma_f (A-c+p-w^*)}}{e^{-\gamma_f (A-c+p-w^*)} - e^{-\gamma_f (A-c)}} \leq 0 \tag{30}$$

where $r = \rho - 1$. The partial derivative with respect to the rest of the parameters are:

$$\frac{\partial q^*}{\partial A} = -\Lambda \frac{\gamma r e^{-\gamma A \rho}}{\lambda \left[e^{-\gamma (A-c+p-w^*)} - e^{-\gamma (A-c)}\right]} \geq 0 \tag{31}$$

$$\frac{\partial q^*}{\partial \rho} = -\Lambda \frac{\gamma A e^{-\gamma A \rho}}{\lambda \left[e^{-\gamma(A-c+p-w^*)} - e^{-\gamma(A-c)}\right]} \geq 0 \tag{32}$$

$$\frac{\partial q^*}{\partial c} = -\Lambda \frac{\gamma e^{-\gamma A \rho}}{\lambda \left[e^{-\gamma(A-c+p-w^*)} - e^{-\gamma(A-c)}\right]} \geq 0 \tag{33}$$

$$\frac{\partial q^*}{\partial \lambda} = \frac{-\Lambda q^{\alpha}}{\lambda} \leq 0 \tag{34}$$

with $\Lambda = \frac{1}{\alpha}\left\{\frac{e^{-\gamma_f A \rho} - e^{-\gamma_f (A-c)}}{\lambda\left[e^{-\gamma_f (A-c+p-w^*)} - e^{-\gamma_f (A-c)}\right]}\right\}^{\frac{1-\alpha}{\alpha}} > 0$. Note that $\left[e^{-\gamma(A-c+p-w^*)} - e^{-\gamma(A-c)}\right] <$ 0.

4 Bankruptcy cost and entrepreneurial activity

The previous chapter focused on the effect of risk-aversion on the individual decision to become an entrepreneur. We then analysed how changes in the equilibrium number of entrepreneurs affected aggregate unemployment and wages. However, we did not model the individual occupational choice in the traditional way, i.e. as a decision between entrepreneurship and dependent employment; nor did we model a financial market. Potential firms were endowed with some initial assets that could be invested in a new venture or in a riskless alternative. We saw that some kind of wealth insurance could have a sizeable impact on the labour market equilibrium when entrepreneurs are assumed risk-averse. Such possible insurance could be provided, for example, by the bankruptcy exemption levels considered in the bankruptcy law.

In this chapter we analyse other ways in which the bankruptcy law could impact the individual decision to become an entrepreneur, and aggregate employment performance. We model the occupational choice of a risk-neutral individual with a given entrepreneurial ability and a business idea. The individual chooses between becoming an entrepreneur, to which a positive probability of failure is associated, and becoming a dependent employee. Failure in the model is costly; the cost is determined by bankruptcy law.

There has traditionally been a sharp divide between continental Europe and the anglo-saxon countries in their approach to bankruptcy. In Europe, most bankruptcy schemes consider the interest of the creditors of greatest importance. That is why in all such schemes the right of the creditors to petition for the debtor's bankruptcy is predominant. Under the German bankruptcy scheme, for example, debtors used to remain liable for what had not been paid off upon completion of the bankruptcy. In other words, early discharge, understood as the release of

the debtor from personal liability, was not considered in the law. The German government reformed the law in 1999 to allow for automatic discharge after seven years. The Netherlands, Belgium or France, who had in place similar systems, have also reformed the law to change its emphasis from protecting the creditors' interest to protecting the debtors'.

The idea behind the reforms is to give those who have failed honestly a second chance by taking away the stigma of failure and reducing its financial cost. That is precisely the philosophy of the anglo-saxon countries' bankruptcy law. In the US, for example, automatic discharge of all debts is allowed after 3-4 months. In the UK the period was of three years but a recent reform, passed in 2001, decreased the discharge period for honest bankrupts to six months.[33]

The reason for passing reforms aimed at changing the focus of interest of the bankruptcy law, from creditors to debtors, is to encourage the small business set-ups, given the increasing evidence that tough bankruptcy laws prevent individuals from undertaking new entrepreneurial ventures. Eurobarometer, for example, reported in 2001 that 46% of Europeans, against 25% of North-Americans, agreed with the statement "one should not start a business if there is a risk it might fail".[34] Among the risks most feared by Europeans were the risk of losing one's property and the risk of going bankrupt. As we saw in the previous chapter, the Global Entrepreneurship Monitor has found similar percentages when individuals have been asked whether the fear of failure was preventing them from starting a business. What is behind the bankruptcy law reforms is maybe best described by Birch [1987], who wrote in his book "Job Creation in America":

[33] In the US that is the case only when the individual has not used the fast discharge clause in the previous six years. See N. Huls [1994] and the consultation document issued by the Insolvency Service of the Department of Trade and Industry entitled "Bankruptcy, a fresh start."

[34] Flash Eurobarometer 134 "Entrepreneurship". Realised by EOS Gallup Europe upon request of the European Comission (Directorate General "Enterprise"). November 2002.

> One of our greatest strengths as a nation is our capacity for failure. The grace and even enthusiasm with which we accept those who try and fail and come back again. (Birch 1987, page 7)

However, by decreasing creditors' rights and exposing them to higher risks, the reforms of the bankruptcy law undertaken by many European governments could jeopardise the access to external finance to young and small companies. There is some evidence in this respect. Using a database of 49 countries to analyse the relationship between the quality of creditors' protection and capital markets, La Porta et al. [1996] concluded that entrepreneurs had better access to external finance in those countries where the legal environment was able to protect adequately potential financiers. Gaillot [1998] studied the French bankruptcy law and arrived to the conclusion that "protecting insolvent firms at the expense of creditors has done little to protect employment." Gropp, Scholz and White [1996] have found a significant negative relationship between bankruptcy laws (measured as asset exemption level in case of bankruptcy) and interest rates in the different states of USA.

Hence reforming the bankruptcy law may be an effective tool to encourage new start-ups. But at the same time, it increases creditors' loss exposure which might damage the terms of credit the new entrepreneurs face. That latter effect can be of importance in countries where commercial banks are the main source of external finance to entrepreneurs. In other countries, like the United States where informal and formal venture capital flows are also quite important, the negative effect of a lax bankruptcy law upon the credit market might not affect potential entrepreneurs' access to finance.

The purpose of this chapter is to construct a general equilibrium model to investigate the impact of reforming the bankruptcy law upon the capital market, the equilibrium supply of entrepreneurs, and the aggregate employment. The

contribution of the chapter is threefold. First, we provide a theoretical framework to study the interactions between the bankruptcy law and the capital market. By using this we can explore the conditions under which the reform of the bankruptcy law jeopardises entrepreneurs' access to finance most. Second, we analyse the full impact that softening the bankruptcy law may have on the equilibrium number of entrepreneurs, taking into account the effect of the reform on the incentive structure of individuals and on the capital market.

The third contribution of the paper is the analysis of the effect of bankruptcy law reform on aggregate employment. For that purpose we assume that job creation of entrepreneurs is proportional to their capital investment. Softening the bankruptcy law will increase the number of new entrepreneurs but induce each of them to invest less in capital and, therefore, to create less employment. We show that initial decreases of the cost of failure have a positive impact on aggregate employment because the initial encouragement of entrepreneurship offsets any other effects of the reform. But further reductions of the cost of failure can decrease employment because, even when there are more new entrepreneurs, each of them employs less people. Hence we find a "Laffer-like" relationship between employment and cost of failure.

The model presented in this chapter belongs to the literature on occupational choice with heterogenous agents started in the late 70s, where the supply of entrepreneurs was determined by the distribution of individual characteristics. Kihlstrom and Laffont [1979], for example, explained the supply of entrepreneurs in an economy where agents differed in risk-aversion. Banerjee and Newman [1993], Boadway et al. [1998] and Chamley [1983] explained the individual occupational choice by means of the income distribution. In Lucas [1978] the classical theory of the firm is reconciled with the fact that firms of different size co-exist in the same industry. Lucas explained this by the existence of an exogenous distribution of

managerial talent that divided the population between employers and employees and, then, determined optimally the allocation of resources across employers. We take from Lucas [1978] the existence of an exogenous distribution of managerial talent across the population but assume that it affects only the individual decision to become an entrepreneur, not the size of the firm. The size of firms will depend solely on the cost of capital, which is endogenous in this model.

