

**GALATASARAY UNIVERSITY
INSTITUTE OF SOCIAL SCIENCES
ECONOMICS DEPARTMENT**

**TAXATION, SUBSIDIES AND BENEFITS IMPACT
ON LABOR MARKET WITH ENDOGENOUS
LABOR FORCE PARTICIPATION**

MASTER'S THESIS

Suna AKIŞ GÜLÜMSER

Thesis Supervisor: Assoc. Prof. Mustafa ULUS

August 2020

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PREFACE

I would like to state my gratitude to my supervisor Assoc. Prof. Dr. Mustafa ULUS for his patience and guidance. It was a great honour and opportunity to work with him. I cannot thank him enough for his never-ending support throughout my thesis writing period.

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ABBREVIATIONS

EITC	Earned income Tax Credit
GDP	Gross Domestic Product
NIT	Negative Income Tax
OECD	Organisation for Economic Cooperation and Development
TCJA	Tax Cuts and Jobs Act
TEA	Turkish Employment Agency
TRY	Turkish Lira
TSI	Turkish Statistical Institute

LIST OF SYMBOLS

H	Cumulative Distribution Function
I	Number of Inactive Individuals
L	Number of Employed Individuals
M	Number of Matches
N	Labor Force
P	Population
S	Subsidies
T	Transfers
U	Number of Unemployed Individuals
V	Number of Vacancy
b	Benefits
h	Vacancy Cost
q	Job Destruction Rate
r	Discount Rate
t	Profit Tax
t_e	Income Tax
t_f	Payroll Tax
u	Unemployment Rate
w	Minimum Wage
y	Productivity
z	Social Aid
x	Home Productivity
θ	Labor Market Tightness
$m(\theta)$	Matching Probability
Ω	Welfare

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RÉSUMÉ

Les gouvernements mettent en œuvre des politiques sociales pour réguler le marché du travail dans l'économie. Un bon fonctionnement du marché du travail est l'un des objectifs les plus importants d'une économie. Certaines banques centrales visent également un emploi élevé, bien que ce ne soit pas une pratique courante. Chaque changement de politique a un impact sur les variables endogènes du marché du travail. La fiscalité, les subventions, les avantages et autres types de transferts sont utilisées comme un outil politique pour réglementer le marché du travail. Dans une économie où il y a des frictions dans le processus de recherche d'emploi et d'appariement, ces outils politiques gagnent en importance. Des modifications inappropriées apportées aux niveaux d'imposition, par exemple, peuvent produire un résultat qui affecte non seulement le marché du travail mais également l'ensemble de l'économie. Par conséquent, il est important de comprendre l'impact de la décision relative à la participation au marché du travail puisque la décision est endogène et affectée par les politiques gouvernementales. La décision d'une personne inactive ou non-participante dépend non seulement du salaire qu'elle gagnera quand ou si elle sera employée, mais aussi de la charge fiscale, des transferts monétaires et des allocations de chômage qu'elle percevra lorsqu'elle entrera sur le marché du travail. Par conséquent, intégrer un troisième état de non-participation au modèle général du marché du travail à deux États, employés et chômeurs, permet de voir clairement les flux entre les États du marché du travail. Étant donné que la participation et l'emploi ont une relation très étroite, il ne peut être ignoré lors de l'analyse des résultats sur le marché du travail des changements de politique.

Le salaire minimum lui-même, en revanche, est déjà un sujet controversé en économie du travail. Contraindre la négociation salariale modifie l'ensemble des résultats d'un effet politique sur le marché du travail. L'hypothèse d'un salaire minimum dans un modèle économique dépend de l'efficacité du salaire minimum dans cette économie. Dans l'économie turque, le pourcentage approximatif de salariés qui gagnent le salaire minimum était de 42% en 2014 selon les données du TSI (Turkish Statistical Institute). De plus, si le rapport entre les salariés au salaire minimum et le total des salariés dans une économie était faible, alors les modifications du salaire minimum devraient avoir des effets moins importants sur l'économie. Comme la Turquie a un ratio de salariés minimum plus élevé par rapport aux autres pays de l'OCDE selon les données d'Eurostat. Par conséquent, les effets sur le marché du travail devraient être différents de ceux des autres pays de l'OCDE en cas de modification de la fiscalité, des subventions ou des prestations. De plus, le rapport du salaire minimum au salaire médian est beaucoup plus élevé en Turquie.

Notre objectif est d'analyser les effets des politiques sociales sur le marché du travail

avec une contrainte de salaire minimum. Les politiques sociales telles que l'impôt négatif sur le revenu (NIT) sont l'un des moyens de réduire la charge fiscale des bas salaires. De nombreux pays comme le Canada, les États-Unis ou la Nouvelle-Zélande, mettent en place un formulaire NIT pour encourager la participation et redistribuer les revenus. En diminuant la charge fiscale d'une famille avec deux enfants qui gagnent moins que le salaire moyen dans l'économie par exemple, ils visent à maintenir les ménages sur le marché du travail et à encourager ceux qui sont indifférents entre le travail et l'inactivité. Une forme bien connue de NIT est le mécanisme EITC (Earned Income Tax Credit), qui est conçu pour les bas salaires. Bien que l'augmentation de la participation au marché du travail soit principalement composée d'individus ayant un faible niveau d'éducation, le gouvernement a pour politique de réduire les inégalités. Le but de ce mécanisme étant également de réduire la pauvreté et d'assurer l'égalité après imposition, c'est un point de départ important pour nous pour construire notre modèle théorique. Non seulement une NIT, mais aussi d'autres politiques améliorant le bien-être telles que les subventions à l'embauche et les allocations de chômage sont également examinées dans notre modèle. Il est tout aussi important que la réduction des impôts d'inciter les entreprises à créer plus d'emplois. De plus, bien que les allocations de chômage soient un sous-thème de l'économie du travail elle-même, nous avons essayé de voir les impacts généraux de ces transferts avec un environnement de salaire minimum. La littérature connexe ne prend les prestations que pendant une certaine période et impose une conditionnalité pour avoir droit à une prestation. Cependant, par souci de simplicité, nous n'assumons aucune conditionnalité pour les gains des prestations et il n'y a aucune exigence concernant la période d'admissibilité.

Nous construisons un modèle de recherche et d'appariement avec une contrainte de salaire minimum et la décision de participation au marché du travail est endogène. Il n'y a pas de recherche d'emploi et les personnes qui décident d'entrer sur le marché du travail devraient d'abord chercher un emploi. Les allocations de chômage sont transférées à tous les chômeurs sans aucune restriction, c'est-à-dire sans contrainte de temps. Tous les individus sans emploi, chômeurs et non participants, ont droit à l'aide sociale accordée par le gouvernement. Les non-participants sont engagés dans la productivité domestique. Les personnes employées gagnent le salaire minimum et les transferts en espèces du gouvernement. Il n'y a pas de transition de la non-participation à l'emploi. Nous essayons de voir les effets de la fiscalité, des subventions à l'embauche et des avantages sociaux sur l'emploi, le chômage, la participation au marché du travail, le budget du gouvernement et la protection sociale. Nous résolvons d'abord le modèle théorique, puis appliquons un exercice quantitatif pour notre modèle.

Nous avons constaté qu'une baisse de l'impôt sur le revenu entraîne une augmentation de la participation au marché du travail et une augmentation du niveau d'emploi. Le

revenu fiscal du gouvernement augmente jusqu'à un certain point d'impôt sur le revenu, puis commence à baisser. Ce résultat montre qu'il peut y avoir un niveau optimal d'imposition du revenu pour l'économie. La protection sociale a également une tendance à la hausse en raison de l'augmentation de la participation. L'impôt sur le revenu dans ce modèle affecte directement le marché du travail par la décision de participation, c'est-à-dire les changements dans la valeur de l'emploi. À mesure que le niveau de salaire après impôt augmente, les personnes qui sont en dehors du marché du travail décident d'entrer sur le marché du travail. Par conséquent, l'effet du taux de chômage dans le bien-être social est contourné. L'imposition d'une taxe sur la masse salariale aux entreprises a des effets négatifs sur les variables du marché du travail. Une augmentation de la taxe sur la masse salariale incitera les entreprises à ouvrir moins de postes vacants, ce qui entraînera une augmentation du taux de chômage. Comme il y aura moins de postes vacants, la probabilité de pourvoir un poste vacant augmentera. Cependant, comme les travailleurs sont incapables de baisser leur salaire de réserve pour trouver un emploi, le taux de chômage augmente. Les recettes fiscales du gouvernement augmenteront en raison de l'augmentation de la taxe sur les salaires. Néanmoins, lorsque la participation diminue plus que prévu, le revenu fiscal commence également à baisser en raison d'une contraction de l'assiette fiscale.

L'imposition d'un impôt sur les bénéfices des entreprises a produit des résultats similaires à ceux de l'impôt sur les salaires. L'augmentation de l'impôt sur les bénéfices amène les entreprises à réduire leurs offres d'emploi, d'où une augmentation du taux de chômage. La baisse de la participation au marché du travail entraîne une baisse du niveau d'emploi. Nous nous attendons à ce que l'assiette fiscale se rétrécisse en raison de ces effets sur la participation à l'emploi. Cependant, la hausse de l'impôt sur les bénéfices était plus que la baisse de l'assiette fiscale, de sorte que le revenu de l'impôt du gouvernement a augmenté dans la fourchette que nous avons déterminée pour l'impôt sur les bénéfices. Inversement, la protection sociale augmente jusqu'à un certain point d'imposition sur les bénéfices, puis diminue. Là encore, en fonction des valeurs initiales que nous attribuons à nos paramètres, il est fort possible que pour ceux de l'impôt sur le revenu, l'impôt sur les salaires et l'impôt sur les bénéfices aient une valeur optimale.

Nous intégrons également les subventions à l'embauche à notre modèle où les entreprises reçoivent un montant de subvention pour chaque jumelage. Ce type de transferts a un impact plus significatif et plus direct sur le marché du travail car ils sont directement imposés à la fonction d'utilité des agents. Nous avons constaté qu'une augmentation des subventions entraîne une augmentation de la participation au marché du travail et de l'emploi. Cette augmentation entraîne une augmentation de l'assiette fiscale pour le gouvernement et le revenu fiscal augmente. Cependant, le budget du gouvernement est affecté négativement

puisque les subventions sont également des dépenses et que les dépenses augmentent plus que les revenus dans ce cas. De manière surprenante, le bien-être social diminue très probablement en raison de la baisse de la production domestique ou de la montée de la tension sur le marché du travail devient plus élevé que la hausse de la participation, ce qui entraîne alors une baisse du bien-être. Là encore, il y a un tournant des subventions, qui modifie la structure du budget du gouvernement. Enfin, nous avons essayé de voir les effets des allocations de chômage sur le marché du travail. Les prestations augmentent la valeur du chômage, donc la participation augmente. La hausse du niveau de participation n'affecte pas cette fois le taux de chômage. Par conséquent, à l'équilibre, le bien-être social augmente. Cependant, les recettes fiscales du gouvernement augmentent à nouveau en raison d'une expansion de l'assiette fiscale, car les avantages sont également des dépenses. Le budget du gouvernement commence à diminuer après un certain niveau de prestations.

Il est important de noter que les changements du taux de chômage, du taux d'activité et du taux d'emploi seraient beaucoup plus différents avec une négociation salariale. Comme les travailleurs et les entreprises n'ont aucun pouvoir sur les salaires, il est inévitable que le taux de chômage augmente en cas de changement de politique défavorable sur le marché du travail. Dans l'ensemble, la fiscalité imposée à la fois aux entreprises et aux travailleurs a des effets négatifs sur le marché du travail. De plus, les paiements de transfert tels que les subventions à l'embauche et les allocations de chômage peuvent avoir un impact positif sur le marché du travail avec une limitation. En outre, l'impôt sur le revenu peut être abaissé pour les salariés au salaire minimum afin d'augmenter la participation au marché du travail et le niveau d'emploi. Nos résultats quantitatifs montrent des résultats très similaires avec notre modèle théorique.

ABSTRACT

A proper functioning of labor market is one of the most important goals in an economy and public authorities often implement social policies to regulate labor market. Taxation, subsidies, benefits and other kind of transfers are used as policy tools to regulate the labor market and every policy change has an impact on the labor market variables. In an economy where there are frictions for workers and firms in the search and matching process, these policy tools gain more importance. Improper changes made in the taxation levels for instance, can generate results that affect not only the labor market but also the entire economy in an undesirable way. For instance, labor force participation decision of a non-participant individual depends not only on the wages they will earn when they are employed but also the tax burden, cash transfers and unemployment benefit they will receive when they enter the labor market. So, the labor force participation decision of an individual depends heavily on government social policies. As the participation and employment has a really close relationship, it cannot be ignored when analyzing the labor market outcome of policy changes. Therefore, it is important to understand the impact of government policies on labor market.

Minimum wage is one of the labor market policies that governments or other public authorities determine and already a controversial subject in labor economics. In Turkish economy, the approximate percentage of wage earners who earn minimum wage was 42% in 2014 according to the data of TSI (Turkish Statistical Institute). Moreover, if the ratio of minimum wage earners to total wage earners in an economy were small, then the changes in the minimum wage would be expected to have smaller effects in the economy. As Turkey has a higher ratio of minimum wage earners compared to the other OECD countries according to the Eurostat data. Therefore, it is expected to see different effects when there are taxation, subsidies or benefit changes on the labor market than of other OECD countries.

Our aim is to analyze the effects of social policies on the labor market through changes in behavior of both workers and firms. Social policies such as Negative Income Tax (NIT) are one of the ways of reducing tax burden of low wage earners. Many countries such as Canada, United States or New Zealand, implements a form NIT to encourage participation and redistribute income. By decreasing the tax burden of a family with two children who earn less than the average wage in the economy for instance, they aim to keep households in the labor market and encourage those who are indifferent between working and stay out of the labor force. A well-known form of NIT is the EITC (Earned Income Tax Credit) mechanism, which is designed for low wage earners. Although, the increase in labor force participation is mainly composed of the individuals with low education level, it is a substantial policy for the government to reduce inequality. As the purpose of this mechanism also to reduce poverty

and provide after tax equality, it is an important starting point for us to build our theoretical model. Not only a NIT but also other welfare enhancing policies such that hiring subsidies and unemployment benefits are also examined in our model. It is as much important as the tax reduction to give incentive for firms to create more jobs. Furthermore, although unemployment benefits are a subtopic of labor economics itself, we tried to see the general impacts of this transfers with a minimum wage environment. The related literature takes the benefits only for a certain period and imposes a conditionality to be entitled to earn a benefit. However, for simplicity we do not assume any conditionality for the benefit earnings and there is no requirement for the time span of eligibility.

We construct a search and matching model with a minimum wage and endogenous labor force participation. There is no on-the-job search and individuals who decide to enter the labor market should first search for a job. Unemployment benefits are transferred to all unemployed individuals without any restriction i.e. no time constraint. All the non-employed individuals, unemployed and non-participant, are entitled for social aid given by the government. Non-participants are engaged with home productivity. Employed individuals earn minimum wage and cash transfers from the government. There is no transition from non-participation to employment. We try to see the effects of taxation, hiring subsidies and benefits on the employment, unemployment, labor force participation, government budget and social welfare. First we solve for the theoretical model and then apply a quantitative exercise for our model.

We have found that a decrease in income tax causes labor force participation to rise and employment level to increase. Government tax income increases until a certain point of income tax and then starts to decline. This result shows that there may be an optimal income taxation level for the economy. Social welfare has also an increasing trend due to the increase in participation. The income tax in this model, effects the labor market directly through participation decision i.e. the changes in the value of employment. As the after-tax level of wage becomes higher, people who are outside the labor market decide to enter the labor market. Therefore, the unemployment rate effect in the welfare is bypassed. Payroll tax imposition on the firms has negative impacts on the labor market variables. An increase in the payroll tax will cause firms to open up less vacant positions causing an increase in unemployment rate. As there will be less vacant positions, the probability of filling a vacant job will increase. However, since the workers are unable to decrease their reservation wages to find a job, the unemployment rate increases. Government tax income will increase due to the rise in the payroll tax. Nevertheless, when the participation decrease more than expected then the tax income also starts to fall due to a contraction in tax base.

Imposition of a profit tax on the firms' profits has generated similar results as of

payroll tax. Increase in the profit tax causes firms to decrease their job openings hence an increase in the unemployment rate. Fall in labor force participation causes a decline in employment level. We expect the tax base to shrink due these effects on the participation on employment. However, the rise in profit tax was more than the fall in tax base, so the government tax income increased in the range we determined for the profit tax. Conversely, social welfare increases until a certain point of profit tax and then decreases. Again, depending on the initial values we attribute for our parameters, it is strongly possible that for those of income tax, payroll tax and profit tax have an optimal value.

We also integrate hiring subsidies to our model where firms are transferred an amount of subsidy for every match. This kind of transfers has more significant and direct impact on the labor market since they are imposed directly on the agents' utility function. We found that an increase in subsidies results in an increase in labor force participation and employment. This increase yields an increase in tax base for the government and the tax income rises. However, government budget is affected negatively since the subsidies are also expenditures and expenditures rise more than the revenues in this case. Surprisingly, the social welfare decreases most probably due to the decrease in home production or the rise in labor market tightness becomes higher than the rise in participation, which then yields in a welfare decrease. Again, there is a turning point of subsidies, which changes the pattern of the government budget. Lastly, we tried to see the effects of unemployment benefits on the labor market. Benefits increase the value of unemployment, so the participation rises. Rise in participation level this time does not affect the unemployment rate. Therefore, in the equilibrium, the social welfare increases. Government tax income again increases due to an expansion in the tax base, however, as the benefits are also expenditures government budget starts to decline after a certain point of benefit level.

