



Hacettepe University Graduate School Of Social Sciences

Department of Economics

Master of Arts Programme in Economics

**NEOCLASSICAL EXPLOITATION: A BARGAINING MODEL
WITH HETEROGENEOUS FIRMS AND WORKERS**

Volkan AHISKALI

Master's Thesis

Ankara, 2024

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ACCEPTANCE AND APPROVAL

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Volkan AHISKALI

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ETİK BEYAN

Bu alıřmadaki bütn bilgi ve belgeleri akademik kurallar erevesinde elde ettiđimi, grsel, iřitsel ve yazılı tm bilgi ve sonuları bilimsel ahlak kurallarına uygun olarak sunduđumu, kullandıđım verilerde herhangi bir tahrifat yapmadıđımı, yararlandıđım kaynaklara bilimsel normlara uygun olarak atıfta bulunduđumu, tezimin kaynak gsterilen durumlar dıřında zgn olduđunu, **Do. Dr. Mustafa Aykut ATTAR** danıřmanlıđında tarafımdan retildiđini ve Hacettepe niversitesi Sosyal Bilimler Enstits Tez Yazım Ynergesine gre yazıldıđını beyan ederim.

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DEDICATION

To İlke

ABSTRACT

AHISKALI, Volkan. *Neoclassical Exploitation: A Bargaining Model with Heterogeneous Firms and Workers*, Master's Thesis, Ankara, 2024.

The idiosyncratic imperfections of labor markets have been widely discussed in the literature. These unique features affect policy outcomes and effectiveness depending on the structure of the markets. This thesis investigates the effectiveness of minimum wage policy in labor markets where heterogeneity, exploitation, monopsony, and informality exist. The effects of the policy are analyzed with a bargaining model that includes these features. The first experiment shows that, when implemented alone, the minimum wage increase failed to increase wages but led to higher informality and exploitation. The second experiment consists of policies combining the minimum wage increase with stricter sanctions against informality. Although this policy set reduced informality, it also caused wages to fall and significantly increased the rate of exploitation of formal workers. In the third experiment, workers' bargaining power was increased in addition to the policies in the previous policy set. It leads to a decline in informality, an increase in wages, a slight increase in average exploitation of formal workers, but a decrease in the proportion of workers exploited. These findings highlight the importance of a multi-layered policy design for the minimum wage policy to be effective in a labor market where heterogeneity, exploitation, monopsony, and informality exist.

Keywords

Exploitation, Monopsony, Bargaining, Heterogeneity, Informality, Minimum Wage

ÖZET

AHISKALI, Volkan. *Neoklasik Sömürü: Heterojen Firmalar ve İşçilerle Bir Pazarlık Modeli*, Yüksek Lisans Tezi, Ankara, 2024.

İş gücü piyasalarının kendine özgü aksaklıkları literatürde geniş bir şekilde tartışılmaktadır. Bu aksaklıklar, piyasaların yapısına bağlı olarak politika sonuçlarını ve etkinliğini etkilemektedir. Bu tez, heterojenlik, sömürü, monopson gücü ve kayıt dışılığın var olduğu iş gücü piyasalarında asgari ücret politikasının etkinliğini araştırmaktadır. Politikanın etkileri, bu özellikleri içeren bir pazarlık modeli ile analiz edilmektedir. İlk politika deneyi, tek başına uygulandığında asgari ücret artışının ücretleri artırmada başarısız olduğunu ve kayıt dışılığı ve sömürüyü artırdığını göstermektedir. İkinci politika deneyi, asgari ücret artışına ek olarak kayıt dışılığa karşı politikaların daha sıkı hale getirilmesini içermektedir. Bu politika seti kayıt dışılığı azaltmış olsa da, ücretlerin düşmesine ve kayıtlı çalışan işçilerin sömürülme oranının önemli ölçüde artmasına neden olmuştur. Üçüncü politika deneyinde, önceki politika setine ek olarak işçilerin pazarlık gücü artırılmıştır. Bu politika seti, kayıt dışılığın azalmasına, ücretlerin artmasına ve sömürülen işçilerin oranının azalmasına sebep olurken, kayıtlı çalışan işçilerin ortalama sömürülme oranında hafif bir artışa sebep olmuştur. Bu bulgular, heterojenlik, sömürü, monopson gücü ve kayıt dışılığın bulunduğu bir iş gücü piyasasında asgari ücret politikasının etkili olabilmesi için çok katmanlı bir politika tasarımının önemini vurgulamaktadır.

