The 2010 Nobel Prize in Economics was awarded to Chris Pissarides, jointly with Peter Diamond and Dale Mortensen, 'for their analysis of markets with search frictions'. The work of the three laureates has deeply enhanced our understanding of how labour markets work and how policy-makers should respond. As many countries are facing consequences of the most severe recession of the post-war era, the 2010 Prize is an award to research on fundamental economic issues that are high on the policy agenda of the moment and at the core of the wellbeing of society at large.

Various forms of imperfections or 'frictions' characterise most kinds of real-world transactions. The importance of these frictions in driving market outcomes is a key issue for understanding such diverse markets as those for a job, a house and a spouse.

While a given market may have buyers and sellers who can in principle agree on a price, this may be insufficient for immediate trade to take place. Both buyers and sellers may need to invest in a costly and time-consuming process of search order to locate and assess matching partners, and they eventually need to agree to enter a transaction rather than wait for better trading opportunities. These frictions derive from several sources, including imperfect information about trading partners, heterogeneous demand and supply, slow mobility, coordination failures and other similar factors.

Search theory provides a versatile framework for understanding market outcomes in a variety of situations in which trade is complex. One key lesson of the theory is that, with search frictions, not all markets will clear at all points in time – some buyers and/or sellers remain unmatched. Another important implication of search theory is that, when access to information is costly and trade opportunities are infrequent, not all traders may trade at the same market price, leading to dispersion in equilibrium prices. Finally, decentralised equilibrium may be inefficient in a search market, if individuals engage in 'too much' or 'too little' search, and in this case policy intervention may improve on what markets alone would be able to achieve.

Although economists have long been aware of the importance of frictions (at least since Hicks's *Treaty of Wages* of 1932), these frictions were not brought into formal models until the work of the three Nobel laureates and a few other researchers in the 1970s. Since then, they have generated an incredibly large and ever growing literature, addressing the role of frictions in many real world scenarios.

In the labour market, frictions are used to explain the existence of unemployment and wage inequality. In business cycle models, they are used to explain the amplification of the response of employment to aggregate shocks. In coordination-failures models, they are used to justify the dependence of the strategy of one agent on that of another. In monetary models, they are used to explain the existence of money. In the housing market, they are used to explain residential choices and fluctuations in housing prices. In the marriage market, they help explain dating, marriage, fertility, and divorce behaviour.

By far the most common and influential application of search theory has been to the labour market, and it has led to the development of what is now recognised as the leading model of equilibrium unemployment. This is the area in which Chris made his main contributions to search theory. His seminal work on the functioning of labour markets with frictions appeared in a number of articles in the late 1970s and 1980s, and was later organised in a unified

framework in the book *Equilibrium Unemployment Theory*, published in 1990, which has become a key reference in modern labour market analysis.

The central idea is that trade in the labour market is uncoordinated, time-consuming, and costly for both firms and workers. Workers need to spend time and resources to find suitable job opportunities, and firms need to spend time and resources to locate and screen job applicants. The process by which workers and firms search for each other and are brought together into productive matches is often represented by the 'matching function', a tool that describes choices available to workers and firms, and captures many features of frictions in labor markets, without need of making them explicit.

While the idea that trade in the labour market is complex is widely accepted these days, when search models of unemployment were first developed they implied a clear break with the perfectly competitive view of equilibrium in the labour market, which hinges on frictionless trade. In a perfectly competitive labour market firms and workers meet costlessly and trade at a single wage, and any excess labour supply would be absorbed instantaneously through a fall in the equilibrium wage. Most economists would argue that the functioning of the labour market is far more complex than this. In particular, the competitive model fails to explain such stylised facts as persistent unemployment, wage differentials among otherwise similar workers, and the coexistence of unemployed workers and job vacancies within certain markets.

By introducing realistic frictions, the search approach has developed a unified and elegant framework that allows us to explain key labour market stylised facts and ultimately think about unemployment and wages in a new light. For example, a direct consequence of frictions is that, as markets typically do not clear, unemployed workers and job vacancies may coexist, even within very narrowly defined labour market segments. In particular, unemployment persists in equilibrium because before all unemployed workers find new jobs, some of the existing jobs come to an end, providing a new inflow into unemployment. This suggests that after an adverse economic shock, it takes time to bring back unemployment to the pre-shock level, and thus recovery after a recession may be slow, even once new job opportunities start to arise.

An important implication of job search frictions is that existing jobs produce 'rents'. This means that if an employer and a worker are separated for reasons outside their control, at least one (and often both) of them is worse off. Rents give employers some degree of market power over their employees, meaning that, unlike in the perfectly competitive model, (small) wage cuts would not induce all employees to quit their jobs, simply because better paid jobs elsewhere in the economy are hard to find. As a corollary of this, workers of similar quality may end up being paid different wages if employed in different firms.

Search models have also been used to understand how aggregate shocks are transmitted to the labour market via the response of job creation and job destruction, and drive cyclical fluctuations in unemployment. Chris has produced two key contributions in this area. The first is his seminal search-theoretic analysis of the dynamics of unemployment, vacancies and real wages (Pissarides, 1985), illustrating the asymmetric behaviour of unemployment following positive and negative shocks. He shows that the rise in unemployment in a recession will be faster than its fall in an expansionary phase, because while an adverse shock results in an immediate increase in job separations, a positive shock only leads to a gradual fall in unemployment because the hiring process is time-consuming.

The second key contribution is Chris's most famous article "Job Creation and Job Destruction in the Theory of Unemployment", written jointly with Dale Mortensen (Mortensen and Pissarides, 1994). This work illustrates how firms' decisions to create new jobs and to end existing ones respond to shocks to aggregate productivity, and thus produce cyclical fluctuations in job flows and unemployment.

The core theoretical work on labour markets with search frictions has been accompanied by a number of contributions focusing on policy analysis and empirical evidence. It has become common practice in the literature to adopt a search framework to analyse the impact of unemployment compensation, hiring and firing costs, minimum wages, and taxes on unemployment and the wage distribution. Empirical work has addressed the implications of search models for individual labour market transitions, aggregate job and worker flows, unemployment dynamics, and the wage distribution.

A large body of empirical work has been devoted to the study of the matching function. Like most other aggregate functions, the matching function is a black box: we have good intuition about its existence and properties but only some tentative ideas about its microfoundations, and its usefulness crucially hinges on its empirical viability. In our first joint project (Petrongolo and Pissarides, 2001), Chris and I surveyed work on the existence and stability of the matching function, and concluded that the available evidence points in the direction of a clear, 'well-behaved' relationship, in which both jobseekers and job vacancies significantly contribute to job creation, whether at the aggregate or local level. We also found strong evidence in favour of constant returns in search markets, implying that larger or denser markets would not systematically deliver faster matching. Constant returns ensure uniqueness of equilibrium unemployment along a balanced-growth path, while multiple equilibria may arise when the matching function exhibits increasing returns, raising a number of policy issues.

I learnt a lot from Chris during our early joint work. I have been most impressed with his way of going after big questions, while never losing attention to details, and with his enthusiasm for writing. Both in our first joint work and in later projects, working with Chris has been an extremely fruitful experience and a true pleasure.

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