Contrary to what it was assumed in the previous chapter, individuals have no initial endowments which means that they have to resort to external finance sources to start their businesses. The seed capital will be provided by a competitive banking sector with imperfect information about the true probability of success of start-ups. That assumption is thought to accommodate the lack of credit or production history of start-ups, which makes it difficult for banks to assess their real success probabilities. We claim that, in this context, the bankruptcy law will affect the optimal behaviour of banks and therefore the terms of credit available to entrepreneurs. The reason is that softening the law will encourage less able individuals to try and start a new venture. Banks will observe an increase in the average probability of default and react by increasing the interest rates they charge upon the entrepreneurial loans.

The inclusion of a credit market with asymmetric information implies that we use some of the tools and concepts of the literature initiated by Stiglitz and Weiss [1981] on credit market imperfections. They suggested that consumer credit-constraints exist because some consumers would default in a credit market with imperfect information.[35] The decision to default is not modelled in their paper: it is assumed that some consumers exogenously default. In this chapter, however, the

[35]There is a large literature on credit market imperfections. See the survey by Jafee and Stiglitz in the Handbook on Monetary Economics, volume II [1990]. See also Bester [1985], Blinder and Stiglitz [1983], Greenwald et al. [1984], Greenwald and Stiglitz [1986], Stiglitz and Weiss [1983, 1987] and Riley [1987].

decision to default is endogenous. However, note that this paper is not intended to be a contribution to that body of literature. We just borrow some of its tools to study the impact of the bankruptcy law on employment, which is the ultimate objective of the chapter.

The first section of the chapter describes the basics of the model, the occupational choice of individuals between entrepreneurship and dependent work, how the banks set optimally their interest rates and the equilibrium. Section 2 studies some comparative statics. Section 3 analyses the impact of the bankruptcy law upon aggregate employment and, finally, section 4 concludes.

4.1 The model

Consider an economy with an entrepreneurial and an established-firms or contract sector. We will start assuming that the entrepreneurial sector is at its simplest: entrepreneurs are self-employed and do not hire people. This simplification allows us to focus on the impact of the bankruptcy law on the number of entrepreneurs. Later on, when we turn to the analysis of how the reform of the law affects aggregate employment, it will be assumed that entrepreneurs decide optimally how many people to employ. The contract sector is competitive so anyone who wants to find a job can do so.

There is a continuum $[0,1]$ of individuals who differ in their entrepreneurial ability, or managerial talent, as Lucas [1978] called it. This is defined as the talent to manage the production from a business idea of random quality. Two individuals with the same idea but different entrepreneurial abilities will get different returns from production; it will be always higher for the person better suited to be an entrepreneur. Entrepreneurial ability is only relevant for entrepreneurs; it does not play any role if the individual opts to become a dependent employee.

There is a large number of identical banks endowed with one unit of capital

(deposits are not model). Banks have two investment possibilities: risky entrepreneurial projects and some investment with known return. The former are risky because there is a positive probability of default on entrepreneurial loans, after which the bank loses its investment. Since individuals have no initial assets, banks cannot ask for collateral to reduce the risk of default.[36]

4.1.1 Occupational choice of individuals

Let

$$Ey(\alpha, p, x) = \alpha p + Ex \tag{35}$$

be the expected production value of an individual who decides to become an entrepreneur. Production is dependent on three variables. The first input is the individual's entrepreneurial ability, denoted by α and distributed uniformly across the population $[0, 1]$. Managerial talent is assumed to be private information. We assume as well that it is a necessary input to production in the entrepreneurial sector.

The second component is an observable and verifiable general productivity parameter, denoted by $p \in (\underline{p}, \overline{p})$. The general productivity can be thought to change with the economic cycle, increasing in booms and decreasing in recessions. It could also be thought to characterize the technology level of an economy. The introduction of such a parameter reflects the macroeconomic framework in which the entrepreneur operates, a key element in the success or failure of any new venture.

The last component of the production function is a business idea whose idiosyncratic quality level is taken from a random distribution $G(x)$ with support $[0, 1]$. One can think about a pool of available ideas from which the entrepreneur picks one at

[36] The results would still apply if we assumed that some potential entrepreneurs have insufficient initial wealth.

random. The quality of the idea does not depend on the entrepreneurial ability of the individual (that is, the distribution $G(x)$ is the same for all individuals). But, given a certain business idea, an individual more talented should be able to get a higher production return. The value of x is revealed to the entrepreneur only after production has started. To simplify proofs and exposition we will assume hereafter that the random variable x follows a uniform distribution.

To become an entrepreneur the individual requires one unit of seed capital, which is provided by a commercial bank. That assumption accommodates the well established fact in the small business finance literature that the main external source of finance of start-ups is debt.[37]

Bank and entrepreneur write the following contract:

	Bank	Entrepreneur
Failure	0	$-f$
Success	R	$y(\alpha, p, x) - R$

In case of entrepreneurial failure, to be defined below, the bank recovers nothing and the entrepreneur pays an exogenous failure cost f, which is the policy parameter of the model. We are aware that the assumption that banks are not able to recover anything from the production might look extreme. The reason behind such assumption is simplicity. We have included in the appendix the equilibrium expression for the more realistic case in which the banks are able to recover the value of the production, but further analytical work is not possible given the complexity of the expressions. On the other hand, this extreme assumption serves to emphasize that banks run the risk to lose their investment if the entrepreneur fails. It could imply that the investment is specific to the entrepreneur so nobody else is able to get any value out of it, or that the capital fully depreciates.

[37] See for example Berger and Udell [1998].

The failure cost the entrepreneur has to pay could also be somehow transferred to the bank. In that case the results of the model would be reinforced: a reduction in the failure cost (for example, an increase in the asset level exempt from the bankruptcy procedure) would affect negatively both the mix of loan applicants and the asset value the bank is able to hold after liquidation of the firm. In this model we focus only in the former effect but keeping in mind that results would hold under other more complex assumptions on firm liquidation rules.

In case of success, the bank recovers the principal plus the interest rate, denoted by R, and the entrepreneur keeps the residual return from production.

Entrepreneurial failure

Entrepreneurial failure occurs when the value of production is not high enough to repay the bank loan, thus when $y(\alpha, p, x) < R$. Similarly, entrepreneurial success takes place when $y(\alpha, p, x) > R$. Therefore the reservation quality of the entrepreneurial idea, $\widetilde{x}$, is given by $y(\alpha, p, \widetilde{x}) = R$. Using the production function in 35:

$$\widetilde{x}(\alpha) = R - \alpha p \tag{36}$$

Since the value of production is assumed to increase continuously with x, the entrepreneur with ability α will "succeed" whenever $x > \widetilde{x}(\alpha)$ and will pay the failure cost contemplated in the bankruptcy law when $x \leq \widetilde{x}(\alpha)$.

Recall that the value of x is only known after production has taken place. But each individual of ability α can calculate her probability of failure simply as the probability that $x \leq \widetilde{x}(\alpha)$, that is, as the cumulative probability $G(\widetilde{x}(\alpha))$. Given 36, the probability of failure will be lower the more able is the entrepreneur, the higher is the general productivity of the economy where the entrepreneur operates, and the lower the interest rate set by the bank.

The marginal entrepreneur

The expected value of becoming an entrepreneur for an individual of entrepreneurial ability α operating in an environment p can now be defined as

$$V^e(\alpha, p) = \int_{\widetilde{x}}^{1} [y(\alpha, p, x) - R]\, dx - f\widetilde{x} \tag{37}$$

That is, in case of success the entrepreneur gets the value of production after repaying the debt to the bank. If the entrepreneur fails, she will pay the failure cost set by the bankruptcy law, which is denoted by f.

Using the explicit production function given in 35 and a uniform distribution for x, 37 becomes

$$V^e(\alpha, p) = \frac{(1 - \widetilde{x}(\alpha))^2}{2} - f\widetilde{x}(\alpha) \tag{38}$$

where the super-index e indicates expected value from entering entrepreneurship.