Anahtar Kelimeler:

Sömürü, Monopson Gücü, Pazarlık, Heterojenlik, Kayıt dışılık, Asgari Ücret

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ABBREVIATIONS

PUMS : Public Use Microdata Sample

SLM : Segmented Labor Market

SUBS : Statistics of U.S. Businesses

USA : United States of America

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INTRODUCTION

Within the theoretical framework offered by the perfectly competitive labor markets, real wages have to be equal to the marginal product of labor. However, there are a lot of factors that push labor markets away from perfect competition. These factors may arise due to the actions of different economic agents such as firms, workers, and policymakers and may generate some imperfections in the market.

Labor markets are often considered a different kind of market than the other factor markets because of the unique characteristics of labor as a commodity. All types of markets may have imperfections, but the distinctive features of labor markets create room for specific imperfections. As a deviation from perfection, monopsony arises due to imperfections in labor markets. Therefore, these imperfections generate a gap between labor productivity and wages by affecting the power balance between firms and workers in favor of firms. In the literature, this gap is often called neoclassical exploitation. With an emphasis on its theoretical background, it is also referred to as Pigouvian exploitation or Pigou-Robinson exploitation. The concept of wage markdown is increasingly used to express this situation.

The wage-productivity gap depends on different features of firms, workers, sectors, and geography, and presents heterogeneous results. There are also structural features that exist because of historical conditions, and it is possible to observe the wage-productivity gap from a macroeconomic perspective rather than the individual relationships between firms and workers. The existence of this gap is not incidental and has various reasons in line with the reasons for imperfections in the labor markets.

Even if there are studies that measure the wage productivity gap in different periods in history the literature mostly focused on the period after the 1970s, a period during which a set of dramatic changes occurred within the structure of capitalism. Even if labor productivity continued to increase, real wages stagnated so the co-movement of the real wage and labor productivity in the golden age of capitalism (which is defined as the era between 1950 and 1970s) has turned into two blades of a scissor and the gap has widened.