It is important to note that, the changes in the unemployment rate, labor force participation rate and employment rate would be much more different in a setup with wage bargaining. As the workers and the firms have no power on the wages, it is inevitable for unemployment rate to rise when there is an adverse policy change in the labor market. Overall, the taxation imposed both on the firms and workers has negative labor market impacts. Further, the transfer payments such as hiring subsidies and unemployment benefits can have a positive impact on the labor market with a limitation. Additionally, income tax can be lowered for the minimum wage earners to boost the labor force participation and employment level. Our quantitative results show very similar results with our theoretical model.

ÖZET

Hükümetler, işgücü piyasasını düzenlemek için sosyal politikalar uygulamaktadır. İşgücü piyasasının düzgün işleyişi, bir ekonomideki en önemli hedeflerden biridir. Bazı Merkez Bankaları da yaygın bir uygulama olmamasına rağmen yüksek istihdamı hedeflemektedir. Her politika değişikliğinin, endojen işgücü piyasası değişkenleri üzerinde bir etkisi vardır. Vergilendirme, sübvansiyonlar, yardımlar ve diğer transferler, işgücü piyasasını düzenlemek için bir politika aracı olarak kullanılmaktadır. İş arama ve eşleştirme sürecinde sürtüşmelerin yaşandığı bir ekonomide, bu politika araçları daha fazla önem kazanmaktadır. Örneğin, vergilendirme seviyelerinde yapılan uygunsuz değişiklikler, sadece işgücü piyasasını değil aynı zamanda tüm ekonomiyi etkileyen bir sonuç doğurabilmektedir. Bu politikalar işgücü piyasasını çeşitli yollarla etkilemektedir. İşgücü piyasasındaki değişiklikler, sürekli olarak işçilerin işsizlik, istihdam ve işgücüne katılmama durumları arasındaki geçişleri etkilemektedir. Bu nedenle, işgücü piyasasını etkileyen değişikliklerin etkilerini tam anlamıyla yorumlayabilmek için işgücüne katılım kararının etkisini anlamak önemlidir. Çalışmayan veya işgücüne katılmayan bir bireyin işgücüne katılma kararı, sadece istihdam edildiğinde veya istihdam edildiğinde kazanacağı ücretlere değil, aynı zamanda işgücü piyasasına girdiklerinde doğacak vergi yüküne, alacakları nakit transferlerine ve işsizlik yardımlarına da bağlıdır. Bu nedenle, işsizlik ve istihdamdan oluşan genel iki durumlu işgücü piyasası modeline üçüncü bir işgücü piyasası durumu olan işgücüne katılmama durumunu dahil etmek, işgücü piyasası durumları arasındaki akışları net bir şekilde görmeyi sağlamaktadır. Katılım ve istihdam gerçekten yakın bir ilişkiye sahip olduğundan politika değişikliklerinin işgücü piyasası sonuçları analiz edilirken işgücüne katılım göz ardı edilememektedir.

Öte yandan asgari ücret, işgücü iktisadında halihazırda tartışmalı bir konudur. Ücret pazarlığının kısıtlanması, işgücü piyasası üzerindeki bir politika etkisinin tüm sonuçlarını değiştirmektedir. Bir ekonomik modelde ücret olarak asgari ücreti almak, o ekonomide asgari ücretin etkinliğine bağlıdır. Türkiye ekonomisinde, TÜİK (Türkiye İstatistik Kurumu) verilerine göre 2014 yılında asgari ücretle çalışanların tüm ücretli çalışanlara oranı yaklaşık %42'dir. Bununla birlikte, bir ekonomide asgari ücretle çalışanların toplam ücretlilere oranı küçük olsaydı, asgari ücretteki değişikliklerin ekonomide daha küçük etkilerinin olması beklenirdi. Eurostat verilerine göre Türkiye diğer OECD ülkelerine göre daha yüksek asgari ücretle çalışan oranına sahiptir. Bu nedenle, işgücü piyasasında vergilendirme, sübvansiyonlar veya işsizlik yardımlarındaki değişikliklerin diğer OECD ülkelerine göre farklı etkiler göstermesi beklenmektedir. Ayrıca asgari ücretin medyan ücrete oranı Türkiye'de çok daha yüksektir. Bu çalışmanın amacı, sosyal politikaların işgücü piyasası üzerindeki etkilerini asgari ücret kısıtı ile analiz etmektir. Örneğin, Negatif Gelir Vergisi (NIT) gibi sosyal poli-

tikalar, düşük maaşların vergi yükünü azaltmanın yollarından biridir. Kanada, Amerika Birleşik Devletleri veya Yeni Zelanda gibi birçok ülke, işgücüne katılımı teşvik etmek ve gelir dağılımını efektif hale getirmek için bir NIT formu uygulamaktadır. Özellikle çocuklu aileleri hedef alan bu politika ile örneğin ekonomideki ortalama ücretten daha az kazanan iki çocuklu bir ailenin vergi yükünü azaltarak, hane halkını işgücü piyasasında tutmayı ve istihdam ile çalışmama arasında kayıtsız olanları teşvik etmeyi amaçlamaktadır. NIT'nin iyi bilinen şekli, düşük ücretliler için tasarlanmış EITC (Kazanılan Gelir Vergisi Kredisi) mekanizmasıdır. İşgücüne katılım artışının ağırlıklı olarak eğitim düzeyi düşük bireylerden oluşmasına karşın, hükümetin eşitsizliğin azaltılması hedefi için önemli bir politikadır. Bu mekanizmanın amacı da yoksulluğu azaltmak ve vergi sonrası eşitliği sağlamak olduğu için teorik modelimizi inşa ederken bizim için önemli bir başlangıç noktasıdır. Modelimizde sadece NIT değil, işe alma sübvansiyonları ve işsizlik yardımları gibi diğer refah artırıcı politikalar da incelenmektedir. Firmaların daha fazla istihdam yaratması için hükümetlerin teşvik vermesi en az vergi indirimi kadar önemlidir. Ayrıca, işsizlik yardımları başlı başına çalışma ekonomisinin bir alt konusu olmasına rağmen, modelimizde bu transferlerin genel etkilerini asgari ücret ortamında görmeye çalıştık. İlgili literatürde yer alan varsayımlarda, işsiz bireyler işsizlik yardımlarını yalnızca belirli bir süre için almakta ve yardım almaya hak kazanabilmek için bir belirli şartları sağlaması beklenmektedir. Ancak, modeli olabildiğince basit tutmak açısından, işsizlik yardımlarına hak kazanmak için herhangi bir koşul aranmamaktadır.

Bu çalışmada, asgari ücret kısıtlaması olan ve işgücüne katılım kararının endojen olduğu bir arama ve eşleştirme modeli oluşturulmuştur. Halihazırda çalışan bireyler iş aramakta ve işgücü piyasasına girmeye karar veren kişiler önce iş aramakta ardından istihdam edilmektedir. İşsizlik yardımları, herhangi bir kısıtlama, yani zaman kısıtlaması olmaksızın tüm işsiz bireylere aktarılır. Çalışmayan tüm bireyler, işsiz ve katılımcı olmayanlar, devlet tarafından verilen sosyal yardım alma hakkına sahiptir. Katılımcı olmayanlar ev üretkenliği ile meşguldür. Çalışan bireyler asgari ücret ve devletten nakit transferleri almaktadır. Katılmama durumundan istihdama geçiş yoktur. Modeli çözerken vergilendirmenin, işe alma sübvansiyonlarının ve yardımların; istihdam, işsizlik, işgücüne katılım, devlet bütçesi ve sosyal refah üzerindeki etkilerini görmeye çalıştık. Önce teorik modeli çözüp modelin analizini yaptık. Ardından modelimiz için nicel bir alıştırma uygulayıp sonuçlarını karşılaştırdık.

Yapılan çalışma neticesinde gelir vergisindeki düşüşün işgücüne katılımın artmasına ve istihdam seviyesinin yükselmesine neden olduğunu bulduk. Devlet vergi geliri, belirli bir gelir vergisi noktasına kadar artmakta ve ardından düşmeye başlamaktadır. Bu sonuç, ekonomi için optimal bir gelir vergisi seviyesi olabileceğini göstermektedir. Sosyal refah da işgücüne katılımdaki artış nedeniyle artış göstermektedir. Bu modeldeki gelir vergisi, işgücü piyasasını doğrudan katılım kararı, yani istihdam değerindeki değişiklikler yoluyla etkiler. Vergi sonrası

ücret seviyesi yükseldikçe, işgücü piyasasının dışında olan insanlar işgücü piyasasına girmeye karar verirler. Bu nedenle refahtaki işsizlik oranı etkisi esgeçilmiş olur. Firmalara bordro vergisi uygulamasının işgücü piyasası değişkenleri üzerinde olumsuz etkileri vardır. Bordro vergisindeki artış, firmaların daha az boş pozisyon açmasına ve işsizlik oranının artmasına neden olacaktır. Daha az açık pozisyon olacağından, açık bir işi doldurma olasılığı artacaktır. Ancak işçiler rezervasyon ücretlerini düşüremedikleri için işsizlik oranı yükselecektir. Bordro vergisindeki artış nedeniyle devletin vergi geliri artacaktır. Bununla birlikte, katılım beklenenden daha fazla düştüğünde, vergi tabanındaki daralma nedeniyle vergi geliri de belli bir noktadan sonra düşmeye başlamaktadır.

Firmalara kâr vergisi uygulanması, bordro vergisiyle benzer sonuçlar doğurmuştur. Kâr vergisindeki artış, firmaların açık pozisyonlarını azaltmalarına ve işsizlik oranının artmasına neden olmaktadır. İşgücüne katılımdaki düşüş, istihdam seviyesinde düşüşe neden olur. İstihdam ve katılım üzerindeki bu etkiler nedeniyle vergi tabanının daralması beklenmektedir. Ancak, kar vergisindeki artış, vergi tabanındaki düşüşten daha fazla olduğundan, devlet vergi geliri, kar vergisi için belirlediğimiz aralıkta artmaktadır. Tersine, sosyal refah belirli bir kar vergisi noktasına kadar artmakta ve bu noktadan sonra azalmaktadır. Yine, parametrelerimize atfettiğimiz başlangıç değerlerine bağlı olarak, gelir vergisi, bordro vergisi ve kar vergisinin optimum bir değere sahip olması kuvvetle mümkündür.

Modelimize ayrıca firmalara her eşleşme için bir miktar sübvansiyon verildiği işe alım sübvansiyonlarını ekledik. Bu tür transferler, doğrudan işveren ve/veya işçinin fayda fonksiyonlarında yer aldığından, işgücü piyasası üzerinde daha önemli ve doğrudan etkiye sahiptir. Sübvansiyonlardaki artışın işgücüne katılım oranında ve istihdamda artışa neden olduğunu bulduk. Bu artış, vergi tabanında bir artış sağlamak ve vergi geliri yükselmektedir. Ancak devlet bütçesi, sübvansiyonların da bir harcama kalemi olması ve bu durumda harcamaların gelirlerden daha fazla artması nedeniyle olumsuz etkilenmektedir. Şaşırtıcı bir şekilde, sosyal refah, büyük olasılıkla ev üretimindeki düşüşe bağlı olarak azalmakta veya işgücü piyasasındaki sıkılığın artması, katılımdaki artıştan daha yüksek olduğu için refah düşüşüne neden olmaktadır. Yine, devlet bütçesinin yapısını değiştiren sübvansiyonlarda bir dönüm noktası bulunmaktadır. Son olarak, işsizlik yardımlarının işgücü piyasası üzerindeki etkilerini görmeye çalıştık. İşsizlik yardımlarındaki artış işsizliğin değerini artırmakta ve işgücüne katılımın da artmasını sağlamaktadır. Bu defa, işsizlik yardımlarındaki artış işsizlik oranını etkilemediği için dengede sosyal refah artmaktadır. Vergi tabanındaki genişleme nedeniyle devlet vergi geliri de yine artış göstermektedir, ancak işsizlik yardımları aynı zamanda harcama kalemi olduğu için devlet bütçesi belirli bir seviyeden sonra düşmeye başlar.

İşsizlik oranı, işgücüne katılım oranı ve istihdam oranındaki değişimlerin bir ücret pazarlığı ile çok daha farklı olacağını belirtmek gerekir. İşçilerin ve firmaların ücretler

üzerinde hiçbir gücü olmadığından, işgücü piyasasındaki olumsuz bir politika değişikliği, işsizlik oranının yükselmesine neden olmaktadır. Genel olarak, hem firmalara hem de işçilere uygulanan vergilendirmenin olumsuz işgücü piyasası etkileri vardır. Ayrıca, işe alma sübvansiyonları ve işsizlik yardımları gibi transfer ödemeleri, bir sınırlama ile işgücü piyasası üzerinde olumlu bir etkiye sahip olabilir. Ek olarak, asgari ücretle çalışanların işgücüne katılım ve istihdam düzeyini artırmak için gelir vergisi düşürülebilir. Son olarak, nicel sonuçlarımız teorik modelimizle çok benzer sonuçlar göstermektedir.



1 INTRODUCTION

Individuals encounter many shocks in the labor market in the form of policy changes in taxation, minimum wages, subsidies, transfers, etc. These changes force them to be in a continuous decision-making process. At every instant, people at the working-age need to decide on their labor market participation and employment status. This decision-making process causes job flows in and out of the labor market. For instance, unemployed people can decide to look for a job or not to participate in the labor market taking into account the policy changes. Therefore, flows from unemployment to employment, unemployment to non-participation, or employment from non-participation are significant indicators of the labor market. As Garibaldi and Wasmer (2005) indicate, understanding the labor market is highly correlated with understanding labor force participation decisions, rather than unemployment. Indeed, the changes in unemployment, employment, and non-participation depend on the policy variables affecting the flows from these three states.

Governments regularly take actions to enhance workers' and employers' welfare by adjusting tax rates and providing different types of transfers or subsidies. They may use subsidies to increase workers' incentive to participate in the labor market and firms' willingness to create new jobs. The source of these transfers is mostly the income generated by the taxes collected from employers and workers since they both are obliged to pay taxes for every created job. Still, authorities must decide on the tax rates, transfers, and which side of the labor market to support in order to increase welfare in the economy. For instance, governments may qualify payroll taxes to increase labor market participation, so that firms' expenditures would diminish, and they would be more inclined to open up new vacancies. Since every job creation yields tax income to the authority, it creates more tax to collect. Another policy to increase participation could be the alleviation of the tax burden of employees. If they were to pay less tax on income, workers' expected utility from being employed would be higher, and they would be more willing to participate in the labor market.

Modifying fiscal policies has multiple-sided effects on the economy. A corporate profit tax reduction can positively affect the labor force participation so that the increased labor supply will expand the tax base for the government. It can be deduced that more people are now employed, hence the consumption tax and income tax rises. However, if the corporate tax share in total tax revenue is more notable than others, then the government tax revenue can fall. Therefore, these kinds of changes are still not precise and they vary across the countries. It also depends on the type of workers, i.e., the low wage earners can be much more affected by the tax reductions, benefits, or transfers than the middle-income earners. Additionally, the composition of workers can be a significant determinant of the results generated by these

fiscal policies. In a country like Turkey, where more than one-third of workers are minimum wage earners, taxation and transfers concerning minimum wage earners become even more crucial.

In this dissertation, we aim to examine how fiscal policy regulations, such as taxation, hiring subsidies and unemployment benefits, influence the agents' behavior in the labor market. To that end, we construct a search-and-matching model with endogenous labor force participation in a frictional labor market. It is even more critical when the participation is endogenously determined since any policy change altering the decision of a worker will directly affect the labor force participation. Although the impacts of changes in the minimum wage have also been widely studied in many papers, we concentrate on the impacts of taxation on labor, leaving the minimum wage constant. The income tax and payroll tax are calculated as a percentage of the unchanged minimum wage. The fiscal policy tools which we try to examine are income tax collected from the minimum wage earners, payroll tax and profit tax collected from the firms, unemployment benefits given to the unemployed workers, and hiring subsidies given to the firms. Our model encapsulates only minimum wage earners.

We find that an increase in the income tax causes a decrease in labor force participation hence employment and welfare. However, the effect on the total tax income of the government is ambiguous. On the other hand, increasing payroll taxes has an ambiguous effect on the welfare and causes unemployment to rise. Both income and payroll taxes have an ambiguous impact on the total tax income. Implementing profit taxation on firms raises the cost of a firm and therefore causes a decline in employment and a rise in unemployment. Total tax income on the other hands, rises as a result of a rise in profit tax. In an environment where the wages determined exogenously, increasing the income tax would not decrease wages so that the employment level is preserved. Therefore, the direct result is an increasing rate of unemployment. We also find that unemployment benefits have a boosting impact on labor force participation and, consequently, employment and welfare. Hiring subsidies can also be used as a temporary solution to reduce unemployment and encourage firms to hire more workers.

The rest of this study is organized as follows. In section 2, we try to outline recent literature about the effects of taxation, subsidies and benefits on labor market. In section 3, we briefly explain the current situation in Turkey related to minimum wage and taxation. Afterwards, we build our search-and-matching model in section 4 and discuss the model's main results when we have changes in taxation, unemployment benefits and subsidies. In section 5, we present a quantitative exercise for our model and discuss the results. Lastly, in section 6, we conclude.

2 LITERATURE REVIEW

There is a vast literature on the impact of taxes on unemployment, employment and labor market participation. Modelling labor force participation as a function of wage levels, income transfers and taxes is a way of attempting to see the impacts of social policy changes on labor market ¹. In a labor market with perfect competition, individuals are assumed either employed or inactive. In this set-up, employed workers are to choose between hours devoted to worked and hours of leisure. Since there is no room for unemployment, any individual can start working instantly without searching for a job. Even though this model neglects the frictional structure of the labor market, it gives some useful insights into the impact of taxes on agents' behavior.

On the other hand, it becomes possible to examine the labor market participation decision of inactive population and unemployed workers in a model with imperfect competition. Plus, in a model with imperfect competition, governments' redistribution policies may influence the behavior of unemployed workers.