Recall that entrepreneurial ability does not play any role if the individual chooses instead to become a dependent employee. We assume that individuals are homogeneous with respect to their productivity as an employee. Thus the income of employees will be given by the exogenous parameter w,

$$V^c(p) = w \geq 0 \tag{39}$$

where the super-index c is an indicator for the contract sector. Given the failure cost, the general productivity, the wage as an employee, and the expected interest rate, a rational individual of ability α will choose to become an entrepreneur if and only if

$$V^e(\alpha, p) \geq V^c(p) \tag{40}$$

The marginal entrepreneur, whose entrepreneurial ability will be denoted by $\widetilde{\alpha}(p)$, is the individual who, given p, is indifferent between both career choices:

$$V^e(\widetilde{\alpha}, p) = V^c(p) \tag{41}$$

Then the occupational choice of individuals can be described as follows:

Proposition 4 *Given the general productivity parameter p, all individuals with $\alpha \geq \widetilde{\alpha}(p)$ will find it optimal to become entrepreneurs. Equivalently, all individuals with $\alpha < \widetilde{\alpha}(p)$ will choose optimally to become dependent employees.*

Proof. The return to dependent employment does not vary with entrepreneurial ability. Therefore, it is enough to show that the value of entrepreneurship increases monotonously with entrepreneurial ability to prove that there is a unique cut-off for every p :

$\frac{\partial V^e(\alpha,p)}{\partial \alpha} = p\left[(1-\widetilde{x}(\alpha)) + f\right] \geq 0 \; if \; p \geq 0$ ■

Figure 12 shows graphically the occupational choice of individuals.

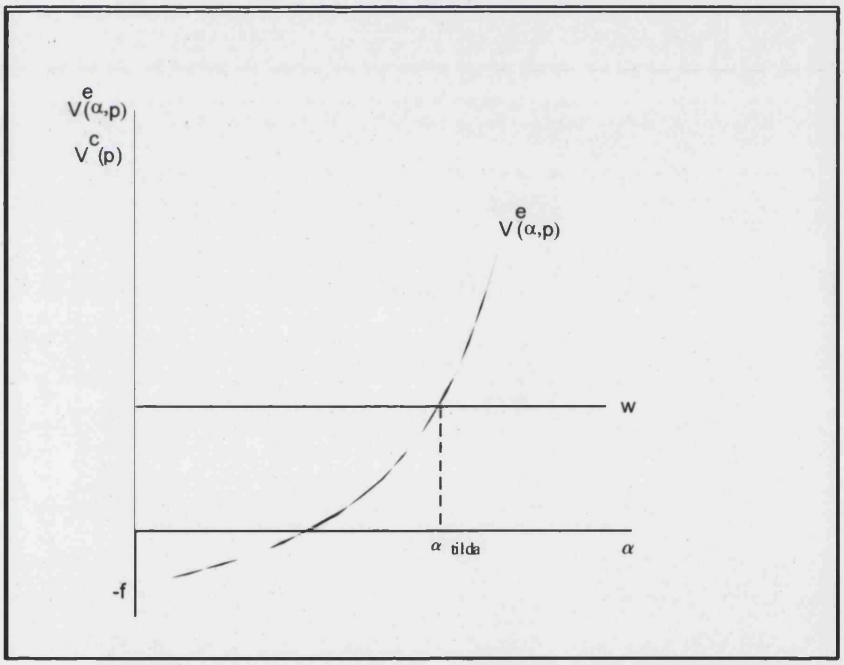


Figure 12: Occupational Choice

Since entrepreneurial ability is assumed to be a necessary input in production, when $\alpha = 0$ the probability of failure takes the maximum value, one. In that

case, the payoff from entrepreneurship is just $-f$, the cost of failure. Given p, as managerial talent increases so does production and the probability of success, which explains the convexity of the curve. The intersection between the value of entrepreneurship and the value of dependent employment gives the ability of the marginal individual $\widetilde{\alpha}$ for each p.

Hence the marginal entrepreneur defines the supply of entrepreneurs for every p, which is given by $1-\widetilde{\alpha}(p)$. An increase in $\widetilde{\alpha}(p)$ is to be interpreted as a decrease in the supply of entrepreneurs. Using 38, 39 and 41, $\widetilde{\alpha}(p)$ can be calculated as a function of the parameters of the model and the interest rate:[38][39]

$$\widetilde{\alpha}(p) = \frac{1}{p}\{R - F\} \tag{42}$$

with

$$F = (1+f) - \sqrt{(1+f)^2 + 2w - 1}; \text{and } \frac{dF}{df} < 0$$

If we ignored the impact on the capital market, it is easy to see that softening the bankruptcy law would unambiguously increase the number of entrepreneurs. But if a decrease in the bankruptcy cost is followed by an increase in the interest rate, which is what we prove next, the positive impact of softening the law is lessen by the negative effect that the increase in the cost of capital has on the supply of entrepreneurs. Expression 42 highlights quite clearly the opposite effects on the number of individuals who decide to become entrepreneurs of both, an increase in the interest rate and a decrease in the cost of failure f.

[38] The positive root of the solution has been chosen because we expect the relationship between $\overline{\alpha}$ and w to be positive, i.e. the higher the pay as dependent employee, the lower the number of entrepreneurs.

[39] From 41 we know that in equilibrium the pay of dependent employees has an upper bound: $w \leq \frac{1}{2}$.

4.1.2 Banks

A representative bank in this economy is endowed with one unit of capital and has two investment choices. The first choice is some investment delivering a fixed and known return. The second alternative is to invest the unit of capital in the entrepreneurial project of an individual operating in a certain economic environment of general productivity p, observable by the bank.

The bank cannot observe the entrepreneurial ability of individuals, nor their random draw of x. The bank only observes the production value of the entrepreneur after the company has been set up and production started. As a result, the bank does not know the exact probability of success of each loan applicant. That assumption is thought to accommodate the lack of credit or production history of start-ups, which makes it difficult for banks to assess their real success probabilities. However, the bank knows that all potential entrepreneurs have an entrepreneurial ability larger or equal than the one of the marginal entrepreneur. Thus, the expected probability of success of a loan applicant can be calculated as the average probability of success, within a framework of general productivity p, conditional on $\alpha \geq \widetilde{\alpha}(p)$:

$$E\left[1-\widetilde{x}(\alpha)|\alpha \geq \widetilde{\alpha}(p)\right] = \frac{\int_{\widetilde{\alpha}}^{1}(1-\widetilde{x}(\alpha))d\alpha}{1-\widetilde{\alpha}(p)} \tag{43}$$

where $1-\widetilde{x}(\alpha)$ is the probability that an individual of talent α picks up an idea with quality enough to succeed, i.e. with $x > \widetilde{x}(\alpha)$. Profit maximization in a competitive banking sector implies that the return from the unit of capital of the bank in all alternative investments should be equal:

$$RE\left[1-\widetilde{x}(\alpha)|\alpha \geq \widetilde{\alpha}(p)\right] = \rho \tag{44}$$

where ρ is the total return to the bank if the unit of capital was invested in the alternative to the entrepreneurial loan. Using the production function given in

35 and a uniform distribution for α, the expected probability of success of a loan applicant operating in an economic framework p can be written in the following way:

$$E[1-\tilde{x}(\alpha)|\alpha \geq \tilde{\alpha}(p)] = 1 - R + \frac{p(1+\tilde{\alpha}(p))}{2} \tag{45}$$

Using the expression above for the expected probability of success, and the equilibrium expression given in 44, the equilibrium interest rate as a function of the parameters of the model and the marginal entrepreneur's ability $\tilde{\alpha}(p)$ is given below:[40]

$$R = \frac{1}{2}\left\{1 + \frac{p(1+\tilde{\alpha}(p))}{2} - \sqrt{\left(1 + \frac{p(1+\tilde{\alpha}(p))}{2}\right)^2 - 4\rho}\right\} \tag{46}$$

4.1.3 Equilibrium

Definition

An *allocation* is a tuple $\{\beta(\alpha), R, V, P\}$ where $\beta(\alpha)$ is a set of occupational choices of individuals with entrepreneurial ability α; $R \equiv R(\beta(\alpha)) \in R_+$ is the set of associated gross interest rates; $V \equiv V(\beta(\alpha)) : R_+ \rightarrow R$ is the expected value associated to the occupational choice of an individual of ability α and $P \equiv P(R) : R_+ \rightarrow R_+$ is the bank's profit associated to a commercial loan with gross interest rate R.