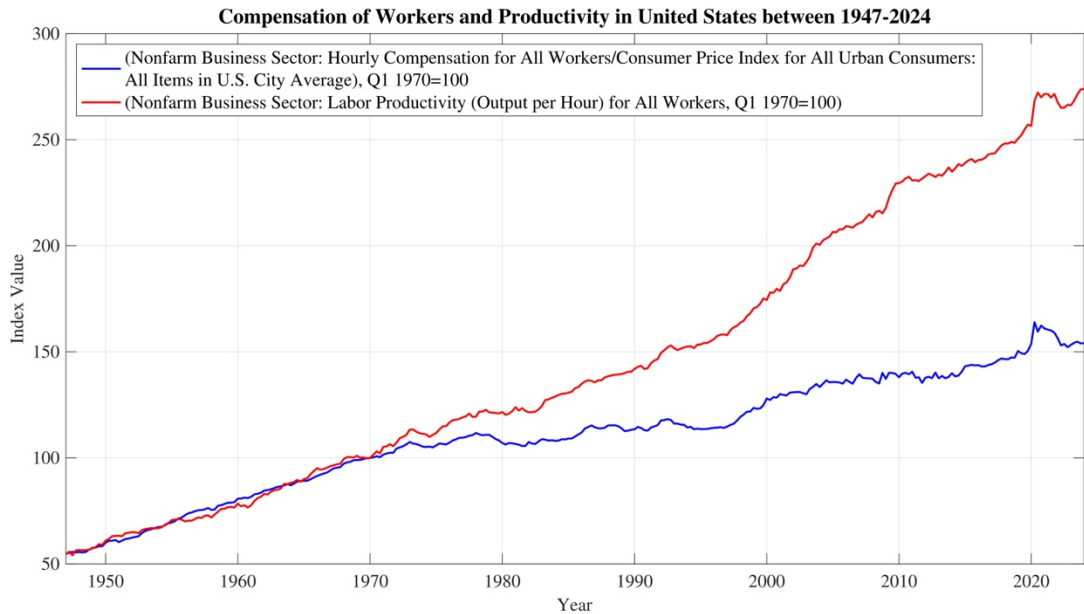


Figure 1

Figure 1: United States, Compensation of Workers and Productivity (1947-2023)

Data Source: (Federal Reserve Bank of St. Louis, 2023)

As seen in the graph above (Figure 1), there has been a gap between labor compensation and productivity since the 1970s. Although these two data showed similar oscillations in certain periods (crisis and boom periods), the difference between them continued to increase significantly.

The economic crisis of the 1970s brought a paradigm shift, and the period of liberalization known as neoliberalism began. During this period, the institutional framework that emerged in the golden age of capitalism which improved the conditions of workers significantly compared to other periods of capitalism began to be abandoned step by step. In addition, the wave of globalization that became evident after the crisis caused labor demand to fall in developed capitalist countries as capital (and therefore production) shifted to developing countries. On the other hand, with technological developments, the job creation process has slowed down with the shift of certain tasks from workers to machines. All these factors have reduced the bargaining power of workers.

In addition to and with historical and structural transformations, the monopsony power of firms, which is a result of imperfections in labor markets, enables the suppression of wages by shaping the balance of power between workers and firms in favor of the firms. This situation affects many variables in the labor market, especially wages and profits. Policy outcomes may also differ in such markets that do not operate according to the rules of perfect competition.

On the other hand, when the heterogeneity and segmentation among the firms and the workers in terms of various characteristics are considered, the effects of shocks and policies will be heterogeneous. For example, policies may end up with extremely different results between firms with lower productivity and the others. Even if the firms with lower productivity levels have monopsony power and make profits, firms may choose to operate informally to avoid the costs of policy implementations and formality. On the other hand, policies will affect workers with low and high wages differently too. Therefore, heterogeneity may cause highly varied policy outcomes for a portion of firms and workers and cause a slight or no change for others. This will affect the total outcome of the policies.

This thesis aims to measure the effects of minimum wage policies by establishing a bargaining model with heterogeneous firms and workers in a monopsonistic labor market structure by focusing on the effects of policies on different factors, especially wages and exploitation within an environment where informality exists. This thesis intends to contribute to the literature by showing the policy effects on wages, informality, and neoclassical exploitation, by using a model consisting of monopsony, bargaining power, and heterogeneous firms and workers.

This thesis argues that in an environment where heterogeneity, informality, monopsony power, and exploitation exist, labor market policies, especially the minimum wage policy, may yield some unintended consequences and policy inefficiencies. To overcome these policy inefficiencies, policies need to be designed in a multi-layered manner to eliminate the unintended consequences. This claim will be examined with a bargaining model, and policy implications and alternative scenarios will be evaluated.

Chapter 1 presents literature related to this study and starts by introducing the theory of neoclassical exploitation. After briefly introducing the neoclassical theory of exploitation and its historical development, the chapter continues with empirical studies on the neoclassical exploitation (the wage-productivity gap) and shed light on the causes of exploitation and the facts that affect exploitation (and to some extent differentiate it between certain structures and segments). Then, the chapter continues by introducing the concept of monopsony and its central importance in this study and, the reasons that cause monopsony (and potentially exploitation) are discussed. After that, a literature review on the axis of monopsony, minimum wage and exploitation will be presented. In the last part of the chapter, segmented labor market theory will be presented. After discussing the origins and claims of the segmented labor market theory, the importance of this theory in explaining labor market policy results is revealed through applied studies. Chapter 2 presents the bargaining model in detail with its specifications about minimum wage, informality and exploitation. In Chapter 3, the data used in the model, the qualities of these data and benchmark parameters are presented. Chapter 4 compares the initial outputs of the model and data, then, presents some variables and distributions that reveal the structure of the model environment. Chapter 5 presents the policy experiments with their results. Finally, the study ends with a conclusion section that summarizes the findings the study by recalling the details and results of the thesis.