Many authors examined the effects of taxation on labor market participation, unemployment and employment. Shi and Wen (1999)² shows that the unemployment benefits and labor income tax resembles each other in a sense that they both have a negative impact on employment. A reduction in unemployment subsidy on the other hand causes welfare to increase by decreasing the government expenditure. Contrary to the reduction in unemployment subsidies, it appeared to be more efficient to implement a vacancy subsidy. Since the vacancy subsidy causes firms to open more positions and increases employment level, the productivity gain and tax revenue of the government is much more higher than of unemployment subsidy. Authors built up a model that includes a wage bargaining process where the firms can change their behaviour in terms of wages when faced with a tax shock. Therefore, the taxes, subsidies and hiring process affect the labor demand by changing the trade off between consumption and leisure. Another finding of the study is that unemployment subsidy has a negative impact on employment since individuals choose to keep searching for a job rather than work, thereby reducing employment. On the other hand, when unemployment increases i.e. more individuals are looking for a job then it is more easy for firms to fill their vacancies. Hence it increases the employment.

Theoretical studies show that the effect of benefits on employment are rather ambiguous. It becomes crucial to measure the size of the unemployment benefit effects. For instance,

¹Hausman, J. A. (1979). The effect of wages, taxes, and fixed costs of women's labor force participation.

²Shi, S., & Wen, Q. (1999). Labor market search and the dynamic effects of taxes and subsidies. *Journal of Monetary Economics*, 43(2), 457-495.

Hagedorn et al. (2015)³ focused mainly on the cut of unemployment benefit duration in the US in December 2013 and its effect on the employment and labor force participation. It is argued that without any unemployment benefit, it becomes more costly for people to search for a job and they may be forced to leave the labor force. However, after the decision of unemployment benefit duration cut made in December 2013, they observe in 2014 that the employment growth was almost 25% higher and the unemployment rate declined.

Subsidies on the other hand, in the form of a negative income tax is a very common way of compensation among governments. The support for the lower income families has been a growing concern over the past decades. A very well-known example of this kind of support is the earned income tax credit (EITC) also known as an implementation of negative income tax (NIT). Basically, the taxpayer gets a refund from the owed tax to the authorities depending on its income level and family conditions. The government offers reductions in the tax and if the reduction exceeds the amount of tax that would have been owed otherwise, then the government pays the difference to the taxpayer. EITC is said to increase the labor force participation and hence the employment. The most distinguishing part is that EITC is given based on the family income but not individual income. Another important work has been made regarding the labor market participation effect of taxes by Eissa and Hoynes(2004). The authors suggest that primary income earners in the families – typically the men, tend to participate more in the labor market as a consequence of tax reduction. As a secondary income earners, mostly women, tend to participate less in the labor market. Authors also show that the expansion of the EITC has caused the married couples to decrease their labor supply.

Rothstein(2010), on the other hand, asserts that the effect of EITC on wages is another important aspect to be considered since the expansion of EITC causes a fall in the wages of EITC recipients as well as the non-recipients. Focusing on the case where the labor supply is more elastic at the extensive margin and wages are fixed, the EITC causes a definite increase in the low skilled women labor supply.

The paper of Hotz and Sholz (2006) shed light on the labor market participation of women. Authors tested whether the increasing level of EITC has a positive effect on the female labor market participation and on employment. They find that the employment of women with two children or more has risen steadily after the expansion of EITC in 1993 until 2000. They also denote that the employment increases when the age range of the children gets higher. Women who have children aged under 2 are %9 to %16 less likely to participate in the labor market.

³Hagedorn, M., Manovskii, I., & Mitman, K. (2015). The impact of unemployment benefit extensions on employment: the 2014 employment miracle? (No. w20884). National Bureau of Economic Research.

Taxation on labor has been a hot topic for both developed and developing countries as the social policies striving to increase especially the female labor force participation. According to the study Fuenmayor et al. (2018), a reduction in the income tax of a secondary earner in a family has caused an increase in the female labor force participation between 1982-1998 in Spain⁴. The changes in the taxation, however, does affect not only the labor force participation but also the economic activity itself. For instance, the Tax Cuts and Jobs Act (TCJA) of 2017 forms a tax reduction of corporate profit from 35% to 21%. With this change, it is expected there will be an increase in the GDP of the United States and the wages and employment level via encouraging the investment⁵. However, although there was an increase in the tax base via increasing labor supply and employment, government tax income falls.

Payroll taxes are also another policy instrument to implement objectives of the governments regarding the welfare improvement. Since the payroll taxes are cost to employers, it is expected that countries with lower payroll taxes have a higher rates of employment. Therefore, if the cost of an increase in payroll taxes cannot be shifted from employers to employees through lowering wages, then it is inevitable that the payroll tax increase cause a decline in employment. Kugler (2003) has constructed a model to compare the effects of payroll tax increase in Columbia over the period of 1982-96 using a survey of Columbian Manufacturers. The study shows that a 10% increase in the payroll taxes causes a 1,4%-2,3% decrease in the wages and 4%-5% decrease in the employment. Therefore the author arrives at a conclusion that minimum wage is binding in this studied working group.

Espinoza and Ruiz (2014) studied the effects of tax reform in France. With an attempt to reduce the labor cost for firms, in the short run where there is no time for capital adjustment, it is found that the more elastic the labor supply, the less labor benefited from the tax cut. Since wages cannot change at the minimum wage level of labor supply curve, reduction in the taxation will not give the chance to bargain their wages with the employers. Therefore, employers will have the full benefit of a tax cut in their payroll tax obligations. However, the employment effect is higher than it is with the more inelastic labor supply. Hence the overall result is the increase in employment level induced by the tax reduction. Firms are now facing lower labor cost and have higher profits to create more jobs.

Amine and Lages Dos Santos (2015) found that introducing a tax credit results in a declining inequality and increasing employment. They also find that the introduction of

⁴Fuenmayor, A., Granell, R., & Mediavilla, M. (2018). The effects of separate taxation on labor participation of married couples. An empirical analysis using the propensity score. *Review of Economics of the Household*, 16(2), 541-561.

⁵Lieberknecht, P., & Wieland, V. (2019). On the macroeconomic and fiscal effects of the tax cuts and jobs act.

a negative income tax cause firms and workers to become less selective. As a consequence reservation wages fall. However, considering the lower standards of both firms and workers, the matching probability increases and consequently the employment rate rises. Although, the negative income tax has a negative impact on the participation rate by lowering the wages, it decreases the unemployment. On the other hand, they find that introducing an unemployment benefit causes a rise in the labor market participation rate since being unemployed is now more attractive for a non-participant. Another effect of the unemployment benefit is the decrease in wages. Since there are more unemployed workers on the market searching for a job, competition pushes the wages down to form a match with a firm.

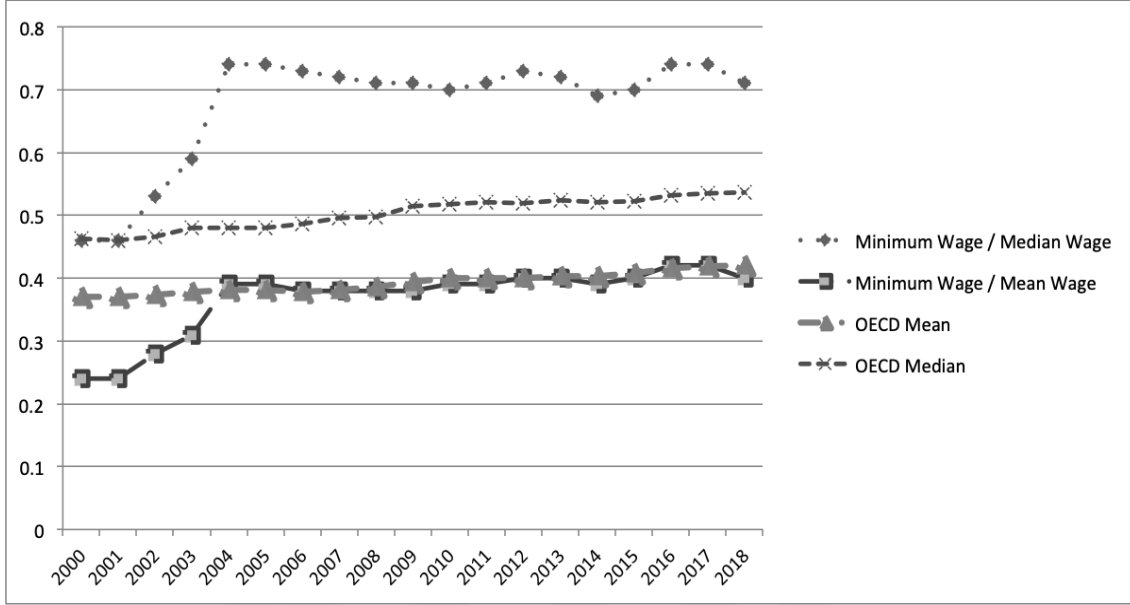


3 MINIMUM WAGE AND TAXATION IN TURKEY

Personal income tax in Turkey is collected from real persons defined in the Income Tax Law No. 193 which was implemented on 1960. Based on their taxable income, individuals are taxed progressively on a yearly basis. For example the first 22.000 TRY taxable income is subject to 15% Income Tax and it increases as the income increases for specified brackets such as 20%, 27% and 35% until the income of 600.000 TRY as of January 1, 2020. The tax payers and the taxable income are defined in the Law and the minimum wage earners are not treated differently. Again as of January 2020, any minimum wage earner whose gross wage is 2.943 TRY is subject to 15% income tax until its income exceeds 22.000 TRY income bracket. Income tax of 15% is applied after the social security premium of 14% (412,02 TRY) and unemployment insurance fund of 1% (29,43 TRY). Then the income tax deducted from a minimum wage earner becomes 375,23 TRY. In addition to those taxes, a stamp tax of 07,59% (22,34 TRY) is deducted from the wage and the minimum living allowance of 220,73 TRY is added to the wage, the net income of a minimum wage earner becomes 2.324,71 TRY. However, with the permanent changes in the Law made with the Law No.7103 in 2018, the net wage of the minimum wage earner will not be affected by the tax bracket when the cumulative income exceeds the first bracket of 22.000 TRY. This regulation is valid only for the individuals without children and single so that their net wage will be the same throughout the year as in January.

We tried to show the effects of taxation and other kind of social policies such as subsidies or benefits on minimum wage earners in this model. Although it is a strong assumption to take only the minimum wage earners, Turkey has a large number of minimum wage earners compared to the other OECD countries. The ratio of minimum wage to the median wage in Turkey has gone up from 46% in 2000 to 71% in 2018 (OECD Statistics). This means that the number of minimum wage earners are increasing and there is a convergence between minimum wage and the median wage.

Figure 1: Turkey Minimum Wage Ratio Relative to Mean and Median Wage



Source: OECD, <https://stats.oecd.org/Index.aspx?DataSetCode=MIN2AVE>

Increases made in minimum wages in 2004 and 2016 has a significant impact on the overall increasing trend in the real minimum wages. Therefore, working with minimum wage becomes more preferable for women with less educational level. However, as we noted before, minimum wage in Turkey has increased faster than the median wage in Turkey and thus converged to the median wage level more in the recent years specially after the increase in 2016. This suggests that the number of workers working with minimum wage or with similar level also increases.

Both the minimum wage and payroll taxes increase the labor cost of a firm therefore any change in these elements will have a significant effect on the employment level. The employer also pays a social security premium which accounts for a 20,5% of the gross wage and an unemployment insurance premium of 2% calculated from the gross minimum wage. Adding the social security incentive of 5% the total cost of an employee working with minimum wage is 3.458,03 TRY for an employer as of January 2020. Any increase in the minimum wage therefore increases the labor cost as well.

Tax wedge is used as an indicator to measure the labor cost to the net real income of the labor. Any increase in the tax rates will cause the tax wedge to rise. The total labor cost includes the payroll taxes and other social security premiums and the worker's real income is deduced after deducting the income tax and social security taxes. Every country has a different tax wedge since it depends on the income level and family status such as married or single, with or without children and how much children there are in the family. Some

countries as described before, prefers to apply more complex taxation systems. EITC is one of the example of this kind of systems. It can be seen from the below table that the countries who adopts this system has a way more different tax burden on the household.

We see from the table that some countries have tax incentives for individuals who are married and have children. In Canada for example, a single worker who earns an average wage has a tax burden of 30,47% whereas a family with two children where only one member is working with an average wage has a tax burden of 11,62%. It is even more clear when we look at the single individual with two children earning 67% of the average wage. The government provides subsidies for those since the tax burden appears as negative. Netherlands, New Zeland, Poland, United Kingdom, United States and some others have also similar differentiations. However, in Turkey, the tax burden of single individual earning 67% of the average wage with no children and single individual earning 67% of the average wage with two children is really close, 35,83% and 34,34% respectively. Further, OECD average for a single individual earning 67% of the average wage with two children is 15,84%. Additionally, in Turkey, the tax burden for a family with two earners with or without children is also close to each other varying around 37-38%.

Preserving the family income in a stable level and providing equality are considered as the main goals of social policies in a country. However, these policy are costly and sometimes hard to implement depending on the economic environment. As will be explained in detail in following sections, tax policies have multiple angles to be considered and have various affects on the government income and expenditure; hence the budget. Changing minimum wage levels are a commonly used policy tool since it has a huge impact on the cost of a firm which directly effect the job vacancy, thence employment level. Increasing the minimum wage to encourage individuals to participate in the labor market or to increase the workers welfare may not result in increasing employment. Contrary, it may cause a decline in the job openings and hirings. Instead of changing minimum wage level, the tax burden on the workers can be deduced via policies such as "EITC" implemented in United States. With a tax refund depending on the family income, individuals who are outside the labor market can be willing to participate.

Table 1: Tax Wedge Calculated as % of Labor Costs, 2019

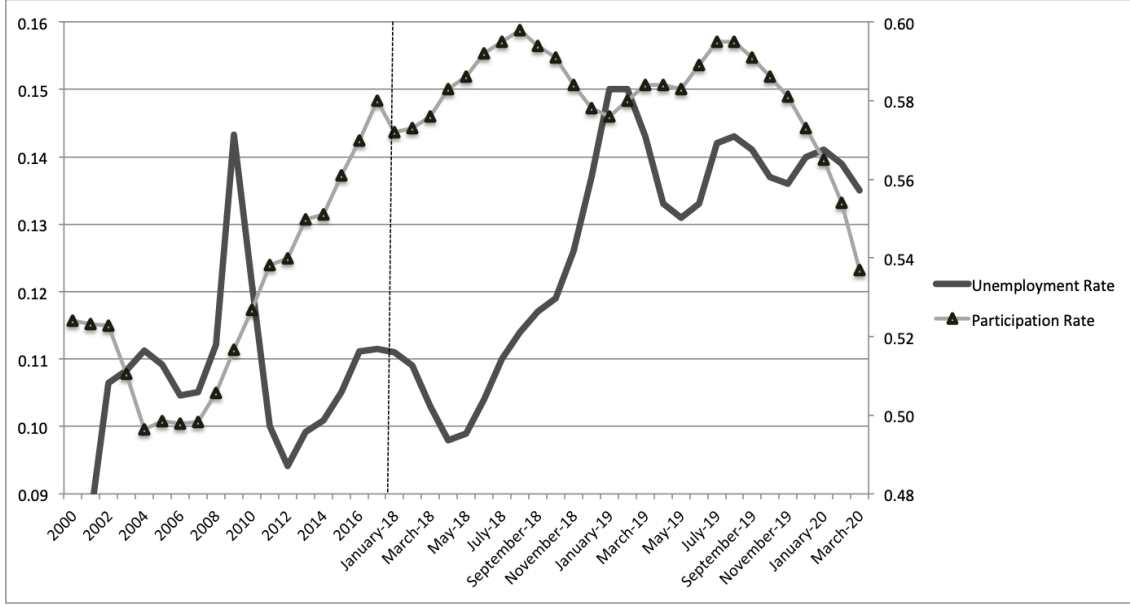
	Single no ch 67(%AW)	Single no ch 100(%AW)	Single no ch 167(%AW)	Single 2 ch 67(%AW)	Married 2 ch 100-0(%AW)	Married* 2 ch 100-67(%AW)	Married* 2 ch 100-100(%AW)	Married* no ch 100-67(%AW)
Australia	22,71	27,95	34,39	1,15	20,77	25,85	27,95	25,85
Belgium	45,39	52,24	58,65	31,19	36,46	44,49	47,92	49,53
Canada	25,25	30,47	31,74	-15,31	11,62	23,93	27,10	28,98
Chile	7,00	7,05	8,33	6,18	7,00	6,67	7,00	7,03
Czech Republic	41,70	43,94	45,76	22,66	26,64	35,40	39,56	43,04
Denmark	32,65	35,43	41,10	4,12	25,16	30,67	32,39	34,32
France	38,90	46,67	53,12	14,74	36,77	39,93	43,67	44,56
Germany	45,23	49,35	51,00	31,55	34,35	42,48	44,77	47,47
Ireland	24,59	33,20	41,82	5,27	17,85	25,46	30,10	29,17
Italy	41,05	48,01	54,06	26,07	39,24	41,88	45,62	45,22
Japan	31,19	32,70	35,14	25,26	27,53	29,72	30,71	32,10
Korea	20,22	23,30	26,02	16,79	20,62	20,73	22,19	22,06
Mexico	16,40	20,14	23,16	16,40	20,14	18,63	20,14	18,63
Netherlands	29,97	37,25	42,48	6,52	32,31	29,32	33,07	34,33
New Zealand	13,90	18,77	24,26	-19,40	3,46	17,32	18,77	16,82
Norway	32,58	35,67	41,52	22,09	32,08	32,28	33,88	34,43
Poland	34,98	35,59	36,09	-3,42	17,68	25,10	27,03	35,34
Sweden	40,52	42,67	50,99	32,70	37,43	38,67	40,05	41,81
Switzerland	19,48	22,27	26,90	4,79	9,90	16,13	18,63	22,02
Turkey	35,83	39,12	42,62	34,34	37,45	37,20	38,62	37,80
United Kingdom	26,05	30,86	37,06	12,28	26,33	26,55	28,87	28,94
United States	27,59	29,76	34,18	10,49	18,81	24,13	26,21	28,36
OECD-Average	31,95	35,97	40,32	15,84	26,37	30,53	32,95	34,34
OECD-EU 23	37,06	41,38	45,78	19,33	30,35	34,71	37,49	39,60

*Two-Earner Family

Source: OECD (2020), Taxing Wages 2020, OECD Publishing, Paris, <https://doi.org/10.1787/047072cd-en>

The labor force participation is a useful data not only to understand the unemployment rate but also the demographic structure of the society. Labor being an important factor of production, it is important also look at the components of labor. As we further explain in details in the following sections, the labor force participation is an increasing element of the social welfare. Below the labor force participation rate of individuals who are at working age of 15 - 64 is shown together with the unemployment rate.