An *equilibrium* is an allocation $\{\beta^*(\alpha), R^*, V^*, P^*\}$ such that:

- Given the expected interest rate $R^e(\beta(\alpha))$, the expected value associated to the occupational choice of an individual with entrepreneurial ability α is maximized:[41]

$$V^*(\beta(\alpha)) \geq V(\beta(\alpha))$$

[40] We have chosen the negative root to ensure that the relationship between the interest rate and the alternative investment return is positive.

[41] Rational expectations imply that expectations are correct in equilibrium: $R^e(\beta(p,\alpha)) = R^*(\beta(p,\alpha))$

with equality if $\beta(\alpha) \in \beta^*(\alpha)$ and

$V^*(\beta(\alpha)) \equiv \max \left[\int_{\widetilde{x}}^{1} [y(\alpha, p, x) - R^e(\beta(\alpha))]\, dx - f\widetilde{x}, w \right]$

- Given the occupational choice of the individual $\beta(\alpha)$, the bank's profits are maximized:

$$P^*(R(\beta(\alpha))) \geq \rho$$

with equality if $R(\beta(\alpha)) \in R^*(\beta(\alpha))$ where ρ is the alternative investment return and

$P(R(\beta(\alpha))) \equiv R(\beta(\alpha)) E[(1 - \widetilde{x}/\alpha \geq \widetilde{\alpha}(p)]$.

Individuals choose occupation so, given the expected interest rate on commercial loans, their expected utility is maximized. Given the occupational choice of individuals, banks set an interest rate such that their profits are maximized, which implies equality across the returns from the alternative investment choices.

The equilibrium values for the two endogenous variables of the model, the ability of the marginal entrepreneur and the interest rate, will be given by the solution to the system of simultaneous equations 42 and 46:

$$\begin{aligned} \widetilde{\alpha}(p)^* &= \frac{1}{p}\{R^* - F\} \\ R^* &= \frac{1}{2}\left\{1 + \frac{p(1+\widetilde{\alpha}(p)^*)}{2} - \sqrt{\left(1 + \frac{p(1+\widetilde{\alpha}(p)^*)}{2}\right)^2 - 4\rho}\right\} \end{aligned}$$

Substituting the value of $\widetilde{\alpha}(p)$ from expression 42 into 46 and rearranging, the equilibrium interest rate can be written as a function of the parameters of the model:

$$R^* = \left(1 + \frac{p-F}{2}\right) - \sqrt{\left(1 + \frac{p-F}{2}\right)^2 - 2\rho} \qquad (47)$$

where $F = (1+f) - \sqrt{(1+f)^2 + 2w - 1}$. Substituting back into the expression for the marginal entrepreneur:

$$\widetilde{\alpha}(p)^* = \frac{1}{p}\left\{\left(1+\frac{p-F}{2}\right) - \sqrt{\left(1+\frac{p-F}{2}\right)^2 - 2\rho - F}\right\} \tag{48}$$

Thus 47 and 48 are the intersection values of the interest rate and marginal ability reaction functions in the $(\widetilde{\alpha}(p), R)$ space, shown in figure 13. Given all the parameters of the model and the expected interest rate, all individuals with $\alpha \geq \widetilde{\alpha}(p)$ will decide optimally to become entrepreneurs. The higher the interest rate, the higher the required entrepreneurial ability which explains the positive slope of the schedule $\widetilde{\alpha}(R)$ in the figure. Given the occupational choice of individuals, the bank sets optimally the interest rate so the expected returns of all alternative investments is equal. The more able are the people who asks for a loan to become entrepreneurs (the higher $\widetilde{\alpha}$), the lower the optimal interest rate. Hence the negative slope of the schedule $R(\widetilde{\alpha})$ in the figure. The equilibrium will be found at the intersection of both reaction functions.

•

Proposition 5 *There is a range of parameters for which the equilibrium always exists.*

Proof. See appendix 3. ■

Before moving to the comparative static analysis, we would like to direct your attention to two partial equilibrium results of some interest.

Firstly, we study how the optimal interest rate charged by banks vary with the economic cycle. One would expect that banks charge lower interest rates during economic booms. Or using a different interpretation of p, we expect that banks charge lower interest rates when financing ventures in high productivity economic sectors. Although we prove below that it is always the case, we have to keep in mind that higher general productivity also means that less entrepreneurially

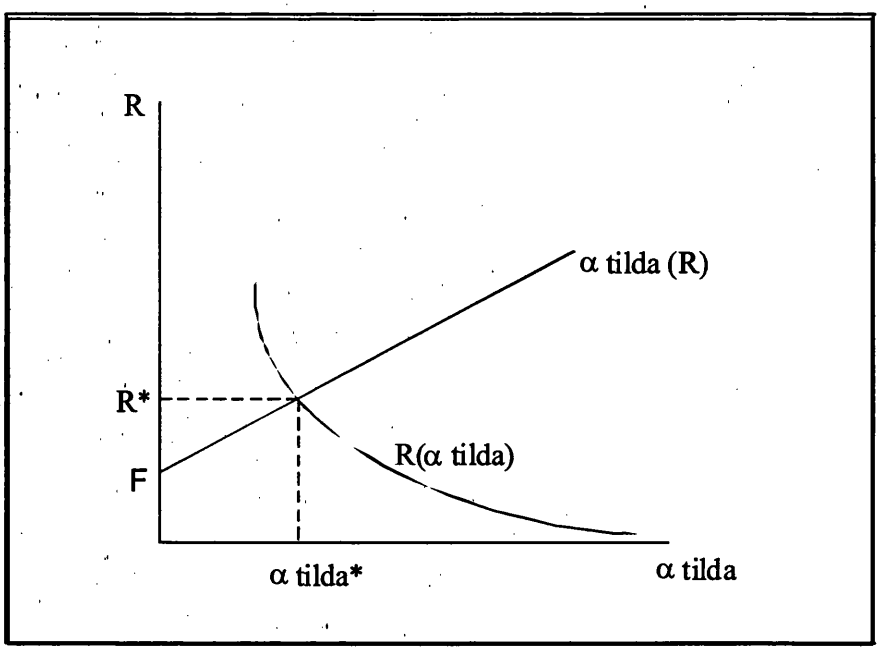


Figure 13: Equilibrium: occupational choice and capital market

able individuals can afford successfully to be entrepreneurs. Hence the expected probability of success of an individual operating in an environment of high p will be high if the direct impact of general productivity on the expected return exceeds the "negative" impact on the required entrepreneurial ability of entrepreneurs.

Proposition 6 *Banks find it optimal to charge lower interest rates to entrepreneurs during economic booms or in high productivity economic environments.*

Proof. From expression 47,

$$\frac{dR}{dp} = \frac{1}{2}\left\{1 - \frac{1+\frac{p-F}{2}}{\sqrt{\left(1+\frac{p-F}{2}\right)^2 - 2\rho}}\right\} < 0$$

■

Secondly, we examine the optimal behaviour of a bank when facing an excess of credit demand: will the bank ration credit, as in Stiglitz and Weiss [1981]?; or will the bank optimally raise the interest rates to restore the equilibrium? In Stiglitz and Weiss [1981], loan applicants with the same expected return from production,

observable by the banks, differed in their riskiness (in a mean-preserving spread sense), which was not observable. For every interest rate, there was a critical value of riskiness such that all individuals with projects of equal or larger riskiness decided to apply for a loan. As the interest rate increased so did that critical value of riskiness, or in other words, adverse selection took place. Given a sufficiently high interest rate, the negative effect due to the adverse selection dominated so banks facing an excess of credit demand decided optimally to ration credit.

In this chapter banks can observe the general productivity of the environment where the entrepreneur operates. Given that macroeconomic framework, the expected return from production, and probability of default, will vary depending on the entrepreneurial ability of the entrepreneur, which is not observable by banks. For every interest rate there is a critical, or marginal as we have called it in this model, value of entrepreneurial ability above which individuals will apply for a loan. As the interest rate increases, so will the ability of the marginal individual so the *least* able individuals drop from the credit market, which is different from Stiglitz and Weiss [1981]. What is also different is that the probability of default or riskiness of the project for the bank is endogenous in this model. As the interest rate increases, so does the probability of default of the loan applicants who decide to apply for a loan.