CHAPTER 1

RELATED LITERATURE

1.1. NEOCLASSICAL THEORY OF EXPLOITATION

In the literature, the concept of exploitation has been extensively theorized and expanded upon by Marx and his followers. The exploitation of labor is a central idea in Marxian understanding, comprising one of the pillars on which the system necessarily rests to sustain itself. Despite being under-analyzed, exploitation is a component of neoclassical theory as well, taken as an implication of a deviation from the perfection of the market.

Marxian and neoclassical theories differ from each other in many aspects, especially regarding their respective understandings and conceptualizations of the perception of value. In the context of exploitation, one of the most important divergence is regarding the conditions of existence of exploitation. While Marxian theory portrays exploitation as a problem of the markets, neoclassical theory perceives it as a problem in the markets (Cengiz, 2021). The former identifies exploitation as a structural phenomenon while the latter defines it as an incidental issue, a deviation within the structure itself. Another important distinction is that while Marx treats exploitation as an outcome of the balance of power between classes, neoclassical (and its predecessor) theories treat exploitation as a deviation from the normal, natural or fair level of wages. Marx does not address exploitation as a situation where wages are lower than they should be, nor does he problematize it as an ethical phenomenon (Cengiz, 2021).

The concept of exploitation in neoclassical economic theory can be traced back to Arthur Cecil Pigou. Although it was not referred to as 'exploitation', many economists who are considered to be the main influences of Pigou, namely Smith, Clark and Marshall, have expressed situations where wages are lower than they should be with various concepts. Smith elaborates on the perfection of the free market with his famous concept of the invisible hand, but perceiving Smith in this simple and unnuanced way is an incomplete interpretation of his framework. The approach that perceives Marx and Smith are at two

different extremes regarding exploitation and that it is necessary to be at one of these extremes is an incomplete reading of Smith and is incorrect (Fairlamb, 1996). Smith is aware of both the structural advantages of capital and the weakness of labor's position, arguing that wages could occasionally fall below the natural rate. He also emphasizes the existence of monopolistic structures and masters' ability to take certain actions to reduce wages (Smith, 1776).

John Bates Clark is known for his marginal productivity theory of distribution, which states that each agent of production should receive wealth equal to that of his creations, governed by a natural law. This theory suggests that if the law operates without friction, income distribution will be fair and optimal. As in Pigou's emphasis on unfairness in his earlier conceptualization, Clark believed that wages equal to the marginal product were socially best and just. Therefore, he argued that any wage lower than the marginal product was socially inferior and unfair to workers (Leonard, 2003).

Marshall also acknowledges the existence of unfair wages but he claims that free competition would provide a solution to this problem in the long run, thus arguing against state intervention. Regarding this aspect, Pigou's perspective differs from that of Marshall's. While Marshall argues that wages will convert to competitive wages in the long run, and that improvements in education are key to enhancing the bargaining power of workers, Pigou defends the importance of redistributive policies such as minimum wages and unions (Flatau, 1997).

Pigou, by diverging from his predecessors, who accept the disadvantages of workers within the bargaining process and the existence of 'unfair wages', defines the disadvantages and inequality in the bargaining process and demonstrates its effects. Pigou defines two types of unfair wages. The first one is the gap between the marginal products of the same worker in different jobs, occupations and geographies. This gap generates an unfairness, as a result of workers' ignorance and immobility. The second type of unfair wages is the gap between the marginal product of labor and the wage of the worker which arises from the monopolistic elements within the bargaining process between workers and employers. While the first one does not imply exploitation, Pigou bases his understanding

of exploitation on the second type of unfair wages, thus introducing it into neoclassical theory (Daniel, 1990).

