



Commitment, advertising and efficiency of two-sided investment in competitive search equilibrium

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ABSTRACT

Competitive search entails both commitment to and advertising of pay-off relevant aspects of market participants. This paper considers incrementally the implications of each in a labor market where both workers and firms invest prior to market entry. A wide range of institutional arrangements are addressed within the same general framework. When the characteristics of jobs or workers are advertised the efficient outcome pertains. Commitment without advertising typically leads to market unraveling: the Diamond paradox. But, whenever wages and human capital are advertised, firms become residual claimants; the private and social returns to investment coincide. Absent wage commitment, the Hosios condition implies efficiency when investments are advertised.

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1. Introduction

This paper looks at how labor market matching frictions affect incentives to invest in the quality of jobs and in human capital. It has two main goals. The first is to examine the extent to which the established efficiency results from competitive search extend to an environment with investment decisions on both sides of the market. The second follows from the recognition that competitive search requires that market participants can both commit to characteristics of the employment relationship, and make that commitment public (through advertising)—the paper examines incrementally the roles of commitment and advertising in shaping outcomes in this extended environment.

For context, consider a labor market with matching frictions and endogenous vacancy creation, but no investment decisions. Moen (1997) showed that competitive search equilibrium generates efficient vacancy creation. Now, if the workers' ability to observe individual firms' wages (which I will call advertising) is removed, Diamond (1971) implies that the equilibrium terms of trade assign the entire match surplus to firms. Workers facing any positive cost of entry will choose autarky. Beyond this, we can also remove the ability to commit to the terms of trade. If the wage is then determined *ex post* by generalized Nash bargaining, the environment becomes that of Pissarides (2000). As long as both sides get some share of the match surplus, for sufficiently small cost of entry, equilibria other than autarky exist. And, we know that efficient vacancy creation transpires under the Hosios (1990) condition (that equates the elasticity of the matching function with respect to vacancies to the firm's share of the match surplus). The objective in the current paper, therefore, is to examine the extent to which these results pass through to a more general environment with two-sided investment.

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The environment considered here is one of a fixed number of workers (death and birth rates are equal) and a set of firms which can create as many vacancies as they like. Prior to market entry, workers acquire irreversible human capital and firms invest in job specific physical capital. Investments cannot be augmented after match formation so they are fully committed to. Output occurs in any match according to a neoclassical production function which requires both physical and human capital as inputs. Possible characteristics of a worker (resp. job) are human capital investment (resp. human capital requirement), physical capital requirement (resp. physical capital investment) and the wage.¹ Committed to values of characteristics are observed in bilateral matches. When they are advertised they also become public knowledge. Potential partners can then direct their search on the basis of these known characteristics. Extending Moen (1997), when anyone advertises a particular value of a characteristic they create a submarket at that value for that characteristic. In all submarkets, unemployed workers and vacancies find each other according to a constant returns to scale matching function.

The generalization of the Moen (1997) efficiency result is that whenever characteristics of jobs and workers to which they commit are advertised, competitive search provides both sides of the market with the “right” incentives. Thus, when wages, human capital or physical capital choices are made public (by either side of the market) the equilibrium conditions coincide with a Social Planner’s optimality conditions for those characteristics.

When characteristics are committed to in private, there is a hidden action moral hazard problem. How this affects the outcome depends on the extent to which private marginal costs and benefits of any choice coincide with social costs and benefits.

Regardless of how investments are determined, if either side of the market can commit to a wage that is not advertised, search frictions ensure that the other side of the market will always accept a wage that is slightly worse for them than the efficient one. The private marginal cost of changing the wage is zero while the private marginal benefit is positive. The economy unravels as in Diamond (1971) and the only equilibrium is autarky; workers simply enjoy leisure and firms do not create vacancies.

What happens when investments are not advertised depends on how wages are determined. The two remaining possibilities are that wages are advertised and that they are determined by *ex post* bargaining. If advertised, wages are determined by competitive search. Firms become residual claimants on match output and directly incur all the costs and benefits from their own physical capital investments. It does not matter whether physical capital is advertised or not, firms always receive their marginal product and, given the wage and prevailing level of human capital, they make efficient investments. Consequently, the advertising of wages and human capital choices alone is sufficient to support the efficient allocation in equilibrium. Human capital choices, however, do have to become public knowledge for workers to make the right decisions. Search frictions ensure that when human capital investments are hidden and workers take the wage as given, the marginal benefit from investment is zero while the marginal cost is strictly positive. Only autarky can be supported as an equilibrium.²

When wages are determined by Nash bargaining and investment choices are hidden, the model becomes essentially that of Acemoglu (1996) or Masters (1998) within the Pissarides (2000) framework. Consistent with those papers there is a hold-up problem that means both sides of the market underinvest. Taking investments as given, the Hosios (1990) condition generates efficient vacancy creation but there is no bargaining power that is also able to prevent hold-up.

Efficiency on every margin is achieved only when there is directed search with respect to both physical and human capital and the terms of trade are determined by the Hosios condition. Even though match output is divided by an *ex post* rule, the fact that either side can create a market at any level of investment means they can use their decisions to attract match partners. Away from the Hosios rule, however, the matching externalities distort returns to investment decisions and vacancy creation.

Papers that incorporate investment in similar environments include Acemoglu and Shimer (1999) and Shi (2001, 2005). Acemoglu and Shimer (1999) incorporates physical but not human capital investment. It shows that commitment to and advertising of the wage alone is sufficient for both efficient investment and vacancy creation. They investigate the source of efficiency by considering variants of their model that are essentially special cases of those considered in this paper. Because efficiency transpires when workers can observe the capital investment of firms and the Hosios condition holds, they conclude that efficiency in their baseline environment follows from the ability of workers to effectively search across firms according to the level of capital invested. The current paper casts doubt on that interpretation because a similar result pertains regardless of which side does the searching. Instead, efficient physical capital investment occurs because with a wage contract, the firm becomes the residual claimant on output.³ Shi (2001, 2005) builds on the work of Acemoglu and Shimer by introducing an exogenous distribution of human capital. He shows that efficiency transpires when firms advertise and commit to a wage and a skill level.⁴

¹ Symmetrically, the terms of trade could be characterized by a rental payment to the firm. How this plays out will be indicated at various points of the exposition.

² If, instead of a wage, a rental payment to firms is advertised, workers become residual claimants. Human capital can be hidden without loss of efficiency but hidden physical capital leads to autarky.

³ See Mailath et al. (2010) which also recognizes the role of the residual claimant for efficient pricing.

⁴ Various papers in the monetary search literature (e.g. Rocheteau and Wright, 2005; Masters, 2010) have also shown that competitive search is able to bring about efficiency on multiple decision margins.

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