Figure 2: Turkey Labor Force Participation and Unemployment Rate



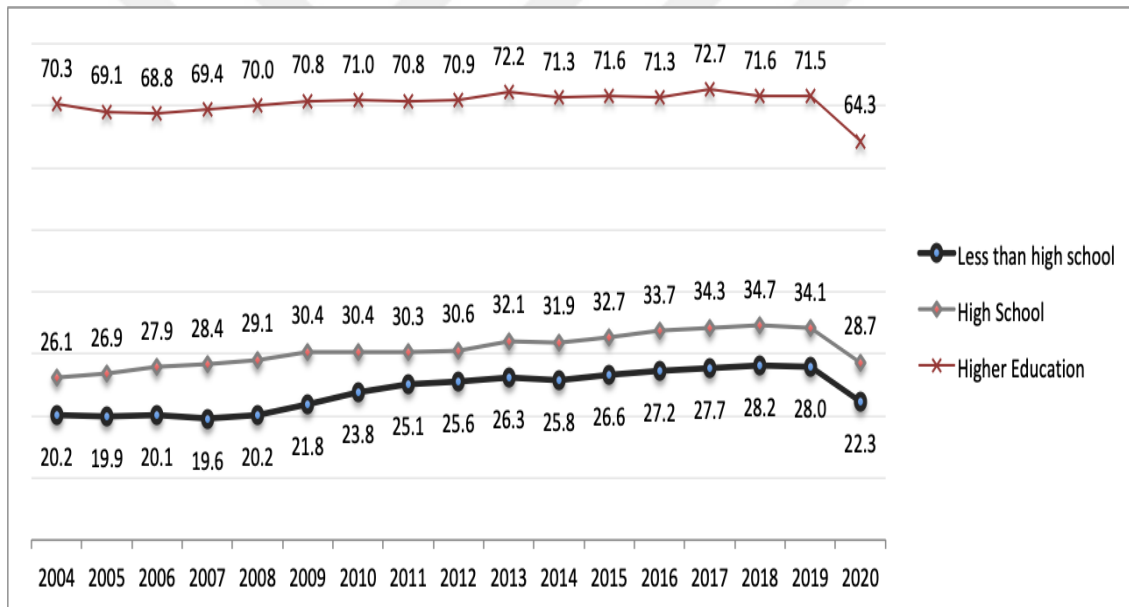
Source: TÜİK, <https://biruni.tuik.gov.tr/medas/?kn=72&locale=en>

The shift from agriculture to manufacturing sector during the late 90's explains the fall in labor force participation rate of women with lower education level; however, with the service sector becomes a driven sector for Turkish economy, we see a rise in the labor force participation of women between the years 2004-2019. footnote Gürsel, S., Uysal, G., & Delibaşı, T. T. (2020). Turkish Labor Market: Complex Dynamics and Challenges. In Turkey's Political Economy in the 21st Century (pp. 85-114). Palgrave Macmillan, Cham. This increase is also caused by the hike in the real minimum wages. The minimum wage has been critically increased in 2004 and 2016 which results in an increase in real minimum wages.

Although there is an increase in the labor force participation rate over the years, we see a downturn for the last two years. Moreover, the educational composition of women is also an explanatory variable for the increase of labor force participation rate of women in Turkey (Gürsel et al. 2020), the data shows that during the 2007-2011 period the labor force participation of women who has a less degree than high school has increased from 17% to 21,6%. Less educated women labor force participation in Turkey comparing to the ones who

have higher education has also shown a significant increase during the last fifteen years. The participation rate for women with high school degree was 26,1% in 2004 and it increases to 36,5% in March 2019. Participation rate of women with higher education on the other hand has increased from approximately 70% in 2004 to 74% in 2012 at most. The point here is that the labor force participation of women with lower educational level has increased, which is a sign of a rise in the number of workers with low wages. Not only participation of women with high school education but also women with less than high school educational level has shown a significant increase. The labor force participation rate of women with less than high school degree has risen from 17,9% in 2005 to 29% as of September 2018 which accounts for almost 62% increase.

Figure 3: Women Labor Force Participation Rate By Education Level (2004-2020)



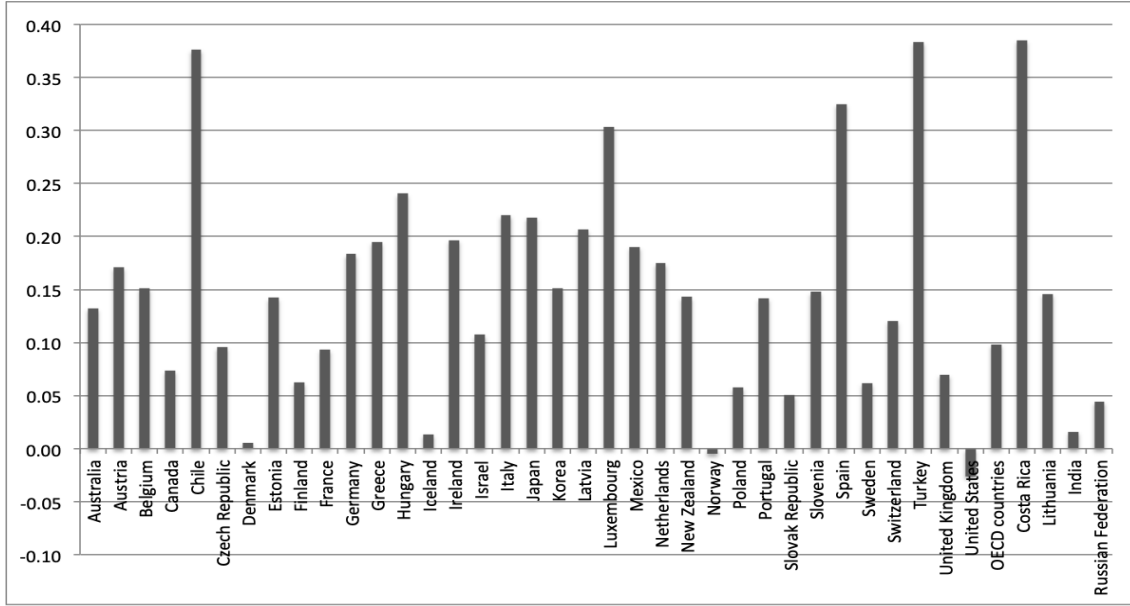
Source: TÜİK, http://www.tuik.gov.tr/PreTablo.do?alt_id=1007

Further, labor force itself has gone up from 22,3 million to 32,5 million between 2006-2019 (OECD statistics). Though it does not fully explain the rise in female labor force participation, female labor force increase has also a role in this overall rise of labor force participation. It increases from 5,8 million to 10,7 million during the same period while the male labor force has increased from 16,6 million to 21,8 million.

Women labor force participation has an average of 65,1% in OECD countries while in Turkey it is 38,7% at the end of 2019. Comparing to the OECD countries' average, Turkey has a non-negligible low level of women labor force participation. Although the change from 2000 through 2019 is significant, it is still low. Overall labor force participation rate in Turkey on the hand is 58,5% while the OECD countries average has a rate of 72,8%.

It is important to note that, labor force participation of women with lower educational level is low in Turkey because of the opportunity cost of searching for a job. The expected income when unemployed or employed does not compensate the cost of home production in which they engage. Especially women with children are responsible for childcare as well as other activities.

Figure 4: Labor Force Participation Rate Change Between 2000-2019



Source: OECD, <https://stats.oecd.org/index.aspx?queryid=64197>

Participation rate is also related with the job creation capacity of the economy as stated in the work of Gürsel, S. et al. (2020). Economic growth performance directly affects the labor market dynamics; hence, the changes in labor force participation rate cannot be degraded into one component. Having an increasing tendency for creating labor-saving technologies, it is more important to keep working age population be attracted into labor market. As the higher job creation means higher labor demand, labor force participation should not only be considered as a one way decision but also a two sided structure. Last but not the least, the incentives in the form of tax cuts or subsidies for firms to encourage job creation gain more importance considering its broader effect on the economy.

4 THE MODEL

We construct a basic search and matching model that analyses the matching process between job seekers and vacant positions. We consider an economy where the working-age population (P) is normalized to unity and consists of individuals who are either unemployed (U), employed (L) or inactive (I). Employed and unemployed workers form the labor force N .

$$L + U + I = P = 1 \quad (1)$$

$$L + U = N \quad (2)$$

Both firms and workers are assumed risk-neutral and infinitely lived. Labor market activity is defined as actively searching for a job for an unemployed individual, engaging in a full-time job for an employed individual, and engaging in home production activity for inactive (non-participant) individuals. The labor market activities are exclusive, i.e., there is no on-the-job search, or a non-participant cannot be a full-time worker. Since there is no on-the-job search, once an employed worker loses her job, her options are to search for another job or stay out of the labor market and become inactive. We further assume that there is no constant population increase in the economy. In equilibrium, the labor force is assumed to be unchanged.

4.1 Matching Process

Time is continuous, and firms and the unemployed individuals meet in the labor market randomly to find a match. We define this matching process with a function that states the number of matches, denoted by M using the number of vacancies and unemployed workers. M then will be a function of these two variables $M=M(V, U)$ and represents an instantaneous flow of matches at any given time. The matching function is both increasing and concave on both factors. If the number of unemployed workers increases, holding the number of vacant positions constant, the probability of a worker finding a job would decline since there are more unemployed workers for the same number of vacant positions. Conversely, the probability of filling a vacant job rises since there exist more unemployed workers. Analogously, if the number of vacant jobs increases, it would be for workers' benefit in a way that their probability of exit from unemployment would increase, and the probability of filling a vacant job decreases. Additionally, the matching function satisfies the constant returns to scale argument. Now it is possible to write the probability of filling a vacant job and the probability of exit rate from unemployment as:

$$M(V, U)/V = M(1, U/V) = m(\theta) \quad (3)$$

$$\frac{M(V, U)}{U} = \frac{V}{U} \frac{M(V, U)}{V} = \theta m(\theta) \quad (4)$$

where θ is the labor market tightness equal to V/U . When the labor market tightness increases i.e. the number of vacant job increases or the number of unemployed workers falls, it becomes much more easier for job seekers to find a job and more difficult for employers to fill a vacant position. Having $m'(\theta) < 0$ and $[\theta m(\theta)]' > 0$, when the labor market tightness rises it is easier to exit from unemployment and it is harder to fill a vacant job.

4.2 Labor Market Flows

The number of unemployed workers increases instantaneously with the rise in the number of newcomers to the labor market i.e., the rise in the labor force, which is denoted by N . However, as we assume that the labor force is unchanged at the steady-state, it will not have an impact on the unemployment rate. There are people also who lose their job at any instant with a rate q . It is also assumed that any individual who lost her job becomes unemployed before deciding to non participate in the labor market. Therefore, the number of unemployed workers (U) increases with the number of people who lose their jobs qL where L is the number of employed individuals and decreases with a rate of $\theta m(\theta)$ which is the exit rate from unemployment. Thus, the instantaneous change in the number of unemployed workers can be written as:

$$\dot{U} = qL - \theta m(\theta)U \quad (5)$$

Dividing both sides with N and knowing that the unemployment rate itself will not change in the steady state; we get:

$$u = \frac{q}{q + \theta m(\theta)} \quad (6)$$

The equation (6) represents the Beveridge curve that shows the relationship between unemployment and vacancies. This equation is the fundamental equation that determines the unemployment rate. One can see that the unemployment rate is negatively correlated with the labor market tightness. As the probability of finding a match $\theta m(\theta)$ grows, the steady-state unemployment rate decreases. Also, the job destruction rate q is positively correlated

with the equilibrium unemployment rate.

An employed worker can be indifferent between working with minimum wage and searching for a job since it may be more advantageous to look for a job than working if the cost of working full time with minimum wage does not compensate the worker's opportunity cost. Therefore, at any instant, there is a movement between labor market states except from inactivity to employment. An inactive person must first look for a job in order to be employed.

4.3 The Behaviour of Workers, Firms and the Government

4.3.1 Workers

In this section, we represent the determinants of workers' decisions on labor force participation. Every person has a productivity level outside of the labor market. If this productivity level is limited, then a worker would prefer to participate in the labor market and search for a job. On the other hand, a person whose productivity level outside of the labor market is high, would not want to participate since the opportunity cost of searching for a job is higher than other workers.

A worker's decision to participate and search for a job rather than staying outside the labor market depends on the value of being unemployed (V_u) or a non-participant (V_i). One can expect that an increase in the value of unemployment or employment would push inactive individuals to participate (Cahuc et al. 2014). When employed workers are engaged in full-time market activity, they are paid a net minimum wage of $W = w(1 - t_e)$, where t_e is the tax rate deducted from the employer's income. Hence, we will assume that people are obliged to pay an income tax or wage tax when employed. For simplicity, unemployment income is considered as a non-taxable income. Here, job seekers are not necessarily paid a specific unemployment income; it is an imputed income from being unemployed or other income that the unemployed person will give up when employed.

The discounted expected utilities of the unemployed, employed and inactive workers are given as:

$$rV_u = z + b + \theta m(\theta)(V_e - V_u) \quad (7)$$

$$rV_e = w(1 - t_e) + T + q(V_u - V_e) \quad (8)$$

$$rV_i = z + x_i \quad (9)$$

where rV_u , rV_e , and rV_i stand for the expected utilities of unemployment, employment, and

being outside of the labor market. In equation (7), z denotes the social aid given by the government when an individual does not have a job, and the discounted expected utility of an unemployed person is the sum of z , unemployment benefit b and the expected gain from actively searching for a job. Again, the government can provide a benefit transfer for unemployed individuals to make them better off and encourage non-participants to join the labor force. There is no defined unemployment benefit conditionality; however, it is the government's incentive to provide unemployed individuals as a provision for their job search activity. On the other hand, job search cost is not introduced in our equations. With probability $\theta m(\theta)$ an unemployed worker finds a job and exit from unemployment.

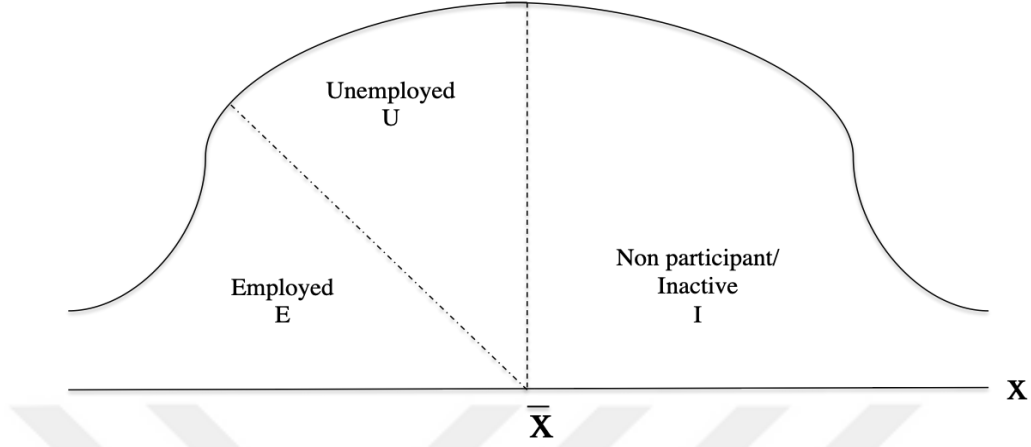
In equation (8), w denotes the gross minimum wage imposed by the government. Thus, there is no wage bargaining in the economy, and every worker earns the same wage. The instantaneous income of an employed worker is negatively correlated with the income tax t_e that is also determined exogenously by the government. As a social policy, the government can subsidize employed workers with cash transfers T to make employment more attractive. With probability q , workers lose their jobs and trace the utility $V_u - V_e$. The discounted expected utility from being employed is composed of wages, transfers, and instantaneous net gain from being unemployed.

Lastly, in equation (9), the expected utility of being a non-participant or an inactive individual is the sum of social aid received from the government and the home productivity level of each individual is composed of. The home productivity level is denoted as x_i with $i = 1, \dots, P$, which has distinct values for every individual in the labor market.

Assuming that the participation decision is a trade-off between being unemployed and non-participant, any enhancement in being unemployed will make some non-participants decide to participate in the labor market. We will formalize the expected utilities of people who are at working-age and outside the labor market in equation (9) with a cumulative distribution function $H(\cdot)$. Any enhancement in the value of unemployment or employment will open the gap between staying outside of the labor market and actively searching for a job. This will give incentive to individuals who are at the margin level to participate in the labor market activities. Accordingly, individuals decide whether to enter into the labor market by comparing the expected discounted values of being unemployed and inactive. The marginal worker, for whom $rV_u = rV_i(x_i)$, is indifferent between unemployment and inactivity. Note that the value of unemployment is independent from the home productivity of individuals.