Neoclassical exploitation theory is often called Pigouvian Exploitation. Some studies refer to it as Neoclassical Exploitation or Pigou-Robinson Exploitation. Pigou develops his understanding of neoclassical exploitation in his early, pre-war writings. In his early work which was published in 1905, *Principles and Methods of Industrial Peace*, by expanding upon the Marshallian theory of wages through the introduction of the bargaining between employees and employers, Pigou argues that wages are determined within a band of indeterminacy where free competition does not exist (Pigou, 2023). Pigou defines a 'settlement locus', which explains the range of wages where the employees and employer will bargain in between the labor demand and labor supply. Then he defines 'range of practicable bargains' (or the arbitration locus), which redefines the settlement locus with the actions of the employees and employers by considering the costs and possible outcomes of these actions (Pigou, 2023).

In his work, *The Economics of Welfare*, Pigou defines exploitation as a phenomenon that exists when the workers earn less than their marginal net products (Pigou, 1920). Therefore, the rate of exploitation is determined within the range of indeterminacy (or, contract zone) with respect to the balance between the bargaining powers of employees and employers (Persky & Tsang, 1974).

Another important economist writing on the subject of exploitation and wages, Hicks, shows the effect of technology and substitution between factors on wages, although he doesn't make an analytical contribution to Pigou's analysis. Hicks differs from Pigou and Robinson by arguing that exploitation is not a big problem for employees in his relatively dynamic analytical approach that focuses on expectations, time and uncertainty (Flatau, 2002). In the 1963 edition of his book, Hicks explains the shortcomings of his approach as follows, emphasizing the break in the development of economic thought in the period when *The Theory of Wages* was published:

1932 was not a lucky date for the appearance of a book like this. It was the blackest year of the Great Depression; there has been no date in this century to which the theory that I was putting out could have been more inappropriate. That would not have mattered so much (for I had no pretensions to be writing a tract for the times) if it had not been that economic theory was at that very time undergoing a revolution -a revolution of which, at the time when I was writing, I was completely unconscious. Already, in the next year, came Mrs. Robinson's *Economics of Imperfect Competition*; three years later, Keynes's *General Theory*. So, soon after its birth, *The Theory of Wages* began to look like the last gasp of an ancient regime. (Hicks, 1963, p.305)

After Pigou (or maybe, with), the most important scholar within the neoclassical exploitation theory is Joan Robinson. Although she largely adheres to Pigou's analysis, in her seminal work, *The Economics of Imperfect Competition*, Robinson developed a more analytical framework (Flatau, 2001). Robinson, who emphasized the monopoly in the products market and monopsony in the labor markets in her analysis, argues that exploitation comes from the lack of the perfect elasticity of labor markets. Different from Pigou, who emphasized the bargaining power in his analysis, Robinson focused on the market structures that would affect the bargaining powers of both employees and employers. In other words, she emphasized the concept of imperfection, which is also in the title of her study (Robinson, 1933, 1969).

The differences between the analysis of Pigou and Robinson can be summarized in three main points. The first one is, contrary to Pigou, by using the analytical neoclassical framework, Robinson shows the variety of markets by applying the profit maximizing firm model. Secondly, while Pigou mentions the importance of bargaining power and elasticities of labor demand and supply, he does not present an analytical solution about the degree of monopsony. He mostly uses graphs and descriptive language in his work and puts the analytical analysis in appendices. However, Robinson proposes a deterministic analytic solution for the degree of exploitation in her study. The last difference is, as Robinson analyzes market imperfections as a whole, both in terms of monopoly and monopsony, she argues that both product market and factor market imperfections can lead to exploitation. In this context, policy implications offered by Pigou and Robinson differ from each other. While Pigou's main focus is on interventions such as minimum wages and trade unions to increase the bargaining power of workers,

Robinson directly critiques imperfect market structures and argues that increasing minimum wages would not eradicate the exploitation of workers (Flatau, 2001).

