5.1 Summary

This thesis focuses on the analysis of equilibrium simultaneous search models of the labor market. As described in chapter 1, allowing workers to observe several employment opportunities at the same moment, has proven to provide a successful explanation for the fact that seemingly identical workers can earn very different wages. The essays in this thesis add to the existing literature by analyzing various extensions to the standard setup.

In the standard model, identical workers search for identical jobs by simultaneously applying to several vacancies. Because the labor market is large and agents cannot coordinate their actions, frictions arise. Multiple workers might apply to the same vacancy and/or multiple firms might offer the job to the same worker. It is well known that if some, but not all, workers observe several employment opportunities simultaneously, then firms face a trade-off between the wage offer and the hiring probability. Firms that offer low wages will only hire workers that do not have better offers, but make a high profit per hired worker. On the other hand, firms offering high wages attract workers more easily, but make a lower profit per hired worker. In equilibrium these effects offset, and all firms make the same profit.

The extensions considered in this thesis improve the understanding of this type of models by relaxing the assumptions of the standard setup in three different ways. The first essay addresses heterogeneity of firms. Contrary to what is often assumed, not all
firms are equally productive in reality. Some firms have newer technologies which allows them to produce a higher output per unit of labor than other firms. This provides workers with a trade-off. If applying is costly, they have to choose whether they want to apply to the highly productive firms, which can pay higher wages, but where also more competition from other workers can be expected. Alternatively, they can apply to less productive firms, where the opposite holds. The market equilibrium for this setup is derived and compared to a social planner’s solution.

The second essay takes the sector in which workers search as given, but focuses on the question whether workers send the right number of applications. It endogenizes the workers’ choice of search intensity by presenting an equilibrium search model in which sending multiple applications is more costly but can also result in a higher wage, since the worker accepts the best job offer if he gets more than one. The workers’ job search intensities, the firms’ entry and the wage distribution are all simultaneously determined in market equilibrium. The model is estimated using wage and aggregate labor force data, after which efficiency is considered, again by comparing the market equilibrium to a social planner’s solution.

The last essay in this thesis studies the effect of on-the-job search in an equilibrium model of simultaneous search. An important novelty compared to existing on-the-job search models is that workers can communicate their current wage to the firm offering them a new job. Firms can choose whether they want to offer the job to an unemployed or an employed worker and they make wage offers conditional on the applicant’s current wage. Unemployed workers are cheaper since they have lower outside options, but the competition from other firms for them is higher than for an employed worker. This provides firms with a trade-off.

The next section describes in greater detail in which way the three chapters in this thesis contribute to the literature. The contributions of the first and the third essay are mainly of a theoretical nature, while the second paper also adds to the methodological and empirical literature. Further, the section describes the policy implications of the findings in this thesis.
5.2 Contributions to Literature

First of all, this thesis contributes to the discussion whether the market equilibrium in the labor market is efficient from a social point of view. Both chapter 2 and 3 find that this is not the case. In the first essay workers fail to diversify their applications over the high and the low productivity sector, while in the second essay a fraction of the workers does not send the socially desired number of applications.

These inefficiency results are interesting from a theoretical viewpoint. For example, the first essay shows that, for many parameter values, the inefficiency continues to exist even when workers can observe the wage offers by the firms before they send their applications. Hence, the inefficiency of the market equilibrium is not driven by the random search assumption, but has a more fundamental cause. Workers try to maximize the productivity-weighted probability to get more than one job offer, while the social planner wants to spread applications over the sectors in order to reduce the coordination frictions. This implies that in the discussion on (in)efficiency of directed search models it is important to carefully consider heterogeneity among workers and/or firms.

A second contribution of this thesis concerns the shape of the wage distribution. Seminal papers explaining wage dispersion, like Burdett and Judd (1983) and Burdett and Mortensen (1998), generate a wage distribution that has a strictly upward sloping density. This is at odds with the data, which typically shows a density with a unique interior mode and a long and fat right tail. The standard way to obtain a better fit to the data is by allowing for worker and/or firm heterogeneity. Chapter 3 and 4 show that such ex ante heterogeneity is not required. In chapter 3 all workers are ex ante identical. Only ex post they differ in their search costs. As a result some workers send few applications, while others send many. This leads to the desired shape of the wage distribution.

Chapter 4 imposes an even stricter form of homogeneity. The only source of variation across workers is the randomness that is inherent to the matching process. Some workers are lucky and get high wage offers, while others are unfortunate and earn less. Since prospective employers observe the current wages of their applicants and base their wage
CHAPTER 5. CONCLUSION

offers on that information, the effect of a good or bad wage offer persists until the next unemployment spell. The wage distribution has a ladder property: high wage levels cannot be reached directly from unemployment, but require several job-to-job transitions. As a result, again a density with a unique interior mode is obtained.