Consequently, we can define a threshold level of home productivity of individuals $\bar{x} = b + \theta m(\theta)(V_e - V_u)$ such that the individual i will be inactive if $x_i > \bar{x}$. The labor force will then be equal to $H(\bar{x})$. Any change, except from z , that increase the value of

Figure 5: Distribution of Home Productivity



unemployment will also increase the labor force participation rate.

$$x_i > \bar{x} \implies rV_i > rV_u \quad (10)$$

4.3.2 Firms

A firm's decision to open a vacant job depends on its expected utility by determining the expected future profits of opening a vacant job. Posting a vacant position costs h , which is considered as the time and effort spent to find a proper worker. Once posted, the vacancy is filled with the probability of $m(\theta)$. We assume further that the government gives subsidies to firms for every new hire (S). Therefore, the expected gain from a vacant job will be the sum of the vacant job's instantaneous cost and prospective gain from filling it.

$$r\Pi_v = -h + m(\theta)(\Pi_e - \Pi_v + S) \quad (11)$$

The expected future returns of a filled job, Π_e , is composed of the productivity y received from the production with a cost of wage plus the payroll tax paid by firms $w(1 + t_f)$. As expected, the firm's profitability from a job depends on the level of taxes t_f and the taxes collected as a proportion to their profit $y - w(1 - t_f)$ called t . If the government decides to impose more tax per employee, firms would be reluctant to create new jobs. Additionally, if the government increases the profit taxes, firms will post fewer jobs because of the decline in the profitability. The possibility of workers to lose their jobs that is a rate equal to q which

reduces the value of a filled job.

$$r\Pi_e = (y - w(1 + t_f))(1 - t) + q(\Pi_v - \Pi_e) \quad (12)$$

Firms post vacant jobs as long as it is profitable considering there is an amount of resource and time invested in. Until the expected profit from a vacant job i.e. the Π_v is strictly greater than zero, firms will enter the market and continue to create jobs. Where Π_v is equal to zero then firms will stop entering the market which is called the *free entry condition*.

When the free entry condition is satisfied $\Pi_v = 0$, and applied to the equations above, we get the equation of *labor demand* shown below:

$$\frac{h}{m(\theta)} = \frac{[y - w(1 + t_f)](1 - t) + S(r + q)}{r + q} \quad (13)$$

Since the probability of filling a job is $m(\theta)$, $1/m(\theta)$ gives us the average duration of the job stays unfilled. If we multiply it by the cost of posting per vacancy h , the left-hand side of the above equation states the average cost of a vacant job. Given that a vacant position stays open until it is filled and the cost of opening a new position for a firm is h , then every instant a job stays open it incurs a cost of h times the average duration of the vacant job $1/m(\theta)$. The right-hand side of the equation shows the expected gain from a filled job where $(y - w(1 + t_f))(1 - t)$ represents the discounted expected profit net of profit tax. First conclusion derived from the above labor demand equation is that an increase in the tax rate paid by firms will lower the profit of the firm by raising the cost of an employee. Consequently, one can expect firms to post fewer vacant positions. Raising the tax rate will affect negative impact on the labor market tightness θ , since the labor force is fixed at the steady state level and wages constant. Firms posting fewer vacant jobs means a decline in the tightness; hence the matching rate $m(\theta)$ will increase to adjust the fall in the profitability of the firm. Constant wage assumption magnifies the drop in the labor market tightness since there is no chance to compensate the drop in income by lowering wages.

4.3.3 Government Budget and Taxes

Since the model covers only minimum wage earners in the economy, there is no room for progressive taxation, and therefore, the government impose lump-sum taxes. Each worker pays taxes proportional to their wages t_e and each firm pays payroll taxes t_f for every worker they hire. Therefore, the wages net of taxes is given as $W = w(1 - t_e)$ where w is the gross

minimum wage.

In return, the government finances its expenditures, such as transfers T to the workers, unemployment benefits b and subsidies to firms for hiring an individual S , through the payroll taxes, wage taxes, profit taxes, and other income-generating activities. Thus, the initial government budget can be written as follows;

$$SM(\cdot) + TL + bU + z(1 - L) \gtrless (t_e + t_f)wL + t(y - w(1 + t_f))L \quad (14)$$

Left-hand side of (14) represents total expenditures while right-hand side represents total income. However, holding budget balance is not our goal here; rather, it is to see the effects of social policy changes. Therefore, the government budget does not necessarily hold, and the budget can have a surplus or deficit. Raising payroll taxes or lowering income tax can cause the tax base to expand by increasing the number of employed workers. Additionally, any changes made in the tax levels may cause a deterioration in the budget balance. Since taxes are not collected to finance the current expenditures only, we will only be interested in the effects of these changes on aggregate variables such as the production, welfare, tax base, unemployment, employment and participation.

Let us finally show the tax wedge, Υ , which is defined as the gap between labor cost to the employer and the purchasing power of the wages. If we write the cost of labor to the firms as $w_f = w(1 + t_f)$ and the purchasing power of wages or the worker's take-home pay as $w_e = w(1 - t_e)$, we can define the tax wedge. Note that we do not take into account the indirect taxes workers face on the market, such as consumption tax. We also consider the ratio between the producer price indexes and the consumer price indexes are equal to 1. Where $0 < t_e, t_f < 1$ we will have the following statement:

$$\Upsilon = \frac{1 + t_f}{1 - t_e} \quad (15)$$

We can see that any increase in the income tax or in the payroll tax will increase the tax wedge.

4.4 Labor Market Equilibrium

The solution of equilibrium is recursive in our model. Our principal parameter is the labor market tightness, and we can solve for the tightness from the equation (13). All the other parameters in that equation are exogenous. Additionally, if there were wage bargaining,

an improvement in the labor market tightness would cause a rise in wages; however, the minimum wage does not adjust. As the tightness improvement indicates an increase in the number of vacant positions or a fall in unemployment, workers would have higher bargaining power over the wages. Therefore, there is no increasing relation between tightness and minimum wages. Thus, the equilibrium labor market tightness is given by (13).

Further to the above, the effects of the parameters which determine the labor market tightness are straightforward. An increase in payroll taxes will decrease the labor market tightness since the labor cost is higher for a firm, as it can be seen from the equation (12). The number of vacant jobs will decline to cause a fall in tightness. Profit taxes will have the same effect on tightness since it also increases the firm's cost. On the other hand, hiring subsidies have an increasing effect on the tightness since it is encouraging support for the firms to increase their vacant job positions.

As we know the tightness, we can now determine the unemployment rate from the equation (6). If the tightness increases, the unemployment rate will fall. Therefore labor market tightness θ and the unemployment rate u are the endogenously determined variables. Additionally, after we have a solution for the θ , we can have a solution for the discounted value of unemployment by using the equations (8)-(7).

$$rV_u = \frac{(w(1 - t_e) + T)\theta m(\theta) + (z + b)(r + q)}{r + q + \theta m(\theta)} \quad (16)$$

Therefore, determining θ is the key to identify the participation level as the value of being unemployed is a crucial indicator for participation rate. After we solve for the θ , we will recognize how many people are employed, unemployed and inactive. Hence, we now know the labor force composition.

4.5 Social Welfare

Every person at the working-age contributes to social welfare by contributing to the overall production in the economy. Employed workers contribute welfare by augmenting the overall production in the economy. Others have varying levels of home productivity. As social welfare is formed by the sum of all the utilities in the society; then the general social optimum condition can be written as follows:

$$\Omega = yL - hV + \int_{\bar{x}}^{x_{max}} x_i dH(x_i) \quad (17)$$

Social welfare is then defined as the total production net of vacancy costs. As the current vacant jobs cause a cost for this aggregate production level, it is introduced as a negative component. Lastly, the working population's production $Y = yL$ is included as a positive indicator of the above function. To expand the above equation further, we take the number of employed individuals as $(1 - u)H(\bar{x})$ and the number of inactive individuals as $1 - H(\bar{x})$. Furthermore, using the form of $V = U\theta$, and $V = H(\bar{x})u\theta$, we will arrive at the below production per capita equation:

$$\Omega = H(\bar{x})(y(1 - u) - hu\theta) + \int_{\bar{x}}^{x_{max}} x_i dH(x_i) \quad (18)$$

The impact of labor market tightness on welfare is twofold. First, a rise in tightness corresponds to a prolonged matching period, which leads to hV to increase. Firms suffer from fading matching rate since the probability of filling a job decreases $m'(\theta) < 0$, which yields a negative impact on welfare. However, the second impact comes from the unemployment rate. An increase in labor market tightness causes a reduction in the unemployment rate, which has a positive impact on welfare.

4.6 Comparative Statics

Income Taxes and Payroll Taxes

As described in section 4.3.3, the government generates income from taxes collected as a proportion of wages and payroll taxes collected from firms. Let us consider a tax policy reform which includes cutting the income tax $dt_e < 0$. The first impact on the tax wedge will be a fall as a consequence of this policy. It is expected that an income tax reduction for minimum wage earners boosts after-tax wages. It also causes an enlargement of the gap between the wage net of taxes and social aid z . It becomes more beneficial for a non-participant individual to look for a job since the discounted expected utility of being employed is now higher. Thus, some non-participants will decide to participate in the labor market. Finally, this policy change would certainly have an increasing impact on the number of unemployed workers via increasing the participation rate. $H(\bar{x})$ will increase via the increase in the rV_e and consequently in rV_u . However, we should note that the decrease in the income tax has no effect on the equilibrium unemployment rate since it does not affect the labor market tightness. The only change is coming from the effect on the value of employment. Therefore, the tax wedge will decrease as a consequence of this policy.

To understand the impacts of payroll taxes on the other hand, we need to first

understand the impact of θ on unemployed workers' expected utility. Taking the derivative of rV_u with respect to θ to see the effect of labor market tightness on the expected utility of an unemployed person, we reach the following:

$$\frac{\partial rV_u}{\partial \theta} = \frac{(r+q)[(w(1-t_e)+T)-(z+b)][m(\theta)+\theta m'(\theta)]}{[r+q+\theta m(\theta)]^2} > 0 \quad (19)$$

We see that the first-order derivative of rV_u with respect to θ is greater than zero assuming the wage net of taxes $w(1-t_e)$ plus cash transfers T is always greater than social aid z plus unemployment benefit b so that people would have the incentive to work. Therefore, if the labor market tightness increases, so does the utility expected from being unemployed.

From the firm's perspective, any rise in the payroll taxes will cause a decline in the labor market tightness from equation (13), resulting in a reduction of job creation. Decreasing market tightness will cause the unemployment rate to increase at the steady-state. Since the cost of labor becomes more expensive for firms, there will be more workers without a job. For an individual outside the labor market, being unemployed is now less attractive. People facing ascending rates of taxes decide not to work if the gap between their unemployment income $z+b$ and the employment income $w(1-t_e)+T$ is reduced. Fall in the expected income of being an employed worker will trigger the fall in the labor force participation rate.

On the other hand, the impact of the payroll tax increase on social welfare is somewhat ambiguous. As the payroll tax increase has a decreasing impact on tightness, which augments the unemployment rate, the final effect of this policy change cannot be determined from the equation (18). We can only say that participation has a definite positive effect on welfare. Let us call the sum of the production of non-participants as function F where $F = \int_{\bar{x}}^{x_{max}} x_i dH(x_i)$. We can see that as the $\bar{x}$ increases, the sum of the production of non-participants decreases i.e., the area of home production shrinks. For a given rate of unemployment the effect of participation on welfare can be written as follows:

$$\frac{\partial \Omega}{\partial \bar{x}} = \frac{\partial H(\bar{x})}{\partial \bar{x}} \left[y(1-u) - hu\theta \right] + \frac{\partial F}{\partial \bar{x}} \quad (20)$$

Any increase in $\bar{x}$ will increase the participation $\frac{\partial H(\bar{x})}{\partial \bar{x}} > 0$, and decreases the sum of home production $\frac{\partial F}{\partial \bar{x}} < 0$. Additionally, yL is assumed always to be greater than hV . Since y is greater than rV_u and the loss in home production when the t_e decreases is actually smaller than the production made by the individuals who enter the labor market; the welfare increases. To put in another way, when an inactive individual enters the labor market, from the equations (8)-(7), we know that w is greater than the rV_u and y is greater than

w so the absolute change in welfare is positive. Therefore any policy change increasing the participation and does not effect the unemployment rate should have a positive effect on welfare.

For the payroll tax increase on the other hand, welfare change is rather ambiguous. As we have stated before, increase in payroll tax decreases the labor market tightness. Additionally, the unemployment rate increases following the decrease in tightness. This eventually causes a decrease in the participation rate. Therefore, as we know that the value of $y(1 - u)$ is always greater than the product of $hu\theta$, the decrease in participation will cause a decrease in the total welfare. As a result, an increase in the payroll taxes causes a decline in the social welfare.

We can comment on the effects of the unemployment rate on social welfare by looking at the below equation. As we know that the value inside the brackets apart is negative, a higher unemployment rate affects welfare negatively.

$$\frac{\partial \Omega}{\partial u} = H(\bar{x})(-y - h\theta) < 0 \quad (21)$$

However, the effect of labor market tightness on welfare is ambiguous. We know that the tightness is affected by the changes in payroll taxes and profit taxes; therefore, any increase in the payroll tax will decrease the tightness from the equation (13).

$$\frac{\partial \Omega}{\partial \theta} = \frac{\partial H(\bar{x})}{\partial \bar{x}} \frac{\partial \bar{x}}{\partial \theta} \left[y(1 - u) - hu\theta \right] - H(\bar{x}) \left[\frac{\partial u}{\partial \theta} [-y - h\theta] - hu \right] + \frac{\partial F}{\partial \bar{x}} \frac{\partial \bar{x}}{\partial \theta} \quad (22)$$

From the definition of $\bar{x}$, we know that the effect of θ on $\bar{x}$ is positive. Additionally, we know that $\frac{\partial u}{\partial \theta}$ is negative; hence, the final effect of a change in the market tightness on the welfare depends on the values inside the brackets. Thus, we may reach the final answer via a numerical illustration.

Tax income is another aspect of the policy changes which we must elaborate. We see that the tax income will be affected by the changes in the income taxes t_e and t_f . The government has a tax-income level (T_I) equal to the sum of income and profit taxes collected from the employed individuals and firms.

$$\begin{aligned} T_I &= (t_e + t_f)wL + t(y - w(1 + t_f))L \\ T_I &= L[t_f(1 - t)w + t_e w + t(y - w)] \end{aligned} \quad (23)$$

Any increase in payroll taxes will have a two-sided effect on the tax income. First, the changes in t_f will increase the tax income. Second effect comes from the payroll tax t_f imposed on the firms via labor market tightness θ , unemployment rate u , value of unemployment rV_u and finally on participation $H(\bar{x})$. Since we know that $L = (1 - u)H(\bar{x})$, we can write the following:

$$dT_I = [(1 - u)H(\bar{x})(1 - t)w]dt_f + [t_f(1 - t)w + t_e w + t(y - w)]\frac{\partial L}{\partial t_f}dt_f \quad (24)$$

We can see that an increase in the payroll tax will increase the tax income if the employment L is constant. However, changes in the payroll tax will also effect other labor market determinants through tightness; hence the effect of t_f on tax income will also be derived from the following effect:

$$\begin{aligned} \frac{\partial L}{\partial t_f} &= -\frac{\partial u}{\partial t_f}H(\bar{x}) + (1 - u)\frac{\partial H(\bar{x})}{\partial t_f} \\ &= -\frac{\partial u}{\partial \theta}\frac{\partial \theta}{\partial t_f}H(\bar{x}) + (1 - u)\frac{\partial H(\bar{x})}{\partial V_u}\frac{\partial V_u}{\partial \theta}\frac{\partial \theta}{\partial t_f} \\ &= \frac{\partial \theta}{\partial t_f}\left[-\frac{\partial u}{\partial \theta}H(\bar{x}) + (1 - u)\frac{\partial H(\bar{x})}{\partial V_u}\frac{\partial V_u}{\partial \theta}\right] < 0 \end{aligned} \quad (25)$$

Therefore, increase in payroll taxes has a negative impact on the tax income since it will decrease the tightness $\frac{\partial \theta}{\partial t_f} < 0$. It will have increasing impact on the unemployment rate since u is negatively effected by the θ , $\frac{\partial u}{\partial \theta} < 0$, and decreasing impact on the value of unemployment $\frac{\partial V_u}{\partial \theta} > 0$. Consequently, the final influence on the participation is negative $\frac{\partial H(\bar{x})}{\partial V_u} > 0$. In the end, the employment level will go down, resulting in a reduction in tax income. Eventually, the increasing effect of payroll tax itself on the tax income will be offset via the decrease in the employment level.

To encourage participation in the labor market, the government can implement a policy via a reduction in the income taxation of the minimum wage earners. Decreasing the income tax t_e will increase participation and have a direct positive impact on the tax income level by increasing employment. Therefore, although it seems a burden for a government to reduce the income taxes, it will augment the overall tax income level.

$$dT_I = [(1 - u)H(\bar{x})w]dt_e + [t_f(1 - t)w + t_e w + t(y - w)]\frac{\partial L}{\partial t_e}dt_e \quad (26)$$

A decrease in the income tax will negatively impact the tax income if the employment level is constant. However, as income taxation also effects the employment and value of unemployment, we need to see this effect thoroughly. Since the income tax of t_e does not affect the unemployment rate through the labor market tightness, we can write the following:

$$\begin{aligned}\frac{\partial L}{\partial t_e} &= (1 - u) \frac{\partial H(\bar{x})}{\partial t_e} \\ &= (1 - u) \frac{\partial H(\bar{x})}{\partial V_u} \frac{\partial V_u}{\partial t_e} < 0\end{aligned}\tag{27}$$

On the one hand, decreasing income tax will decrease the tax income, however; it will encourage participation and eventually expand the employment base, causing an improvement in the tax income. Again the effect of income tax on the tax income of government is ambiguous.

