



Labor supply with job assignment under balanced growth[☆]

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Abstract

We consider a competitive equilibrium growth model where technological progress is embodied into new jobs which are assigned to workers of different skills. In every period workers decide whether to actively participate in the labor market and if so how many hours to work on the job. Balanced growth requires that the job technology is complementary with the worker's total labor input on the job, which is jointly determined by his skill and his working hours. Since lower skilled workers can supply longer hours, we show that the equilibrium features positive assortative matching (higher skilled workers are assigned to better jobs) only if differences in consumption are small relative to differences in worker skills. When the pace of technological progress accelerates, wage inequality increases and workers participate less often in the labor market but supply longer hours on the job. This mechanism can explain why, as male wage

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inequality has increased in the US, labor force participation of male workers of different skills has fallen while their working hours have increased.

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1. Introduction

The idea that new technologies come embodied into a limited supply of new capital vintages dates back at least to [Solow \(1960\)](#). If the production technology requires each worker to be assigned to a specific capital unit, technological progress also leads to heterogeneity in jobs. In the words of [Akerlof \(1981\)](#), good jobs become a scarce resource, which the economy should assign to workers with potentially different skills. This assignment friction has been widely studied, see [Sattinger \(1993\)](#) for a literature review. But existing assignment models have typically abstracted away from labor supply decisions either at the intensive margin (how many hours to work on the job) or at the extensive margin (whether to actively participate in the labor market). This is an interesting issue because, in assignment models, standard income and substitution effects in labor supply lead to a non-trivial allocation problem between the number of hours worked on the job, which determines the output each job produces, and labor force participation, which determines the number and quality of operating jobs. Income and substitution effects also play a non-trivial role in determining whether the equilibrium features positive assortative matching—i.e. whether higher skilled workers are assigned to better jobs. This is because the amount of labor input supplied by a worker on the job is determined by his skill as well as by his working hours. So a low skilled worker can supply greater working hours to compensate for his lower skill level, which implies that standard conditions for assortative matching based on capital-skill complementarity ([Becker, 1973](#)) are directly affected by labor supply.

To study labor supply in an assignment model, we consider a simple neoclassical growth model with perfectly competitive labor markets and vintage capital as in [Jovanovic \(1998\)](#). Technological progress is embodied into new jobs, which are slowly created over time. Hence in equilibrium there is dispersion in job technologies. Workers differ in skills and they can be employed in at most one job. This leads to a simple assignment problem in the spirit of [Becker \(1973\)](#) and [Sattinger \(1975\)](#). But in our framework labor supply is endogenous because in every period each worker decides whether to actively participate in the labor market, which involves a fixed utility cost, and how many hours to work on the job he is assigned to. To guarantee the existence of a balanced growth path, we assume log preferences in consumption (so that in the long run income and substitution effects cancel out) and a production technology on the job that features unitary elasticity of substitution between the job technology and worker's total labor input, which is jointly determined by the worker's skill and his working hours. In equilibrium, the model endogenously generates inequality in jobs, wages, and labor supply, but all workers of the same skill consume the same amount—which is a natural implication of the permanent income hypothesis. Subject to the assignment friction, the competitive equilibrium is efficient and its allocation coincides with the solution chosen by a social planner who gives (potentially) different Pareto weights to workers of different skills.

When labor supply is exogenous, complementarity between the job technology and worker skill ensures that the equilibrium features positive assortative matching (see for instance [Becker,](#)

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