As a criticism of the focus on the exploitation of labor, Chamberlin argues that, for each factor of production, firms have to pay less than their marginal products to avoid bankruptcy. Therefore, highlighting labor exploitation cannot be justified as exploitation is almost universal for all factors of production (Bloom, 1941; Spector, 2018). In a letter to Kaldor, Robinson claims that Chamberlin's trouble was his concern to find anti-laissez-faire implications in his analysis (Flatau, 2001).

1.1.1. Neoclassical Exploitation and Wage-Productivity Gap

In terms of the applied studies, the concept of Pigouvian exploitation is mostly discussed within the concept of wage-productivity gap in the literature. In this literature, some studies use the term Pigouvian exploitation or neoclassical exploitation, and some others only use the wage-productivity gap and do not conceptualize the issue within the theoretical background that Pigou and Robinson framed. Hereafter, concepts of Pigouvian exploitation, neoclassical exploitation and wage-productivity gap will be used interchangeably.

Some of the studies on the wage-productivity gap have focused on the impact of various factors. While some studies directly explain the wage-productivity gap, others include productivity as a part of the analysis and focus on whether the differences in these factors can explain the differences in wages. Another part of the literature focuses on certain factors in the same way but mainly addresses the dynamics of wage-productivity gap historically, especially by analyzing the post-World War II period. The period from 1950 to 1970 saw wages and productivity rise together, but starting in the 1970s, a divergence emerged where wages stagnated while productivity continued to increase, a phenomenon which has been extensively studied.

Many factors influence the wage-productivity gap. Although some factors do not always produce the same results in different times and places, some factors remain explanatory

under different conditions. These factors can be listed as worker characteristics, industry and firm characteristics, levels of bargaining power, unemployment and legislative structure in labor markets.

Within the worker characteristics that effect the wage-productivity gap, there are studies mostly about the age, gender and education level of workers. In their analysis on worker characteristics and the wage-productivity gap, Ilmakunnas and Maliranta, found that the wage-productivity gap was larger for jobs with low technical education and non-technical education compared to workers with the highest technical education. Additionally, their analysis showed that the wage-productivity gap increases as age increases due to the decline in labor productivity in higher ages and the increase in wages due to the seniority effect (Ilmakunnas & Maliranta, 2005). In line with Ilmakunnas and Maliranta, Hellerstein and Neumark, showed a decline in productivity compared to the wages of older workers by using the firm-level data of Israel (Hellerstein & Neumark, 1995). Crépon et al. (2003) have found that relatively younger workers are underpaid, and relatively older workers are overpaid in France by using the matched employer-employee longitudinal dataset. Also, they claimed that there is no or little wage discrimination by gender (Crépon et al., 2003). In another study, Hellerstein and Neumark showed that women in Israel work in relatively less productive jobs and receive lower wages and claimed that there is no discrimination (Hellerstein et al., 1999). In line with these results, Bartolucci claimed that the wage gap between male and female workers is mostly about productivity differentials. By exploiting the German matched employer-employee data, Bartolucci argued that female workers are less productive, more mobile and have a lower level of bargaining power on average than their male counterparts (Bartolucci, 2013). However, in the literature, many studies are arguing the opposite. In line with Bartolucci's argument about the bargaining power of female workers, by differentiating from his results, Card et al. have argued the differences in terms of sorting and bargaining power explain the gap between male and female workers (Card et al., 2016). Sin et al. argued that the difference between the productivity levels of male and female workers explains an extremely small portion of this gap by using the linked employer-employee data of New Zealand (Sin et al., 2022). In another analysis, by using the term neoclassical exploitation, Pirpour showed that female workers are more exploited than male workers

in Singapore (Pirpour, 2020). In their analysis, by employing Belgian linked employer-employee panel data, Rycx et al. (2015) have found that education both increases wages and productivity. However, the effect of education on productivity is bigger than the effect on wages. This gap is bigger among the women and younger workers (Rycx et al., 2015). By using the Norwegian matched plant-worker data set, Hægeland and Klette (1999) concluded that women with the same experience and education receive lower wages than men in line with their productivity. They stated that the difference between male and female employees cannot be explained only by productivity. Although there is a positive relationship between education, wages and productivity, the authors emphasized that the effects of the education level on productivity may not always be reflected in wages. They found that experience has positive effects on productivity, but these are not fully reflected in wages (Hægeland & Klette, 1999).