If we look at the effect in government budget when there is a decrease in the income tax, we can see from the equation (14); tax base for the government increases.

$$\begin{aligned}\text{Revenue} &= (t_e + t_f)wL + t(y - w(1 + t_f))L \\ \text{Expenditure} &= SM(\cdot) + TL + bU + z(1 - L)\end{aligned}$$

A decreasing income tax of t_e causes an increase in employment L ; therefore government revenue increases since $\frac{\partial L}{\partial t_e} < 0$ as we found in equation (27). Government expenditures on the other will increase, since the decrease in t_e causes participation to increase. Participation increase then will cause the equilibrium employment to rise causing transfer expenditure TL to rise. Additionally, unemployment benefit expenditure bU rises since there are now more people searching for a job in the labor market i.e. the number of unemployed individual in the market increases. Overall, the effect of an income tax reduction on the government budget cannot be determined precisely.

If the government increases the payroll tax on the other, it has a negative impact on employment which is shown in equation (25). As the impact of employment decrease has a greater effect on the tax income than the t_f itself, we can say that the government revenue decreases. Decreasing employment and increasing rate of unemployment causes government unemployment benefit and social aid expenditure to rise. However, as the matching probability decreases, government expenditure for the subsidies decrease. Transfer expenditures also decreases because of the fall in employment. Therefore, net impact on the government expenditure cannot be determined. At the end, the effect of a payroll tax increase on the

government budget is ambiguous.

The final impacts of wage tax and income tax on endogenous variables are represented in Table 2. Overall, imposing taxes has deteriorating effect on the employment and participation. Although the unemployment rate is unaffected from the changes in income tax, payroll tax causes an increase in the unemployment rate. Finally, social welfare is negatively affected by the wage tax increase, while the impact of payroll taxes on welfare is inconclusive.

Table 2: The Impacts of Taxes

	Wage Tax t_e	Payroll Tax t_f
Tightness θ	No Impact	-
Unemployment Rate u	No Impact	+
Employment e	-	-
Participation $H(\bar{x})$	-	-
Tax Income T_I	Ambiguous	Ambiguous
Welfare Ω	-	Ambiguous
Government Budget	Ambiguous	Ambiguous

Taxation on Profit

The government generates income from income taxes and profit taxes, as explained in section (4.3.3). Every firm that employs a worker makes some profit from the productivity of the worker. In this section, we suppose that the government introduces a tax reduction policy to make the employment preferable and increase labor force participation. As explained before, increasing labor force participation will increase the matching probability.

We see from the labor demand equation (13) that any increase in the taxation on profit t will cause the labor market tightness to decline via the decline in the number of job openings. Any decrease in the profit tax, on the other hand, will cause employers to open up more vacancies since the relative profit is higher for any worker they employ, given the same wage and payroll tax level. Therefore, increasing the taxation on profit will cause a fall in the profitability of the firms. The profit tax has a negative impact on market tightness and thus on the value of unemployment. Hence, the labor force participation $H(\bar{x})$ will decrease.

$$dT_I = (1 - u)H(\bar{x})(y - w(1 + t_f))dt + [t(y - w(1 + t_f)) + (t_e + t_f)w]\frac{\partial L}{\partial t}dt \quad (28)$$

On the other hand, tax income will increase if the employment effect of profit taxation is ignored. Tax income will be negatively affected from this increase due to the fall in employment. However, the change in profit tax is higher than the change in employment level; therefore, the increase in profit taxation will have a positive effect on the government

tax income.

$$\begin{aligned}
\frac{\partial L}{\partial t} &= -\frac{\partial u}{\partial t} H(\bar{x}) + (1-u) \frac{\partial H(\bar{x})}{\partial t} \\
&= -\frac{\partial u}{\partial \theta} \frac{\partial \theta}{\partial t} H(\bar{x}) + (1-u) \frac{\partial H(\bar{x})}{\partial V_u} \frac{\partial V_u}{\partial \theta} \frac{\partial \theta}{\partial t} \\
&= \frac{\partial \theta}{\partial t} \left[-\frac{\partial u}{\partial \theta} H(\bar{x}) + (1-u) \frac{\partial H(\bar{x})}{\partial V_u} \frac{\partial V_u}{\partial \theta} \right] < 0
\end{aligned} \tag{29}$$

Diminishing the labor force participation rate and increasing unemployment will deteriorate the welfare, as can be observed from the equation (20). As the employment level will also fall due to the lack of job creation, the decrease in production will follow. However, the final effect on the social welfare depends on the magnitude of the difference between vacancy cost and total production. If the decrease in the vacancy cost as a result of a fall in labor market tightness is smaller than the production loss, then the social welfare may increase. The final effect on social welfare cannot be determined. Once again, it is essential to note that if the wages were to be bargained, then the unemployed individuals would have the opportunity to negotiate with the firms to find a job by lowering their reservation wages. However, given the minimum wage restriction, it is impossible to adjust those policy changes by lowering or increasing wages. Tax income, on the other hand, is expected to increase at first glance. Nevertheless, increasing profit taxation produces adverse effects on the labor market determinants. Government tax income is positively correlated with the profit tax level; however, the falling employment level will downsize the tax income.

Changes in government budget also show similar results with payroll tax. Through the decrease in participation, government expenditures for the subsidies and cash transfers also decrease. However, as the unemployment rate rises, unemployment benefit and social aid expenditures also rise. Therefore, the net change in the government expenditure cannot be determined, so does the government budget.

Table 3: The Impacts of Profit Tax

	Profit Tax t
Tightness θ	-
Unemployment u	+
Employment e	-
Participation $H(\bar{x})$	-
Tax Income	+
Welfare Ω	Ambiguous
Government Budget	Ambiguous

Unemployment Benefit

Governments are in charge of determining the level and the duration of unemployment benefits. So they introduce policies to support unemployed workers through increasing their welfare and thus of the society. By constructing a model with unemployment benefits, we try to see its impacts on employment, unemployment, labor market participation, and welfare.

Benefits are introduced as an encouraging social policy to increase the labor market participation and to decrease income inequality. Any increase in the unemployment benefit or just introducing the benefit mechanism itself will cause a definite improvement in the well-being of an unemployed worker. Additionally, there are no barriers or eligibility criteria for the unemployed individual to become entitled to an unemployment benefit. Every inactive individual will be entitled to receive an unemployment benefit when participating in the labor market.

We see from the equation (16) that the unemployment benefits have a positive impact on the value of being unemployed. Thus increasing the benefit will consequently raise the incentive for non-participants to search for a job since rV_u is now higher.

$$\frac{\partial rV_u}{\partial b} = \frac{r + q}{r + q + \theta m(\theta)} > 0 \quad (30)$$

As a consequence, the participation rate increases, and eventually, the employment will increase. The effect of unemployment benefits on social welfare is also positive as we can see from the equation (20). We know that in any case w is greater than the utility of the most efficient individual who enters the labor market, and the production level y is greater than w . Therefore, the overall impact of unemployment benefit increase on welfare becomes positive.

$$\frac{\partial \Omega}{\partial b} = \frac{\partial H(\bar{x})}{\partial \bar{x}} \frac{\partial \bar{x}}{\partial b} (y(1 - u) - hu\theta) + \frac{\partial F}{\partial \bar{x}} \frac{\partial \bar{x}}{\partial b} > 0 \quad (31)$$

From the employers' perspective, there is no change in their labor cost. Thus, they have no incentive to open new jobs. However, given the increasing number of unemployed workers, thanks to the improvement of unemployment conditions, the matching probability of filling a vacant job is now higher than before. However, the rigidity of wages will prevent employees and employers from bargaining. Consequently, at the new equilibrium level, the effect of the unemployment benefit on employment is positive.

Government tax income will also increase from the increase in employment level. Similarly, the government expenditure for benefits and subsidies also increase. However, the

increase in both expenditure and revenues makes it unclear for us to see the net impact on the government budget. Below table represents the results on endogenous variables.

Table 4: The Impacts of Unemployment Benefit

	Benefit b
Tightness θ	No Impact
Unemployment Rate u	No Impact
Employment e	+
Participation $H(\bar{x})$	+
Tax Income	+
Welfare Ω	+
Government Budget	Ambiguous

Hiring Subsidy

Opening a job vacancy incurs a burden that employers need to bear. If the hiring process cost or other types of match-specific costs are high, the employer will have no incentive to create a new job. Governments have been pursuing policies to subsidize firms to boost job creation capacity. Based on the wages, payroll taxes, and other expenses of the firms, governments provide such subsidies in the form of tax reduction, cash transfers, etc. In this model, a hiring subsidy will be given to employers for every worker they hire.

The first impact of the increase in hiring subsidy is that the firms are inclined to increase their labor demand. From the labor demand equation (13), we know that as the cost of opening a new vacancy is now less than before, they will create more jobs, which raises the labor market tightness θ . Since the labor market tightness has a positive effect on the value of unemployment (19), any increase in the tightness will cause the rV_u to increase.

Table 5: The Impacts of Subsidies

	Subsidy s
Tightness θ	+
Unemployment Rate u	-
Employment e	+
Participation $H(\bar{x})$	+
Tax Income	+
Welfare Ω	+
Government Budget	Ambiguous

Improvement in the state of being unemployed will attract non-participants; hence the participation rate will increase. On the other hand, from the equation (6), we see that a rise in the number of vacant positions decreases the unemployment rate. The overall impact of hiring subsidies on employment and participation then is positive. As stated before, from

the participation and employment impact, social welfare will also increase as a result of an increase in the hiring subsidies.

Through the increase in employment, government tax base increases hence the government revenues increase. However, giving subsidies is a burden on the government budget and causes an increase in the expenditures. However, as participation increase causes an increase in employment, the unemployment benefit and social aid expenditures paid to unemployed individuals decrease. Therefore, net change on the expenditures cannot be determined properly.



5 QUANTITATIVE EXERCISE

We have shown above how taxes, subsidies and benefits affect labor force participation, unemployment and labor market tightness. Although some effects seem to be ambiguous we need to visualize the amount of the changes on our endogenous variables.

We tried to build a numerical example by applying significant and reasonable parameters. By doing so, we tried to reach sensible endogenous results for unemployment rate, participation rate and labor market tightness. As we do not have sufficient parameter values for the Turkish economy, the values for base notations shown in the following table do not reflect a particular economy. In particular, we search for parameter values of $y, z, S, T, t_e, t_f, t, b, h, A$, and w to be as close as possible to the Turkish labor market values of tightness and unemployment rate. By changing the parameter values of taxes, benefits, and subsidy, we are left with the three unknowns; tightness, participation, and unemployment rate. We also look for changes in welfare and government budget in our model economy. We set the discount rate at $r = 0.005$, which is quite common with the matching literature and the job destruction rate as $q = 0.1$. Additionally, we take the distribution of home productivity as a normal distribution. To better evaluate the matching technology in our model economy, the matching function is taken as a standard Cobb-Douglas form, and the share of vacancy indicated as $VShare$ is taken as 0.40. However Kanik et al. (2014)⁶ have found from the Turkish Employment Agency (TEA) data that $VShare$ is approximately 0.54.

$$m(U, V) = AU^{1-VShare}V^{VShare} \quad (32)$$

In (32), m represents the number of matches, while A is the matching efficiency we take as 1 for simplicity. U and V are the numbers of unemployed individuals and the number of vacant jobs. Since we assume that the matching function has constant returns to scale property, dividing both sides with U will yield:

$$\frac{m(U, V)}{U} = A \left(\frac{V}{U} \right)^{VShare} = A\theta^{VShare} \quad (33)$$

Therefore, the job finding rate of $\theta m(\theta)$ becomes a non-linear function of labor market tightness. Any increase in the share of vacancy will increase the job finding probability.

⁶Kanik, B., Sunel, E., & Taşkin, T. (2013). Unemployment and Vacancies in Turkey: The Beveridge Curve and Matching Function (Vol. 1335). Türkiye Cumhuriyet Merkez Bankası.

Table 6: Numerical Example

Notation	Value
Productivity y	7.5
Social Aid z	0.5
Unemployment Benefit b	0.7
Subsidy S	0.3
Income Tax t_e	0.15
Payroll Tax t_f	0.17
Profit Tax t	0.20
Vacancy Cost h	1.8
Destruction Rate q	0.1
Transfer T	0.25
VShare	0.40
Discount Rate r	0.005
Minimum Wage w	5.85
Matching Efficiency A	1

Additionally, we take the mean of the distribution function of $H(\cdot)$ as 4 and the standard deviation as 1. By applying the values in the Table (6) to our model, we try to solve for the equilibrium values for labor market tightness, unemployment rate, and participation. Some of our results from the theoretical model were ambiguous for government budget, government tax income and welfare. First results from the above parameters are as shown below:

Table 7: Numerical Example Solutions

Endogenous Variables	Result
Productivity of Marginal Worker $\bar{x}$	4.5268
Participation $H(\bar{x})$	0.7008
Labor Market Tightness θ	6.0380
Unemployment Rate u	0.0465
Employment	0.6683
Tax Income	1.3386
Government Budget	0.9628
Welfare	5.8549

5.1 Changes in Income Tax

Our findings from the theoretical model tell us that the a reduction in income tax affects labor force participation, employment and social welfare in a positive way. As the labor market tightness is not affected from the changes in income tax, the unemployment rate

also stays unchanged. Since the income tax does not have any burden on the employers, the only channel of this tax policy is from the workers' side via disposable income. A reduction in income tax with no doubt increases the after tax income by also improving the employment status which can be seen from the equation (8). Any improvement in employment state hence improves the unemployment state, rV_u . Non-participants then are more willing to enter in to the labor market because of an improved unemployment state. As a result of a reduction in income tax thus increases both labor force participation and the employment. Further to the increases in participation and employment, we expect the social welfare also improves, since the unemployment rate and labor market tightness are unchanged and the increase in participation is greater than the decrease in home production.

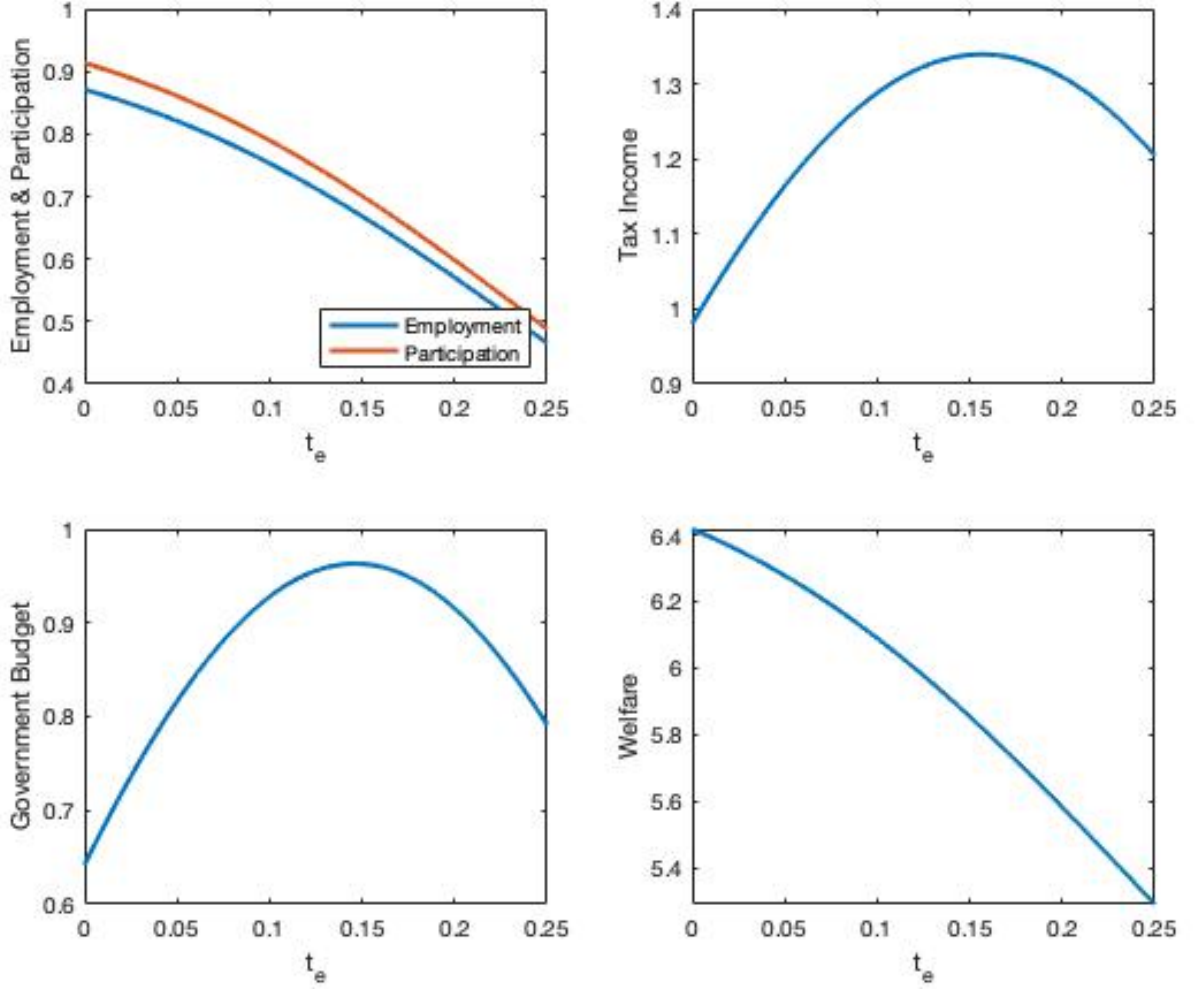
However, the results for the government tax income and government budget are not clear cut from the theoretical solution. On one hand, the income tax rate decrease affects the total tax income negatively. on the other hand, this reduction in tax rate increases the employment level which means an increase in the number of taxpayers in the economy. Therefore, the net change in government tax income could not be determined. Government budget also gives the same unclear result because of the increasing employment. Since the employment rise means also the rise in government expenditures through more subsidies and transfers from the budget equation of (14), the net difference between government expenditures and government revenues becomes uncertain.