We proceed to examine how the expected return from investing one unit of capital in an entrepreneurial project (the return times the probability of repayment) changes following an increase in the interest rate. Starting from the expression of the expected probability of success of a loan applicant, given in 45, the expected return of the bank after investing in an entrepreneurial loan is, after substituting the value of $\widetilde{\alpha}(p)$ given in 42, simply:

$$E(return) = R\left(1 + \frac{p - F}{2}\right) - \frac{R^2}{2}$$

Hence like in Stiglitz and Weiss [1981], the expected return of the bank has an inverted-U shape when plotted against the interest rate, with a maximum at $\overline{R} = 1 + \frac{p-F}{2}$. From that point on, the bank will choose to ration credit rather than to increase the interest rate in a situation of excess of demand for credit because further increases of the interest rate would reduce its expected profit. The reason, however, is different from Stiglitz and Weiss [1981]. In this model there is not adverse selection (there is "positive" selection if such a term can be accepted) but the probability of default is endogenous. Hence as the interest rate increases, so does the probability of default, which decreases the expected profit from the bank. For a sufficiently high level of interest rate that negative effect dominates.

Note that the turning point after which the bank chooses optimally to ration credit occurs at higher interest rates the higher the general productivity parameter p. Hence credit rationing seems to be a problem only in low productivity environments.

Proposition 7 *There is a p, or general productivity parameter, above which banks will not ration credit.*

Proof. It is enough to see that $Limit_{p \to \infty} \overline{R} = \infty$, where $\overline{R} = 1 + \frac{p-F}{2}$. ■

This result can explain the observed credit rationing of entrepreneurs in low productivity environments in a situation of excess of credit demand. Entrepreneurs in high productivity sectors, or during economic booms, do not face credit constraints.

Stretching a bit the concept, we could also think of p as the general education level of an individual, something observable by banks which increases the individuals's expected value of production for every α. In that case this result would imply that highly educated individuals will face less credit constraints than low educated ones. There is not much empirical evidence on this topic, however, Parker and Van Praag [2003] using a sample of some 400 Dutch managers to study the effect of education and capital access on firm performance, find that one extra year of

education decreases capital constraints by 1.4%.[42]

Figure 14 shows how the bank's return from investing the capital in an entrepreneurial project changes as the interest rate increases, and how the whole schedule shifts as the general productivity increases.

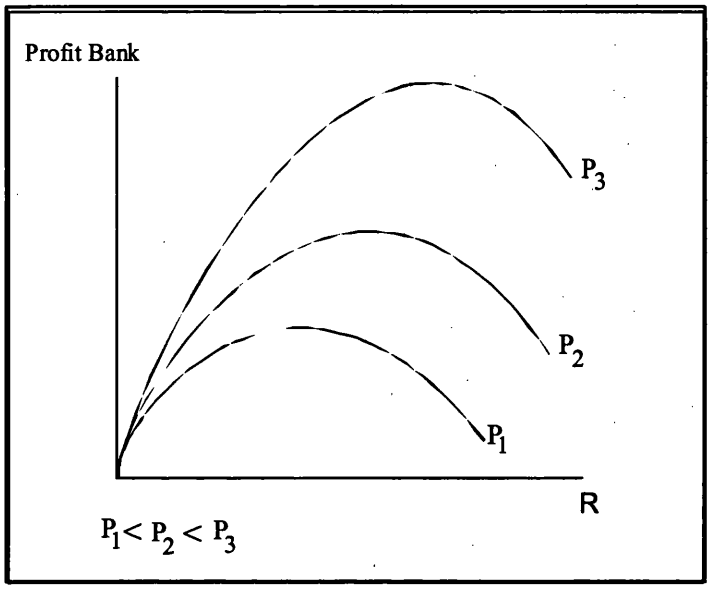


Figure 14: Bank's profit and interest rate

We are now in position to start exploring some comparative statics.

4.2 Comparative Statics

We start this section with the analysis of the interaction between the bankruptcy law and the capital market.

The direct effect of the reduction of the cost of failure is to encourage entrepreneurship, as it was shown previously. The reason is that people who, given their entrepreneurial ability, before did not consider it an optimal choice, now that failure is cheaper find entrepreneurship worthwhile. Less entrepreneurially able individuals are now

[42]Capital constraints are measured as the difference between the capital wanted by managers and the capital actually obtained.

thinking about starting their own business. For that they need a loan from a bank. The bank observes this change in the optimal occupational choice of individuals and acts consequently changing its interest rate. The optimal response will be to increase the interest rate to compensate for the decrease in the expected probability of repayment of the loan:

Proposition 8 *When the bankruptcy cost decreases, the optimal response of banks is to raise the interest rate on entrepreneurial loans. The bankruptcy law will have a smaller impact on the capital market: (1) the lower the alternative investment return ρ; (2) the higher the pay for dependent employees w; and (3), the higher the productivity parameter p.*

Proof. See Appendix 3. ■

Thus, we can provide a theoretical framework able to explain the negative relationship between the strictness of the bankruptcy law and the interest rate found in the empirical studies of Grant [2000] and Gropp et al. [1996] in the United States, and La Porta et al.[1997] in a cross-country analysis. Landier [2001] find a similar mechanism to explain the negative effect of the cost of failure on interest rates. Landier argues that there is imperfect information in the labour and capital markets about the ability of failed entrepreneurs who are trying to make a new start. If there exists the belief that failed entrepreneurs have low managerial talent, then banks will raise their interest rates to all second-time entrepreneurs. That will discourage potential new entrepreneurs so the equilibrium, like in this chapter, will be characterised by a low level of entrepreneurial activity.

This model shows that the negative impact of the reform of the bankruptcy law on interest rates is small when the bank alternative return is low, when the employees' wage is high, and when the general productivity of the economy where the entrepreneur operates is high. The first condition is quite intuitive. The reason behind the second one is the following: when the pay of employees is very high, a reduction in the cost of failure does not attract more individuals

into entrepreneurship and, therefore, does not change substantially the expected probability of default on entrepreneurial loans. Hence the banks will not change the interest rates. With respect to the third possibility, one has to keep in mind that the general productivity parameter increases the expected probability of success for every given level of entrepreneurial ability. Then it is easy to understand that, even when the entrepreneurial ability of loan applicants decreases, the good moment of the cycle, which is one of the possible causes of a high p, induces banks to moderate their response to the reform of the bankruptcy law.

Once the interaction between the bankruptcy law and the capital market has been explored, we can proceed to study the full impact of reforming the bankruptcy law on the equilibrium number of entrepreneurs, taking into account the reaction of banks to the change in legislation. We depart from expression 42, which we reproduce here for convenience:

$$\widetilde{\alpha}(p) = \frac{1}{p}\{R - F\}$$

The total effect of decreasing the cost of failure on the equilibrium number of entrepreneurs will be given by the total derivative of $\widetilde{\alpha}(p)$ with respect to f :

$$\frac{d\widetilde{\alpha}(p)}{df} = \frac{1}{p}\left\{\frac{dR}{dF} - 1\right\}\frac{dF}{df} > 0$$

because $\frac{dF}{df} < 0$ and, as we have shown in the proof of proposition 8, $0 < \frac{dB}{dF} < 1$.

Hence, after a reduction in the cost of failure, the equilibrium number of entrepreneurs always increases ($\widetilde{\alpha}(p)$ will decrease). But the effect is smaller than what we might expect from a partial equilibrium analysis. The reason is that the reform of the law results in banks raising optimally the interest rates they charge to entrepreneurial loans. That negative effect of the reform of the law is captured by the first term of the brackets above (recall that everything is multiplied by $\frac{dF}{df}$, which changes its sign). The second term in the brackets of the total derivative

reflects the direct impact that softening the bankruptcy law has on entrepreneurial activity: to encourage more people to start their own business by decreasing the cost of failure.