Characteristics of firms and industries are stated as another factor affecting the wage-productivity gap. Krueger and Summers (1988) argue that intersectoral wage differences vary significantly among workers with the same skill set. Workers employed in high-profit sectors receive higher wages than those working in low-profit sectors with similar characteristics. The authors claim that this difference cannot be fully explained by productivity differences and argue that efficiency wage behavior explains the wage difference between sectors (Krueger & Summers, 1988). In their study on French data, Abowd et al. argue that personal characteristics (such as skills, and experience) are the main source of wage differences and are more decisive than firm and industry factors. They concluded that firms that employ high-wage workers are more productive, while firms that pay high wages are generally more productive and more profitable. Even if there is a positive relationship between firm size and wages, the authors argue that this is due to worker characteristics (Abowd et al., 1999). Das et al. (2017) analyzed the Indian manufacturing industries and they found that the relationship between wages and productivity is heterogeneous across industries. They found that while there was a positive relationship between wages and productivity in a small number of industries, this relationship was not significant overall (Das et al., 2017).

Another determinant of the wage-productivity gap which is mentioned in the studies on the bargaining power of the workers is mostly analyzed together with unemployment, unionization, and labor market legislation. These factors significantly affect workers' bargaining power. In their seminal article on the measurement of Pigouvian exploitation, Persky and Tsang (1974) found that union power significantly affects the level of exploitation. Also, they argued unemployment, inflation, government controls, and capital stock growth tend to increase exploitation at the macroeconomic level (Persky & Tsang, 1974). In their econometric analysis, Elgin and Kuzubaş (2012) found a strong relationship between the wage-productivity gap and unemployment in Turkey in the period between 1950 and 2009. The authors, who examined the economic mechanisms behind this relationship with a search model that includes endogenous bargaining, concluded that the bargaining power of workers determines the gap (Elgin & Kuzubaş, 2012). In their other study about the issue, the authors also found a positive relationship between the wage-productivity gap and unemployment and a negative relationship between unionization in their analysis on OECD countries for the period between 1960 and 2009 (Elgin & Kuzubaş, 2012). López-Villavicencio and Silva (2011), analyzed OECD countries in the period 1985-2007 and observed differences between countries with low and high employment protection legislation. While they found a positive relationship between unemployment and the wage-productivity gap in countries with low employment protection legislation, they did not find a significant relationship in countries with high employment protection legislation. The authors, who found a positive relationship between the increase in temporary contracts and the wage-productivity gap, claimed that the increasing wage-productivity gap in recent decades is associated with the relaxation of employment protection legislation (López-Villavicencio & Silva, 2011). Millea (2002) analyzed several developed economies and found that when union representation exceeds 25%, the conventional wage determination dynamics (equality of real wages and marginal productivity of labor) tend to occur. The conventional relationship between wages and productivity is not observed in the United States, where union representation is below 25%. The author claims that labor's ability to get its share of the productivity increase depends on the bargaining power of workers through unions (Millea, 2002). Tilli and Rollin (2017) examined institutional factors such as taxation, labor market policies, labor and good market regulations, and the role of unions in wage

bargaining for 14 OECD countries between 1983 and 2003. They showed that tax wedge reduction, union density and employment protection for temporary workers reduce the wage-productivity gap (Tilli & Rollin, 2017).

Although there are studies on the wage-productivity gap in the literature dealing with different periods and places¹, most of the studies deal with the period after the Second World War or more specifically the period after the 1970s. While the period between 1950 and the mid-1970s, known as the golden age of capitalism, is generally considered a period in which wages and the real wage of labor increased, and compensations and productivity moved together. Starting from the 1970s, this co-movement turned into a separation. While productivity levels continued to rise, with an interruption in the 1970s, wages increased slowly or stagnated and this phenomenon is called ‘the great decoupling’ or ‘wage stagnation’ (Brynjolfsson & McAfee, 2013; Škare & Škare, 2017).