We see the results of our quantitative exercise from Figure (6). A decrease in the income tax causes an increase in the labor force participation and hence the employment. Our findings are consistent with our theoretical model since we know that the income tax increase has a negative impact on the workers. As the workers' decision depends on the value of employment, any change upgrading employment value will have an increasing effect. We take the change in income tax t_e from 0% to 25%. The effects on the labor force participation and employment is almost the same since the income tax has no impact on the labor market tightness. As the income tax directly affects the workers' after tax income and is not a determinant of labor demand, firms do not change their behaviour concerning hiring new workers. Unchanged labor demand thus, results in an unchanged unemployment rate. However, the improvement of the well being of an employed individual directly improves the well being of an unemployed individual. Thence, the labor force participation increases causes the number of unemployed individual increase in the labor market.

The rise both in the participation and employment drives up the government tax income; although it is expected to lower it due to the reduction in tax rate. However, the results show that after a certain vale of income tax the government tax income starts to fall. This can be explained by the reduction in income tax effect exceeds the employment increase

effect on the government tax income.

Figure 6: Effects of Income Tax



Ultimate change in the tax income was unclear before this numerical exercise. We have discussed that a decrease in the income tax increases the government tax income at the first step from the employment effect. However, as the tax rate rises, so does the participation rate. The rise in the participation rate will then cause a rise in expenditures. If the employment rises, then the number of taxpayers will increase, which becomes an increasing effect on the total government tax income. It was not clear from the equation (23) that the final effect of a reduction in income tax on the government tax income. However, we see from the figure (6) that the reduction in income tax has a positive impact until some point and then has a negative impact on the government income for our model economy. We see that depending on our parameter values, income tax may have an optimal value.

Government budget also shows similar results to that of tax income. An increase in income tax yields a rise in the budget; however, after around 16% of income tax rate the budget starts to fall due to the decrease in labor force participation and employment level. Moreover, less tax payers cause less government income.

We know that the income tax is one the most important determinants of the social welfare; as it directly affects the purchasing power. Individuals change their choice of time between work and leisure, or their behaviour of consume or save depending on the tax levels. Therefore, we expect the changes in income tax should have important impacts on the social welfare. We see from the figure (6) that social welfare decreases if the income tax level rises. Since the income tax has no effect on the unemployment rate and labor market tightness, the direct effect of an increase in income tax decreases the welfare via a decrease in labor force participation.

Garibaldi and Wasmer (2004) found that a reduction in taxes yields in a larger entry to labor market and lower rates of exit from labor market where the labor market participation decision is described by entry and exit margin. Therefore, increase in labor force participation causes an increase in employment and higher labor market activity. We can say that our results are consistent with existing literature for the income tax reduction.

Our results can be indicated as; the increasing tax rates does not necessarily mean increase in government budget and government tax income. The reduction in income tax does certainly have a positive impact on labor force participation and employment. Depending on the model variations the social welfare is affected positively from the reduction in income tax.

5.2 Changes in Payroll Tax

We have examined the effects of the changes in payroll tax in comparative statics and found that an increase in payroll tax decreases the labor market tightness. This results is actually a starting point for the other endogenous labor market variables to change. We found that the increase of a cost of a worker force the employer to open less vacant positions i.e. decrease in number of hirings. As per the equation (6) we say that the fall in labor market tightness increases the unemployment rate. Thus, from the deteriorating welfare of an unemployed and employed individual, the labor force participation and the employment fall. The government tax income and government budget gives exactly the same ambiguous results with the income tax. We find that the increase in tax rate cause the tax income to rise however, by the fall in employment, the increase in tax income is offset. Therefore,

the net change in government tax income is ambiguous. Again, the falling employment rate causes the government expenditures to change. Subsidies and transfers were to decrease on one hand, expenditures for social aid increase on the other. Thus the government budget cannot give certain results because of the unclear tax income and government expenditures. Finally, the social welfare is expected to be affected from the increase in payroll tax negatively as a result of a decrease in labor force participation. However, the labor market tightness decrease makes it difficult to observe the net change on the welfare. We obtain these result with a strong assumption of minimum wages where they are exogenously determined and do not affect the labor market tightness and the behaviour of individuals. In the presence of a wage bargaining process, the wages should adjust to the falling firms hiring decision. If the workers were able to lower their reservation wages, then the unemployment rate would be unchanged.

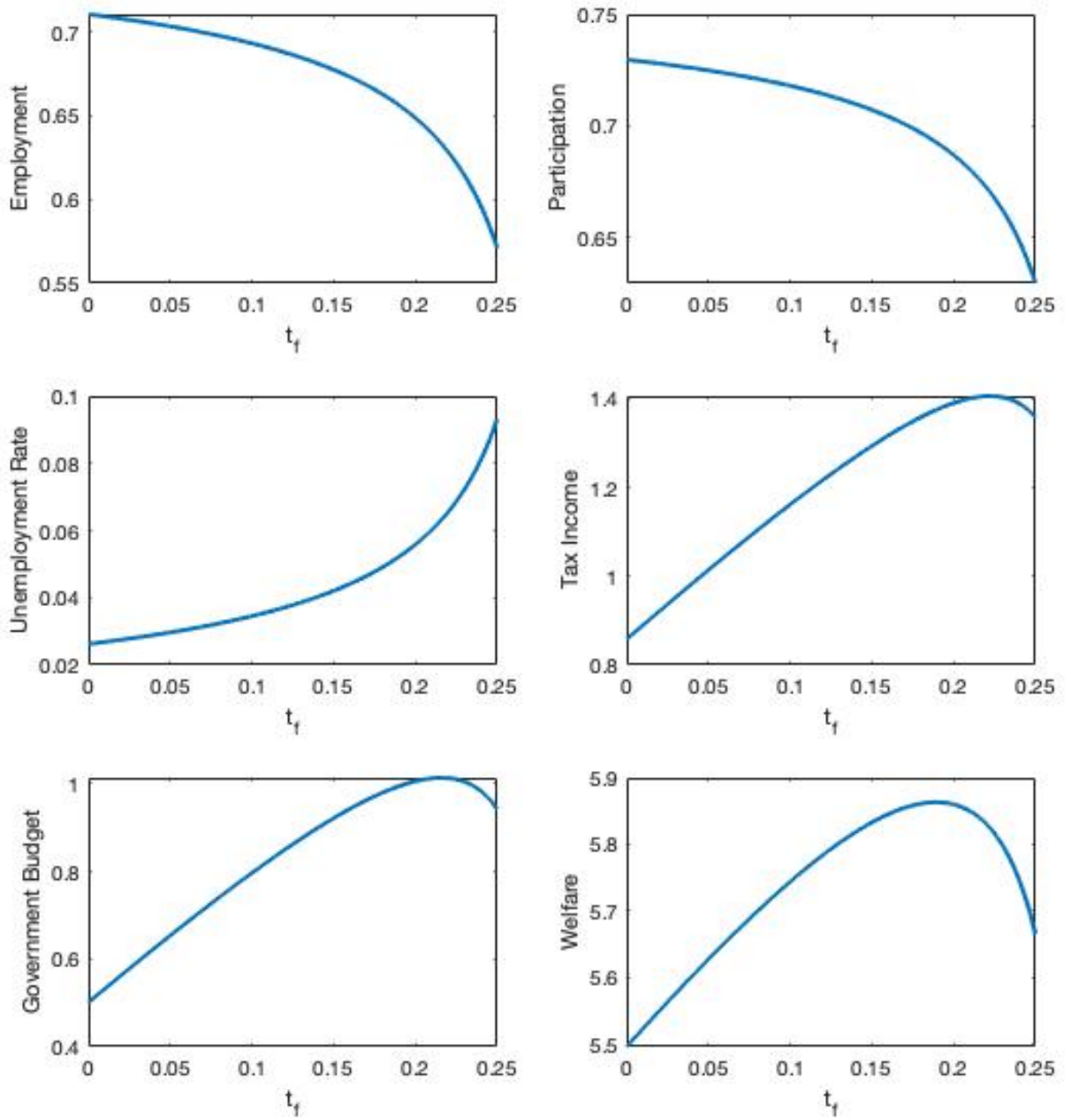
The results of the numeric example show that 25 percentage point rise in the payroll taxes reduces the labor market tightness and increases unemployment as we know from the equation (6). Thus, a reduction in tightness and a rise in the unemployment rate cause a decline in labor force participation and employment. Although we could not find a definite impact on the government tax income from the theoretical solution, we do find that the government's tax income rises until a certain value of payroll tax. This result is important in terms of policy making. As we have also found in policy effects of income taxation, increasing the payroll tax level does not necessarily mean an infinitely increasing government tax revenue. In our example for instance, after the payroll tax of 20% the labor force participation falls more steeper than before which eventually reduces the employment level. As the fall in employment means the tax base to shrink, the tax revenue of government reverses its movement and starts to decline.

Further, after this certain point of payroll tax, the participation effect of the rise in payroll tax become greater and offset the rise in government tax income. The economics of these results indicates that extending payroll taxes forces firms to reduce recruiting, i.e., lower labor demand. Another important point arises when we further increase the payroll tax. The unemployment rate rises from around 2.5% to 6% when the payroll tax increases from 0 to 20%. However, this increase is more critical after the payroll tax level passes 20% threshold value. While a 20 percentage point increase in tax causes a 140% increase in unemployment rate, a 5 percentage point increase causes almost 67% increase in unemployment rate after the threshold value. As it is one of the most important indicator of a well functioning economy, the rise in unemployment rate among the minimum wage earners should be of concerns for the policy makers if the share of these low wage earners is high.

It is worth mentioning here from a well-known study of Kramarz and Philippon

(2001) that payroll tax subsidies have small and insignificant impact on transition from non-employment to employment. Although they have found that increasing the labor cost increases the transition from employment to non-employment, it is an interesting result that the reverse did not hold for a decreasing labor cost.

Figure 7: Effects of Payroll Tax



An empirical study made by Korkeamäki and Uusitalo (2008) shows also important results backing our results. A regional experiment of a payroll tax cut of 3 to 6 percentage point in Northern Finland yields a wage increase in that region. This increase in wages therefore offsets the reduction in firms cost generated by the payroll tax reduction. Eventually, the overall labor cost reduction makes no significant impact on employment level. Maybe the most important assumption in our model is the minimum wages are binding for all workers and it does not change during any policy change. Hence, the increase in payroll tax causes unemployment to rise and employment to fall because the workers do not have the chance to lower their reservation wages.

Since there is no wage negotiation between workers and firms, the wages do not adjust, so the unemployment rises. Otherwise, the workers would be able to lower their reservation wages to stay employed. Additionally, lower labor demand will affect the non-participant's decision whether to participate or not. As expected, staying outside the labor market is more favorable; therefore, the labor force participation declines. Again, the fall in the participation rate will cause the employment level to decline.

Government budget also shows similar results with tax income. As revenues increase, the budget shows an increasing pattern. As stated before, participation falls significantly after a certain point of payroll tax, then the tax income and government budget falls with it. However, comparing in the percentage level of the effects of income tax and payroll tax increase, the payroll tax increase help government budget to rise more than the income tax increase. If we look at the participation impact of both of these taxes, we see that the payroll tax increase has a much smaller effect on the participation. A 25 percentage point increase in payroll tax lowers the participation by almost 16% while the same level of increase in income tax causes almost 80% decrease in the labor participation.

Welfare impact of payroll taxation was also ambiguous from the theoretical model. As the increase in payroll taxation causes the tightness to decrease, the welfare affect becomes unclear. We see from the Figure (8) that fall in participation level causes an increase in the home production however, after the payroll tax level of approximately 20% the welfare significantly falls. If the payroll taxes to be decreased then the hirings of workers would increase causing a rise in the welfare. For an increase in payroll tax however, the reduction in the cost of a vacancy is higher than the reduction in the production which yields a rise in the welfare until the value of 20%. After this point of payroll tax, the participation effects weighs more in the social welfare causing a downturn in the welfare level. Therefore, payroll tax is a very important element of the social welfare.

5.3 Changes in Profit Tax

The results of a corporate profit tax change on the labor market were examined in the comparative statics section. The effects are various as it is with the other types of taxation. We found that any rise in the profit tax affects the labor market tightness first by changing the behaviour of the firms. If the cost of a firm increases then the a profit maximizing firms is expected to decrease its cost. Therefore, increasing profit tax rate causes the firms open less vacancy. Hence the decreasing vacancy decreases the labor market tightness. We should once again recall that the exogenously determined wages are a restriction on the way of workers to reduce their reservation wage. Thus, the unadjusted wages cause the tightness to be able to directly effect the unemployment rate. The unemployment rate rises as a result of the decrease in the labor market tightness. Additionally, the state of being unemployed deteriorates and the labor force participation together with employment fall. We also concluded before that the falling labor force participation and increasing unemployment rate cause the social welfare to fall if the fall in vacancy cost is greater than the production loss.

We can see the effects of the profit tax on labor market from the figure (8). Effects of the corporate profit tax on the labor market is quite similar to those of payroll taxes. Firms are unwilling to hire workers since now their profit is lowered by the increase in the profit taxation. If we increase the profit tax 20 basis points we see that the market tightness and participation falls, unemployment rises as shown in the Figure (8).

We have discussed before that the imposition of a profit tax has a negative impact on both labor force participation and employment by lowering labor demand. The results of quantitative exercise also show that an increase in profit tax decreases the participation and employment. However the effect of a 40 percentage point increase on employment and participation is rather small. The decrease in employment stays limited with only 4 percentage point. This finding is also consistent with the work of Feld and Kirchgässner (2001) where the effect of corporate income tax in Switzerland has been examined for a 14 years of period. They found that corporate income tax has rather small and negative effect on employment for the small and medium sized firms. However, this result is valid where the firms cannot change their location since Switzerland has different taxation practice among different regions.

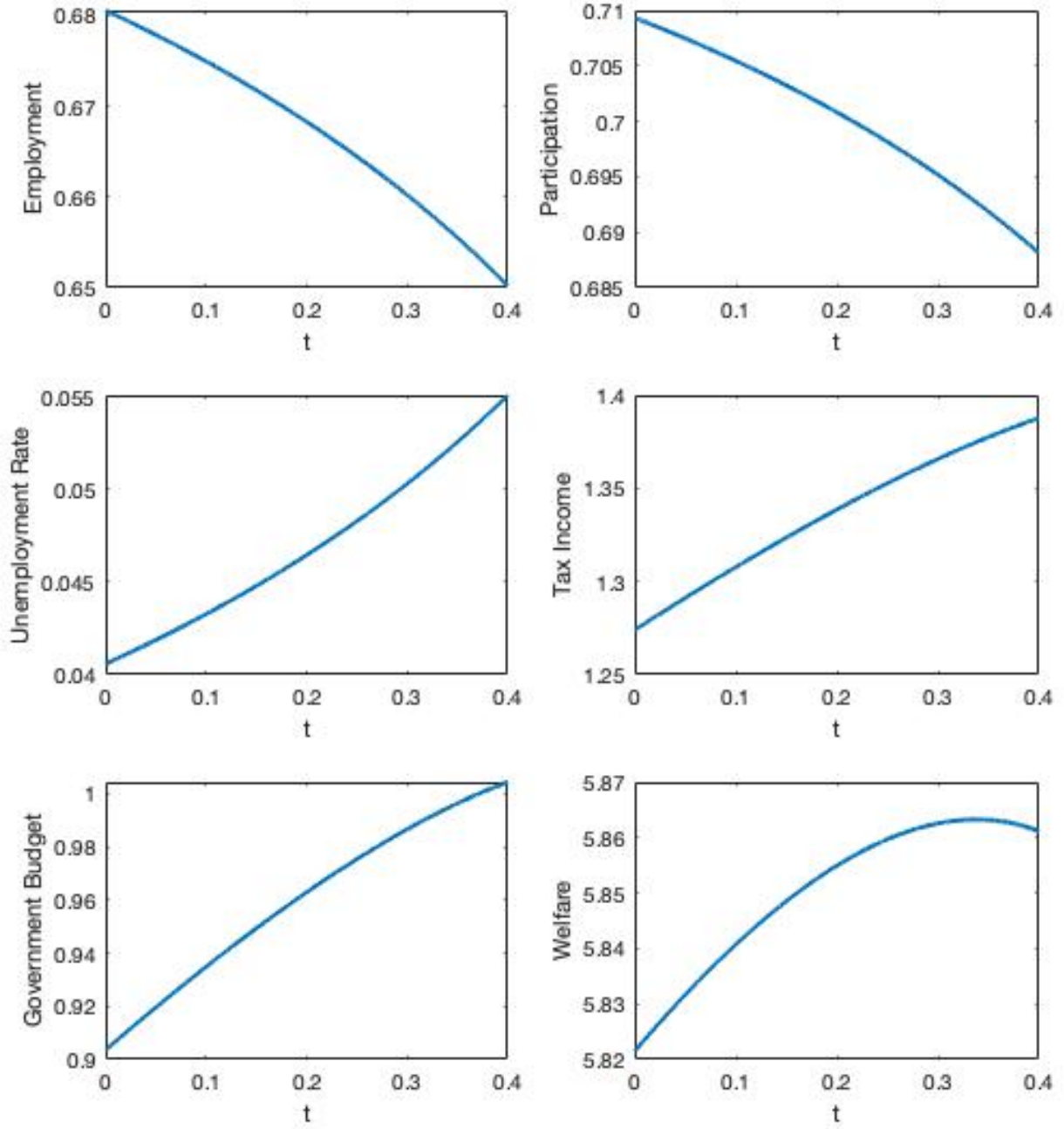
As the impact of profit tax is rather small on labor force participation and employment, the increase in tax level increases the government tax income and budget. We see from the results that a 1% increase results in a 0.002% increase in tax income. Again the same level of increase in profit tax increases the government budget by only 0.0025% according to

the results of quantitative exercise.