Figure 15 shows graphically how the combination of both effects impacts upon the equilibrium:

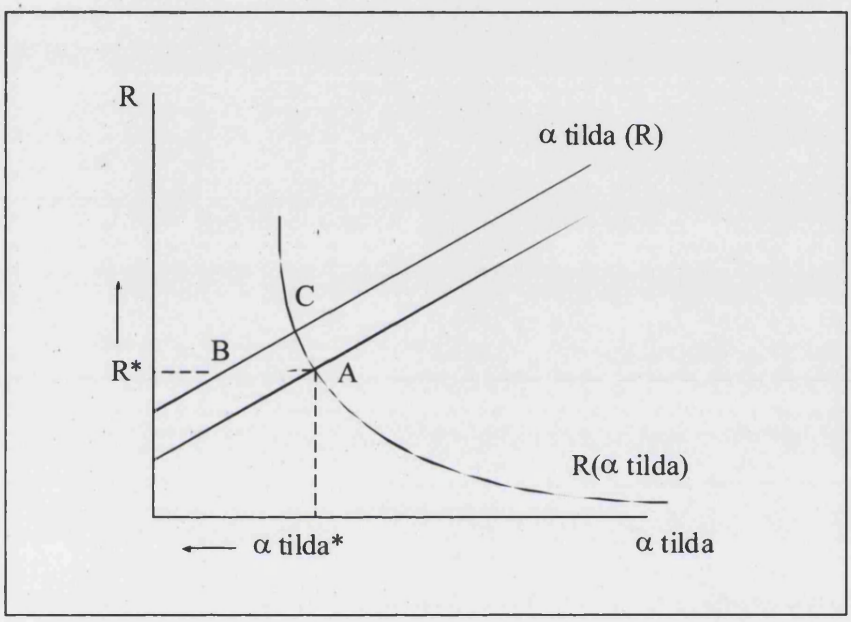


Figure 15: The effect of reducing the cost of failure on the equilibrium

The economy is in the initial equilibrium at A. The government decides to decrease the cost of failure in order to foster entrepreneurship. That shifts the $\widetilde{\alpha}(R)$ schedule to the left: for every interest rate, the marginal entrepreneurial ability decreases. If the credit market was not affected the new equilibrium would be found at B. But the entrance of "worse" entrepreneurs into de credit market demanding a loan to start a business decreases the expected probability of repayment so banks raise optimally the interest rates. That is a movement along the schedule $R(\widetilde{\alpha})$ until the new equilibrium is reached in C.

When would softening the bankruptcy law be most effective at encouraging entrepreneurship? The answer is, when the direct impact of the reform on the incentive structure of the individual is large *and* the resulting increase of interest rates is small.

From the expression of the total derivative of $\widetilde{\alpha}(p)$, we see that the direct impact of the law is large when the productivity parameter is low: those who have much to lose, that is, with a high probability of failure, will be the most benefited from the law reform. Given the model, the probability of failure decreases with the parameter p. Hence, the policy reform will be most successful at encouraging entrepreneurship, given the reaction of the banks, in low productivity environments. It is true that, as we have seen in proposition 6, a low productivity framework will induce banks to raise their interest rates, dampening some of the positive impact of the law on entrepreneurship. But the first effect of p will always be dominant.

When the wage one receives as a dependent employee is not too competitive, any reform aimed at fostering entrepreneurship will have great success. Hence a decrease in the cost of failure in low-income countries might have a large effect on entrepreneurial activity.

Finally, given all the rest of the parameters, the response of banks to the reform will be moderated as long as the alternative investment return ρ is low. Thus, monetary policy might have an important effect on the real economy, at least in the short-term, by lessening the reaction of banks to the change in the bankruptcy law. Another possibility for the reform of the bankruptcy law to be effective is to offer potential entrepreneurs access to alternative sources of finance, such as micro-credits by the Government or informal investment.

Apart from the bankruptcy law, captured by the parameter f, the model considers other exogenous parameters of interest. We proceed to analyse briefly their impact on the equilibrium of the model.

Proposition 9 *An increase in the pay of employees will reduce the equilibrium supply of entrepreneurs and interest rate. An increase in the alternative investment return for the bank (or deposit interest rate) will increase the interest rate and reduce the equilibrium supply of entrepreneurs. During booms, or in a macroeconomic framework of high productivity, the equilibrium interest rate will be lower and the supply of entrepreneurs larger.*

Proof. See Appendix 3. ■

A raise in the pay dependent employees receive, w, has a direct impact on the individual's occupational choice. For every interest rate, less individuals will find it optimal to become entrepreneurs. Only the very able, that is, the ones expecting a high return from entrepreneurship, will still opt for the entrepreneurial venture. Therefore only the more able individuals will apply for a loan, which explains the decrease in the equilibrium interest rates.

An increase in the alternative return ρ, or in the deposit interest rate, will increase the optimal interest rate independently on the occupational choice of individuals. Higher interest rate means that the probability of default increases so only the very able individuals will still decide to open a business. That is the reason for the decrease in the equilibrium number of entrepreneurs.

Lastly, an increase in the general productivity p fosters entrepreneurship for two, reinforcing reasons. Given any interest rate, the improvement in the macroeconomic framework where the entrepreneur operates will increase the probability of success of entrepreneurial ventures. Therefore more individuals will opt to become entrepreneurs. Banks know that individuals with lower entrepreneurial ability are now trying to get seed capital for a venture. But the positive impact of the general productivity parameter on the probability of success dominates, which explains that banks will respond reducing the interest rate. That decrease will encourage further entrepreneurial activity. Therefore an increase in the general productivity seems to be the most effective way to foster entrepreneurship, according to the model

presented in this chapter. Policy intervention aimed at increasing the R&D level of a country (with fiscal incentives for private firms or directly from the public sector) is therefore justified.

4.3 The effect of the bankruptcy law on aggregate employment

Let us now extend the model in a very simple way in order to explore the impact of the bankruptcy law reform on aggregate employment. So far we had assumed that all entrepreneurs demanded one unit of capital, and apart from their own job, they were not creating any further employment. We will relax that assumption now to allow entrepreneurs to demand $K(R)$ units of capital, with $\frac{dK(R)}{dR} < 0$. Furthermore, we will assume that each entrepreneur hires a number of employees proportional to the capital investment. The analysis of this section implies that the entry and employment decision are separated. Or in other words, the individual decides first to start a new company, and then, how much employment to create. The profit from the new venture is very simply written as:

$$\pi(\alpha, p, x, K(R)) = \alpha p + K(R)x - K(R)R \tag{49}$$

Capital has been assumed to depend only on the expected quality of the idea and on the cost of capital, contrary to Lucas [1978]. Then banks cannot learn the managerial talent of the individuals by the amount of capital they demand, which is sometimes the case in the credit market imperfection literature. We do not intend to explore further those issues but rather to focus on how employment changes with the bankruptcy law.

The capital investment that will maximise expected profits will be the same for all individuals (the distribution of x is not dependent on the entrepreneurial ability of the individual) and given by:

$$\frac{dK(R)}{dR} = \frac{R}{x} \tag{50}$$

Equilibrium aggregate employment in this economy will be equal to the total number of entrepreneurs multiplied by the capital investment (employment creation) of each one of them:

$$AE(f) = (1 - \widetilde{\alpha}(f)^*)\, K(R^*(f)) \tag{51}$$

where the dependance with respect to the failure cost has been made explicit.

Let us assume a very simple explicit function for $K(R)$:

$$K(R) = \frac{2}{1 + R(f)} \tag{52}$$

Now the aggregate equilibrium employment can be written as follows, using the equilibrium expression for $\widetilde{\alpha}$ given in 42 and 52:

$$AE(F) = \frac{2}{p}\frac{p + R(F) + F}{1 + R(F)} \tag{53}$$

where $F = (1 + f) - \sqrt{(1 + f)^2 + 2w - 1}$. What is left now is to see how the aggregate employment, shown in the expression above, changes with the failure cost. In order to be able to do so, the best strategy is to rewrite 53 only in terms of $R(F)$. We have shown somewhere above that there is a univocal relationship between R and F: to every value of F we can find a corresponding value of R and to every value of R a corresponding value for F. Hence we will plot aggregate employment against the interest rate R but keeping in mind that it is equivalent to plotting employment against F, and of course, against f.

The equilibrium interest rate was given in 46:

$$R(F) = \left(1 + \frac{p - F}{2}\right) - \sqrt{\left(1 + \frac{p - F}{2}\right)^2 - 2\rho}$$

Let us define $z = 1 + \frac{p-F}{2}$. Then, rearranging from 46 and using the definition of z,

$$\begin{aligned} z &= \frac{R(F)^2 + 2\rho}{2R(F)} = 1 + \frac{p - F}{2} \rightarrow \\ F &= 2 + p - \frac{R(F)^2 + 2\rho}{R(F)} \end{aligned} \tag{54}$$

Plugging the value of F found above back into 53, we find a pretty simple expression for aggregate employment as a function of $R(F)$:

$$AE(R(F)) = \frac{2}{p}\frac{(2+2p)R(F) - 2R^2(F) - 2\rho}{R(F)(1+R(F))} \tag{55}$$

That function, shown in figure 16, can be plotted as a curve with one maximum for a positive value of R (and therefore of F and of f, the failure cost).