Having models that can explain the shape of the wage distribution without allowing for heterogeneity in productivity is relevant for empirical work like considering the relative contributions of search and coordination frictions, on-the-job search, productivity differences, and measurement error to wage dispersion. Past literature has typically found that productivity differences are a large component of the variation in wages. This result is not surprising given that a good fit to the wage data was not possible without such differences. Using the models presented in this thesis might however lead to different conclusions.

All three essays add to the literature by extending the standard urn-ball matching function with multiple applications as presented by Albrecht et al. (2004). In the first essay workers are given an additional choice. They have to decide to which sectors they want to send their applications. It turns out that in most cases workers are indifferent between sending two applications to the high productivity sector and two applications to the low productivity sector. The second essay generalizes the standard matching function by endogenizing search intensity and by allowing for variation in the number of applications sent by the workers. Further, it provides an estimate of the resulting matching technology. In the third essay, the number of applications sent by the workers is determined by a draw from an exogenously given distribution. The novelty in this essay is the extra choice that firms have. They observe the employment state of all their applicants and decide whether they want to hire an unemployed or an employed worker.

Finally, the second essay describes how, using wage data, one can estimate the search cost distribution of workers, the implied matching probabilities, the productivity of a match, and the flow value of non-labor market time. Further, it shows how these estimates can be used to derive the socially optimal firm entry rates and distribution of job search intensities. As such the model can be used to analyze the effects of active labor market
programs that try to increase the search intensity of certain groups of workers. The model is estimated for the Dutch labor market using data from wage records of firms. The level of inefficiency is quantified at approximately 12% of total output.

5.3 Policy Implications

The results found in this thesis have important policy implications. First of all, the inefficiency result of the first two essays implies that government intervention in the labor market could be beneficial. The first essay shows that the socially optimal outcome is not achieved because workers fail to diversify their applications across the high and the low productivity sector. Hence, governments could increase welfare if they can change the fraction of workers mixing between both sectors. This is however not straightforward, since most of the instruments that governments have, like taxation, will make one of both sectors more attractive. This will then only increase the fraction of workers sending both applications to this sector without changing the fraction of workers diversifying their applications. In any case, governments should try to ensure that excessive numbers of applications are not sent to any particular sector, as such congestion creates coordination frictions that reduce social welfare.

A similar conclusion is drawn from chapter 3. Using structural estimation it is shown that several inefficiencies coexist in the labor market. Too many workers do not search for a job, but at the same time a small fraction of the workers sends out too many applications. Moreover, too many vacancies are created for a given level of workers’ search intensity. This essay argues that a marginal increase of the minimum wage and/or unemployment benefits conditional on actively searching for a job could reduce all three sources of inefficiency and therefore improve welfare. Both instruments increase the expected payoff of the first application and therefore increase participation. At the same time, they discourage workers from sending many applications by compressing the wage distribution a bit. They also reduce firms’ profits by increasing the equilibrium wages, which lowers entry of vacancies.
Finally, all three essays are equilibrium models of the labor market. Hence, they are suitable for analyzing the equilibrium effects of active labor market programs or policy reforms. In the evaluation of these programs it is quite common to focus on the effect on the treated, but the essays in this thesis show that the spillovers on other agents in the market are potentially very large. For example, any program that changes the search decision of a fraction of the workers, has an effect on the wage distribution, the number of firms entering the market, the search decision of other workers, et cetera. Therefore, it is crucial to take the equilibrium effects into account for a proper evaluation of public policy.

5.4 Directions for Further Research

The essays in this thesis relax the assumptions of the standard simultaneous search model in a couple of ways. However, many other research projects could be pursued. For example, in models of simultaneous search the role of firms, besides making a wage offer, is often quite limited. Chapter 4 tries to improve on this by letting firms decide whether they want to hire an unemployed or an employed job candidate, but in reality the choice firms face is more complex. For example, workers differ in their productivity and this creates a second choice that has to be made by the firms. Although a firm would prefer to hire the most productive worker, it realizes that the competition from other firms for this worker is very large. If interview resources and/or time are scarce, this might induce the firm to choose another worker, who is slightly less productive, but easier to hire. At the same time however, workers with a very low productivity are only attractive candidates if no better workers show up, implying that in equilibrium endogenous segmentation of the labor market could arise. Incorporating productivity differences among workers in this way would also greatly improve the estimation of simultaneous search models, since it makes it feasible to consider the labor market as one large market with heterogeneous agents rather than a collection of submarkets, each with homogeneous agents.

Another interesting direction of extension would be to relax the assumption that each
firm has one vacancy. In reality many firms have multiple vacancies simultaneously and assuming that an independent hiring process for each vacancy exists seems questionable. If workers observe the wages and the number of vacancies at each firm, firms with more vacancies can offer lower wages since they provide the worker with a larger probability to be hired. It is well known that if all firms have one vacancy and all workers send two applications, a wage distribution with two points of support arises. Each worker sends her first application to a firm offering the low wage and the second to a firm offering the high wage. An interesting question would therefore be how heterogeneity in the number of vacancies changes this result: do all workers send both their applications to the same type of firms, like in the first essay in this thesis, or do they diversify over different firm types?