We see that the effect of this increase on the unemployment rate is not as high as expected. Government tax income again has the same movement as it has after the changes in payroll tax. Since the change in profit taxation is greater than the change in employment level, the tax income increases i.e. the fall in employment was not able to compensate the increase in profit tax. Additionally, the government budget also rises together with the rise in profit tax. Since the employment level does not show a significant fall, the increase in profit tax has a positive impact on the government budget.

Welfare on the other hand, shows an interesting result. Until a certain point of profit tax, which is approximately 32%, welfare increases due to the shift from labor market activity to non-participation i.e. the home production increases. However, after the threshold level, the welfare shows a decline. Therefore, we can say that although the impact of profit tax on employment is relatively small, it is not negligible. Existence of an optimal point for profit tax is, similar to income and payroll taxes is a valuable deduction for our study. The welfare effect can also be seen in economy from the behaviour of firms. Decreasing profits will force the firms to decrease their hiring levels to balance their cost-profit optimization. Hence the level of employment will fall by negatively affecting the social welfare.

Figure 8: Effects of Profit Tax



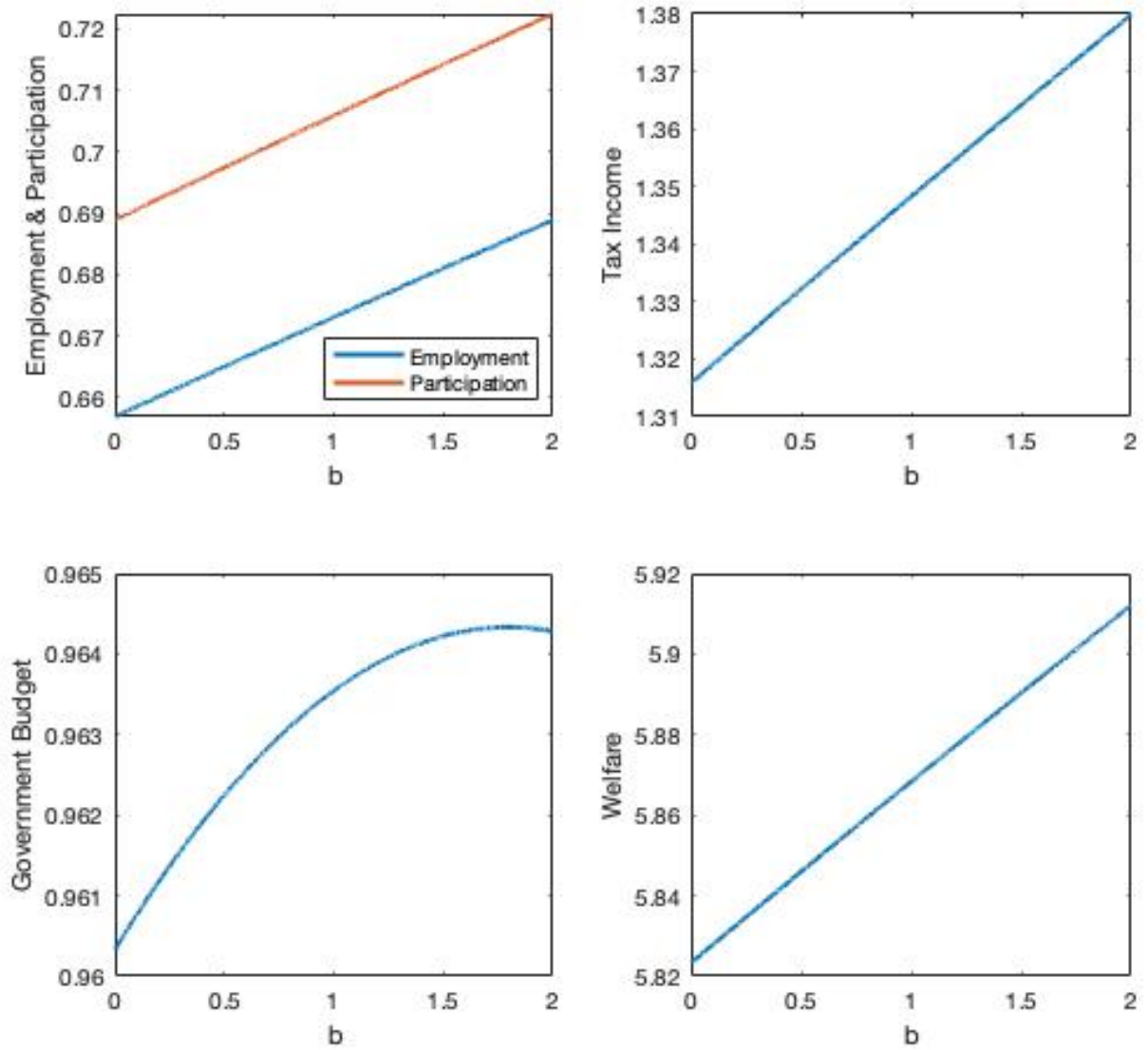
Our results are consistent with the results found in the work of Garibaldi and Wasmer (2001) which indicates that the taxation on the market activities has substantial negative impact on the labor market when the labor force participation is endogenously determined in the model.

5.4 Changes in Unemployment Benefit

The comparative statics results of the unemployment benefit shows that imposition of an unemployment benefit increases both the labor force participation and employment. Since the benefit directly increases the value of unemployment, the labor force participation rises. However, the benefit extension again is not a concern for the employers since it is not included in their cost functions. Therefore, there is no incentive for the firms to change their hiring behaviour. However, since there is now more unemployed worker in the labor market as a consequence of a rising participation, government expenditures for the benefits rise too. Although social aid given to the non-participants decrease, as a result of an increased participation in the labor market, the social aid given to the unemployed individuals increases. Additionally, from the participation increase the government tax income increases, however, the changes in the government expenditures are not as clear. Again, the increase in labor force participation increases the social welfare, since any individual entering the labor market will have an higher productivity than of the inactive state , rV_i .

The effects of unemployment benefit extension is shown in figure (9). We know that the unemployment benefit does not effect the labor demand however, it affects the labor supply. Through the increase in the value of unemployment, labor market participation increases. The decision point of $\bar{x}$ for the individuals who are outside the labor market increases. Thus at the equilibrium the employment increases. However, the increase in employment and participation is not as high as expected compared to the increase in benefit level. This may be the result of a higher value of unemployment. The more the unemployment income rises the more people would want to stay unemployed. Individuals with a lower home productivity level may decide to participate in the labor market if the benefit is high enough. Although, the improvement in the state of unemployment brings more people to labor market, the labor demand side of the market would stay unchanged. When there are no job openings for the new comers to the labor market, the employment increase would be limited.

Figure 9: Effects of Unemployment Benefit



The rise in the employment level means the increase in the number of tax payers in the economy. Thus the government tax income increases as much as the employment. However, after a certain level of unemployment benefit, the government budget starts to decline since the benefit is an expenditure and if the expenditures increases more than the rise in revenues, the budget deteriorates. Moreover, if the wages were not determined exogenously, workers would raise their reservation wages. Since the opportunity cost of working is now higher as a result of an increase in unemployment benefits, they will demand more for their work. Additionally, the increase in wages would yield in a decrease in vacancy by increasing the

cost of labor for a firm. Therefore, if the unemployment benefits had an impact on the labor market tightness, then the employment rate would fall.

Government budget on the other hand shows a slight uprising when we doubled the unemployment benefit. The rise in budget is approximately 0.3% although it starts to decrease after a certain point of unemployment benefit. We can comment that this movement is partly because of the increasing participation rate. Let us remember the equation (14) where the participation increase cause the expenditures for cash transfers and subsidies (increasing matching probability) to rise. However, if the expenditure increase surpasses the rise in government revenues, the government budget falls.

Furthermore, we can easily say that unemployment benefit has quantitatively weak impact on employment, labor force participation, government tax income, government budget and social welfare. This is an important result for us. Starting from an employment rate of 66% when there is no benefit at all, the increase in unemployment benefit would increase the employment only to 68% i.e. a 1% increase in unemployment benefit effects employment by only 0.01%. Welfare effects of this policy change is again rather small compared to the income tax or payroll tax. It increases with the rise in benefits, since the participation increases and there is no change in the labor market tightness and unemployment rate which can be seen from the equation (18). We found that a 1% increase in unemployment benefit has increased the social welfare by approximately 0.0075%.

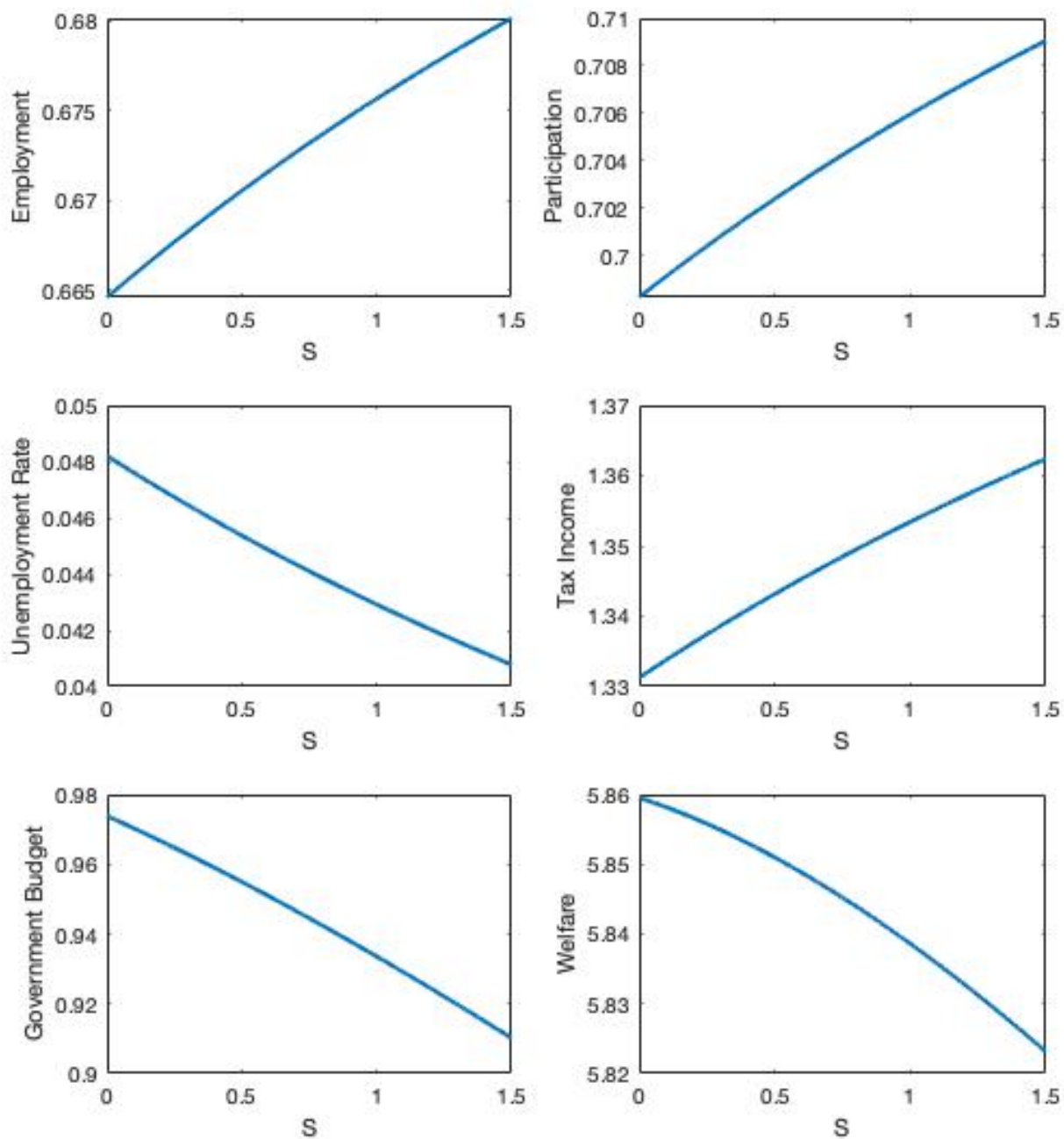
Usually, both the empirical and theoretical studies on unemployment benefits focus on the the duration and eligibility of these benefits. However, we tried to see only the effects of an extension of these benefits on the labor market by increasing the amount. Our results are consistent with the comparative statics. A rise in unemployment benefit yields a rise in labor force participation and employment level through the improvement in the unemployment state. Surprisingly, yet until a certain point, the government budget increases. Lastly, as a result of an increase in the participation level, the social welfare rises.

5.5 Changes in Hiring Subsidy

Subsidies are a very common way of implementing labor market policies. Hiring subsidies in our model are given to firms for every hire they make. Although the examples of using hiring subsidies can be temporary and be used as a cheaper substitute of wage subsidies, our model assumes that these subsidies are only for employers who employs minimum wage earners. We have increased the level of subsidies to see the effects on the labor market. From the equation (13) we know that the subsidies effect the market first from the labor demand

side. Because of an increase in the hiring subsidies, the employers are now more willing to open up new vacancies, so the job creation increases. With the increase in the job creation, the labor market tightness increases making it more favorable for the individuals who are out of labor market.

Figure 10: Effects of Hiring Subsidies



According to the numerical example, we find similar results with comparative statics. The exit rate from unemployment is an increasing function of hiring subsidies from the equations (4)-(13). Rise in hiring subsidies results in a decrease in the unemployment rate. Additionally, employment rises in all equilibrium points since the participation rate increases. Furthermore, as stated in the work of Delpierre, M (2019)⁷, depending on the sensitivity of $\theta m(\theta)$ to S , the rate of change in the unemployment and employment changes. The more sensitive the $\theta m(\theta)$ to S , the more job creation rises so does the employment. However, we have only analyse the equilibrium impact of S on the labor market without changing any other variable.

We should underline the fact that if the wages were not exogenously determined, workers would increase their reservation wage since their outside option would be much higher as a result of increase in subsidies. However, this would cause the firms to increase job destruction rate. Therefore the rise in job creation generated by the rise in hiring subsidies would be offset by the increase in job destruction. Therefore, the increase in hiring subsidies would not yield immediately in a decreasing unemployment rate.

According to the results of our quantitative exercise, a 10% increase in hiring subsidy decreases the unemployment rate by 1%. Compared to payroll tax and profit tax, the effect of hiring subsidy on unemployment rate is relatively small. Moreover, the increase in S creates a rise in the government tax income from the equation (23) since it increases the employment. Therefore, without any change in the tax levels, raising the participation level causes an enhancement in the number of tax payers in the economy. However, as the subsidies are expenditure, government budget declines as a result of this increase. Increase in participation and decrease in unemployment rate is expected to yield an increase in social welfare. However, the social welfare falls though with a lower rate when there is an increase in hiring subsidy. This result contradicts our finding in comparative statics. We have commented before from the employment and participation effect that the social welfare increases. The reason why the welfare decreased as a result of an increasing hiring subsidy can be the fall in home production. Additionally, if the labor market tightness increases enough to surpass the effect of labor productivity in welfare, than the welfare declines. Because then, the matching probability falls, since there are more vacant positions per unemployed individual in the labor market. Therefore, we cannot directly say that hiring subsidies are a welfare enhancing social policy. This deduction of course can be reversed depending on the construction of the model.

⁷Delpierre, M. (2019). Are hiring subsidies detrimental to employment stability. Insights from a calibrated matching model. mimeo, IWEPS.

6 CONCLUSION

In this dissertation, we examined the effect of income tax reduction, payroll tax and profit tax increase, hiring subsidies and unemployment benefits with a search and matching model. We observed that the existence of minimum wage limits the changes in unemployment, labor force participation and employment. In this paper, we reduced the income tax born by the minimum wage earners and found that the labor force participation increase significantly together with employment level. However, the change in income tax does not affect the labor market tightness nor does the unemployment rate. We also include hiring subsidies to our model. When compared to a tax income reduction, hiring subsidies has a lower impact on employment and labor force participation. Additionally, unlike income tax reduction, an increase in hiring subsidy reduces the unemployment rate. We also found that the unemployment benefits have similar effects with income tax reduction and hiring subsidy. All have an increasing impact on employment and labor force participation. However, only the rise in hiring subsidies can lower the unemployment rate. Moreover, a hiring subsidy can be more inefficient than unemployment benefit since it reduces the government budget. Unemployment benefits could be inefficient if the workers would have the chance to raise their reservation wages. Increase in reservation wages would certainly decrease the firms' willingness to hire. However, existence of minimum wages prevents firms and workers to negotiate.

Payroll taxes and profit taxes are also incorporated into our model as cost items for firms. Though they have quite the similar results when increased, the unemployment effect of the payroll tax is higher than the profit taxes imposed on the firms profits. An increase in payroll tax of 25% causes the unemployment rate to rise from 2% to almost 10%. Meanwhile, an increase of profit tax of 20% causes unemployment to rise from 4% to 4.6%. Further, the labor force participation and employment level falls as a result of an increase in both tax types. However, profit tax increase has less effect on participation than the payroll taxes. To conclude, we have found that the all types of taxes included in this model has negative impacts on labor market conditions. Although the imposition of taxes increases the government budget for some cases, it is rather ambiguous for the social welfare. According to the results of the quantitative exercise, income tax, payroll tax and profit tax has an optimal value. After the profit tax rate of 30% for instance, the social welfare starts to decline. Overall, we see that there may be optimal values for taxes and other transfers. The results in this study indicate that taxation policies and transfers such as unemployment benefit and hiring subsidy have all impact on labor force participation level which is the key determinant of employment with the minimum wages.

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TEZ ONAY SAYFASI

Üniversite : T.C. GALATASARAY ÜNİVERSİTESİ
Enstitü : SOSYAL BİLİMLER ENSTİTÜSÜ
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JÜRİ ÜYELERİ

Unvanı, Adı Soyadı

İmza

Doç. Dr. Mustafa ULUS

Doç. Dr. Bilge ÖZTÜRK GÖKTUNA

Doç. Dr. Ozan BAKIŞ

Prof. Dr. M. Yaman ÖZTEK

Enstitü Müdürü