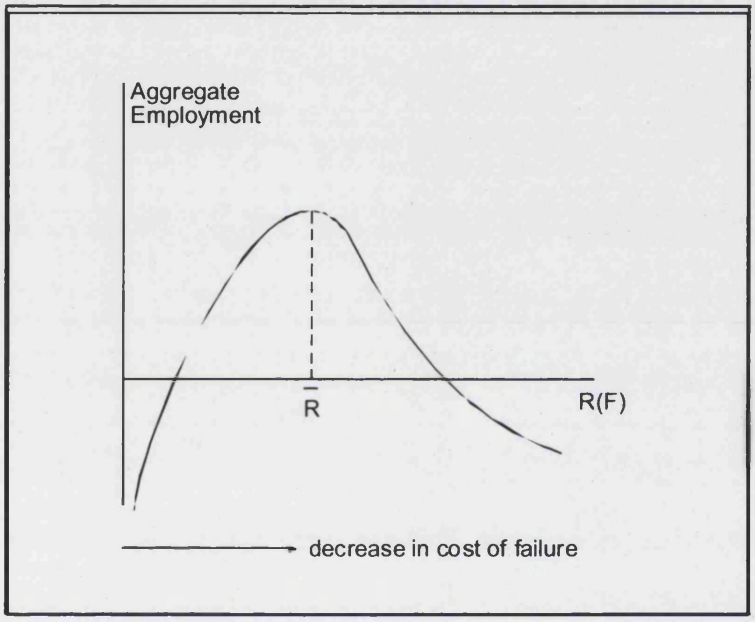


Figure 16: Aggregate employment and bankruptcy cost

We will show in the appendix that the maximum is reached at $\overline{R} \geq 1$, that is, for reasonable values of the parameters.

As we move to the right in the figure, the interest rate increases. That implies that F increases and, therefore, that the cost of failure f decreases. Initial reductions of the cost of failure increase overall employment because, in spite of decreasing the investment per entrepreneur, the equilibrium number of start-ups grows enough to compensate. After a certain point, further reductions in the cost of

failure will decrease aggregate employment because, even with more entrepreneurs in the economy, each of them is creating very little employment and that effect dominates.

Proposition 10 *There is a positive value of cost of failure for which aggregate employment is maximised. Countries where the bankruptcy law imposes a higher failure cost do not have enough entrepreneurs in equilibrium. Countries where the bankruptcy law is very lax suffer from very high interest rates due to the lack of protection to creditors and, therefore, have low capital investment and employment creation.*

Proof. See Appendix 3. ■

To get an idea of the magnitude of the changes, we have calibrated the model. The equilibrium supply of entrepreneurs and the interest rate are given by 42 and 46 respectively:

$$\begin{aligned} \widetilde{\alpha}(p)^* &= \frac{1}{p}\{R^* - F\} \\ R^* &= \frac{1}{2}\left\{1 + \frac{p(1+\widetilde{\alpha}(p)^*)}{2} - \sqrt{\left(1 + \frac{p(1+\widetilde{\alpha}(p)^*)}{2}\right)^2 - 4\rho}\right\} \end{aligned}$$

and the capital function is given by 52 and aggregate employment by 55:

$$\begin{aligned} K(R) &= \frac{2}{1+R(f)} \\ AE(R(F)) &= \frac{2}{p}\frac{(2+2p)R(F) - 2R^2(F) - 2\rho}{R(F)\,(1+R(F))} \end{aligned}$$

The parameter values for the wage of dependent employees, general productivity and alternative investment return satisfy all the conditions required for the existence of equilibrium and are provided in the table below:

Parameter values	
w	0.25
p	2
ρ	1.5

Table 24: Parameter values

The purpose is to see how the equilibrium number of entrepreneurs, interest rate, capital investment and aggregate employment vary with the policy parameter of the model, f, which will vary from 0 to ∞.

f	0	0.2	0.5	1	2	5	∞
$\widetilde{\alpha}(f)$	0.45	0.455	0.46	0.47	0.48	0.49	0.50
$R(f)$	1.19	1.14	1.10	1.07	1.05	1.02	1
$K(f)$	0.91	0.93	0.95	0.97	0.98	0.99	1
$(1-\widetilde{\alpha}(f))\,K(f)$	0.5005	0.507	0.513	0.514	0.5096	0.505	0.5

Table 25: Calibration: impact of bankruptcy cost

Upon observation of the table above, several things become clear. First, everything behaves as expected: reducing the bankruptcy cost increases the number of entrepreneurs, increases the interest rate and decreases the capital investment. Aggregate employment increases at first but then decreases again, being the cost of failure that maximises employment equal to one. The second observation is that the impact of the cost of failure on all those variables is quite small. Employment, for example, increases only about 2.8% when the cost of failure is reduced from infinite to its maximising value, one. The interest rate, as expected since in case of entrepreneurial failure the bank does not recover anything in this model, increases quite a bit when the cost of failure decreases. However that increase in the interest rate is not so reflected in a reduction of the capital investment which could be due, at least partially, to the explicit function assumed in the model.

4.4 Conclusions

Governments across the world are considering softening their respective bankruptcy laws in order to encourage entrepreneurial activity. However, banks are the primary source of external capital to start-ups. Loosening the bankruptcy law decreases

creditors' protection and, therefore, results in a rise of the interest rates banks set on entrepreneurial loans.

This chapter introduces a relatively simple equilibrium general model to study, first, the relationship between the bankruptcy law and the capital market, second, the full impact of the bankruptcy law upon the supply of entrepreneurs and, third, its impact on aggregate employment. We find that the optimal reaction of banks facing a reform aimed at softening the bankruptcy law is to increase interest rates. That increase will be smaller the higher the general productivity of the economy or economic sector where the entrepreneur operates, the lower the alternative investment return of the bank, and the lower the wage in the contract or established firms sectors.

Starting from the assumption that entrepreneurs do not create employment in order to evaluate the overall impact of the law reform on the equilibrium number of start-ups, we find that softening the bankruptcy law has a direct positive effect on the equilibrium supply of entrepreneurs for each given interest rate level. But the capital market is also affected by the law reform. The resulting raise in the interest rates does hamper the impact of the reform on entrepreneurial activity. But still, we prove that the overall effect of the law reform on start-ups is positive, although small as the calibrations show.

To explore the impact of the law upon aggregate employment we assume that each entrepreneur's employment creation is proportional to her capital investment. Since softening the bankruptcy law increases the interest rates, capital investment, and employment creation, will be jeopardised. We find that there is a "Laffer-type" relationship between aggregate employment and the cost of failure. Initial reductions of the cost of failure increase overall employment because, in spite of decreasing the investment per entrepreneur, the equilibrium number of start-ups grows enough to compensate. After a certain point, further reductions in the cost of

failure will decrease aggregate employment because, even with more entrepreneurs in the economy, each of them is creating very little employment and that effect dominates.

4.5 Appendix 3

4.5.1 Equilibrium under more complicated liquidation rules

Let us assume that the entrepreneur and the bank write the following contract:

	Bank	Entrepreneur
Failure	$y(\alpha, p, x)$	$-f$
Success	R	$y(\alpha, p, x) - R$

Hence, in case of failure the value of production is transferred to the bank and the entrepreneur pays the failure cost imposed by the bankruptcy law. In case of success the bank receives the gross interest rate R and the entrepreneur retains the residual profit.

The occupational choice of the individuals does not vary, hence the equilibrium marginal individual will be given by

$$\widetilde{\alpha}(p)^* = \frac{1}{p}\{R^* - F\}$$

What changes is the optimal interest rate for the bank. Recall that the banking sector is competitive. Therefore the equilibrium will be characterised by the equalisation of returns across investments:

$$RE\left[1 - \widetilde{x}(\alpha) | \alpha \geq \widetilde{\alpha}(p)\right] + \{y | \alpha \geq \widetilde{\alpha}(p); x \leq \widetilde{x}(\alpha)\} E\left[\widetilde{x}(\alpha) | \alpha \geq \widetilde{\alpha}(p)\right] = \rho \quad (56)$$

The expected return from the entrepreneurial project will be the sum of the expected probability of success, given that the individual decides to start a venture, times the return in case of success, plus the expected probability of failure, again conditioned on the individual having decided to become an entrepreneur, times the return in case of failure. That latter return is the value of production under two conditions: that the individual is an entrepreneur, which puts a lower bound in his entrepreneurial ability; and that the quality of the idea was so low to lead

the individual to entrepreneurial failure. Mathematically, the value of production recovered by the bank in case of failure is

$$\{y|\alpha \geq \widetilde{\alpha}(p); x \leq \widetilde{x}(\alpha)\} = \frac{\int_{\widetilde{\alpha}} d\alpha \int^{\widetilde{x}} dx(\alpha p + x)}{(1-\widetilde{\alpha})\,\widetilde{x}} = \frac{p+R}{2} \tag{57}$$

Plugging 57 into 56, and using 45 for the expected probability of success, 56 becomes

$$R = \left\{1 + \frac{p}{2} + \frac{p(1+\widetilde{\alpha})}{4}\right\} - \sqrt{\left\{1 + \frac{p}{2} + \frac{p(1+\widetilde{\alpha})}{4}\right\}^2 - 2\rho - \frac{p^2(1+\widetilde{\alpha})}{2}} \tag{58}$$

The new equilibrium would be given by expressions 42 and 58, which are clearly not too friendly to work with.

4.5.2 Proof of proposition 5

We reproduce here once again the equilibrium values of the model:

$$\begin{aligned} \widetilde{\alpha}(p)^* &= \frac{1}{p}\{R^* - F\} \\ R^* &= \left(1 + \frac{p-F}{2}\right) - \sqrt{\left(1 + \frac{p-F}{2}\right)^2 - 2\rho} \end{aligned}$$

For the equilibrium to exist, it is required in the first place that the squared root above is positive. That imposes a lower bound on p: $p \geq 2\sqrt{2\rho} - 2 + F_M$ where F_M is the maximum value that F can take (at $f = 0$).

The equilibrium expression of R is a parabola whose central axis is parallel to the x-axis and with the minimum at $R = \sqrt{\rho}$. Since we have taken the negative root, the crossing-point or equilibrium should happen in the decreasing part of the parabola. However, there could be some cases where that is not the case. To avoid that, we have to impose that $R < \sqrt{\rho} \rightarrow p \geq 3\sqrt{2\rho} - 2 + F_M$. That lower bound dominates the other previous one.

Next we impose further restrictions to ensure that the equilibrium interest rate and entrepreneurial ability are within the bounds assumed in the model: $R \geq 1$

and $\widetilde{\alpha} \in [0,1]$. Setting $R^* \geq 1$ leads to the condition $p \leq 2\rho - 1$. The condition that $\widetilde{\alpha}^* \geq 0$ is trivial since $\widetilde{\alpha}(p)^* = \frac{1}{p}\{R^* - F\}$ with $R^* \geq 1$ and $F \leq 1$. To ensure that $\widetilde{\alpha}^* \leq 1$ it is required that $p \geq \frac{\rho}{1-F} - F_M$.

To summarise, for an equilibrium to exist (and in the decreasing branch of the parabola) we require that

$$p \geq 3\sqrt{2\rho} - 2 + F_M \tag{59}$$

For the equilibrium values to fall into the assumed boundaries we require that

$$\begin{aligned} p &\leq 2\rho - 1 \text{ and} \\ p &\geq \frac{\rho}{1-F} - F_M \end{aligned} \tag{60}$$

All conditions are compatible for low values of F. Hence, we can find a range of parameters for which the equilibrium exits and is reasonable.

4.5.3 Proof of proposition 8

We are trying to find the sign of the total derivative:

$$\frac{dR}{df} = \frac{dR}{dF}\frac{dF}{df}$$

with

$$\frac{dF}{df} = 1 - \frac{1+f}{\sqrt{(1+f)^2 + 2w - 1}} < 0$$

From 47,

$$\frac{dR}{dF} = \frac{1}{2}\left\{-1 + \frac{1 + \frac{p-F}{2}}{\sqrt{\left(1 + \frac{p-F}{2}\right)^2 - 2\rho}}\right\} > 0$$

Therefore, $\frac{dR}{df} < 0$.

Moreover, it can be proven that $0 < \frac{dR}{dF} < 1$. To see that, note that the derivative will be largest when $1 + \frac{p-F}{2}$ is smallest. We know from the proof of the

previous proposition that $p - F$ is bounded from below: $p - F \geq 3\sqrt{\rho} - 2$. Then $1 + \frac{p-F}{2} \geq 1 + \frac{3\sqrt{\rho}-2}{2} = \frac{3}{2}\sqrt{\rho}$. Substituting that lower bound back into the total derivative above we find its maximum value:

$$0 < \frac{dR}{dF} < \frac{1}{2}\left\{-1 + \frac{\frac{3}{2}\sqrt{\rho}}{\sqrt{\frac{9}{4}\rho - 2\rho}}\right\} = 1$$

It is easy to see that the derivative converges to zero (no impact of the law on the capital market) as ρ tend to zero, w tends to its maximum and as p tends to infinite.

4.5.4 Proof of proposition 9

The equilibrium marginal entrepreneur and interest rate are given respectively by the expressions below:

$$\begin{aligned} \widetilde{\alpha}(p)^* &= \frac{1}{p}\{R^* - F\} \\ R^* &= 1 + \frac{p-F}{2} - \sqrt{\left(1 + \frac{p-F}{2}\right)^2 - 2\rho} \end{aligned}$$

where $F = (1+f) - \sqrt{(1+f)^2 + 2w - 1}$.

The dependent employment return w only affects directly $\widetilde{\alpha}(p)^*$, with

$$\frac{d\widetilde{\alpha}(p)^*}{dw} = -\frac{1}{p}\frac{dF}{dw} > 0$$

Therefore an increase in w implies that less individuals, only the most able ones, will attempt to open a business. That will result in a reduction of the probability of default on bank loans, and, therefore, in the fall of the optimal interest rate.

Equivalently, ρ only impacts directly on the interest rate. The impact on the supply of entrepreneurs will be through the change in the cost of finance. As ρ increases, so does the interest rate:

$$\frac{dR^*}{d\rho} = \frac{\rho}{\sqrt{\left(1 + \frac{p-F}{2}\right)^2 - 2\rho}} > 0$$

When the seed capital becomes more expensive, fewer people decides to open a firm.

Lastly, an increase in p will encourage more individuals to become entrepreneurs, at any given level of interest rate. But as proposition 4.2 showed, in spite of that the expected average probability of entrepreneurial success increases with p so the banks will reduce the interest rates.

4.5.5 Proof of proposition 10

We depart from the expression of aggregate employment as a function of the interest rate:

$$AE(R(F)) = \frac{2}{p}\frac{(2+2p)R(F) - 2R^2(F) - 2\rho}{R(F)\,(1+R(F))}$$

From the expression above we can start bounding aggregate employment finding its values for the limit values of R. Then,

$$\begin{aligned} Limit_{R\to 0}\ AE(R(F)) &= -\infty \\ Limit_{R\to\infty}\ AE(R(F)) &= -2 \end{aligned}$$

Hence the curve will have one or more maxima. We study the behaviour of the curve in between both values by taking the derivative with respect to R :

$$\begin{aligned} \frac{p}{2}\frac{dAE(R(F))}{dR(F)} &= \frac{-2(2+p)R^2 + 4R\rho + 2\rho}{R^2(1+R^2)} = 0 \\ \overline{R} &= \frac{\rho + \sqrt{\rho^2 + \rho(2+p)}}{2+p} \end{aligned}$$

Hence the function has only one maximum to be found at $\overline{R}$. Plugging the lower bound of the parameter ρ given above: $\rho \geq \frac{p+1}{2}$ into the expression of $\overline{R}$ to find its lower bound, it is easy to see that $\overline{R} \geq 1$. That means that the aggregate employment maximum does exist for reasonable values of the parameters. Finally, using the relationship between R and F and between F and f we can work out the corresponding values for which aggregate employment is maximum.

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