Dramatic changes in policy making and the structure of capitalism after the 1970s crisis put pressure on wages. With the wave of globalization, as capital flows to countries where labor is cheaper, the decline in demand for labor in high income countries puts pressure on earnings. In addition, the bargaining power of labor has declined over time with the decline of pro-labor policies and institutions (Paternesi Meloni & Stirati, 2023). In this process, the bargaining power of workers, especially the lower and middle classes was eroded in favor of employers, and the reflection of productivity increases on wages was interrupted, especially for these groups (Bivens et al., 2014).

Some explanations emphasize the shift in production technologies. Although Brynjolfsson and McAfee do not ignore the importance of changes in policies and globalization (offshoring) in their studies, they explain the divergence of the wage-productivity gap in this period with technological developments. They claim that the improvements in technology, in terms of both becoming cheaper and being capable of

¹ One of the most important studies about the wage productivity gap which analyzes the 19th century rather than these second-half of the 20th century is Robert Allen’s study on the effects of the industrial revolution in the British economy. Allen shows that the existence of a divergence between the productivity and wages from 1760 to the middle of the 19th century (Allen, 2009).

increasing the number of tasks that human workers do, have stagnated wages and wages suffered more than the job growth rates (Brynjolfsson & McAfee, 2013).

1.2. MONOPSONY

Monopsony generates an imbalance in the bargaining power between firms and workers and introduces imperfections in the labor market. This, in turn, impacts various labor market dynamics and increases the level of worker exploitation.

As mentioned in the previous chapter, the bargaining power of employers and firms has been discussed by some previously mentioned economists. The imbalance between employers and employees in terms of their power and opportunities was not new. However, it took time to grasp this phenomenon theoretically.

The concept of monopsony was coined by Joan Robinson (Robinson, 1969, p. 215). To complement the term for an individual seller, monopoly, Robinson has defined monopsony as the case of an individual buyer in the market. In the most basic sense, monopsony can be defined as the case of a single buyer who confronts numerous sellers. In the perfect competition case, a buyer confronts a perfectly elastic supply of goods (in this case factors of production, especially labor). However, in the case of monopsony, there is a lack of perfect elasticity. A monopsony has the power of setting the price of the good with this monopsony power. As this study will focus on labor markets (also as a huge part of the literature did), from here on the good is the workers in the economy and the price is the wage which is paid to these workers.

Similar to monopolistic competition, the concept of monopsony has widened to recall the cases with multiple firms that have monopsony power and called “oligopsony” or “monopsonistic competition”. In the relatively recent part of the literature, monopsony started to be used as a general perception of the monopsony power of a single firm within a market that includes many firms, rather than a single buyer firm in the industry (Manning, 2005). Similar to the one buyer case, if a firm’s labor supply elasticity is not

perfect (so a decline in offered wages results in a small change in the labor supply), the firm has a certain level of monopsony power.

Quantifying monopsony power requires understanding the labor supply elasticity that firms face. To measure the monopsony power of a single firm by looking at its labor supply elasticity is a popular approach in the literature. Although there are different thresholds and percentage values, one common method of measurement is calculating the percentage degrees in the number of workers who want to work in the firm when the firm decreases the wage level by 10% (Araki et al., 2022). Insightful approaches for various sectors and occupations have also been developed through concentration rates. Market concentration indices, especially the Herfindahl-Hirschman Index, are widely used to calculate concentration in labor markets (Araki et al., 2022). Another method is to compare wages and marginal product of labor (Langella & Manning, 2021). Considering the model structure explained below, this method will be the most relevant for this study.

1.2.1. Reasons for Monopsony

As a deviation from perfection (perfect competition between firms), monopsony represents an imperfection in labor markets. As mentioned above, when the concept of monopsony has widened and it started to define more than a single buyer firm, there is a necessity to widen the reasons for monopsony further than the reasons of the single buyer firm case. Labor markets can include some frictions and the level of these frictions can vary within a spectrum the variety of these frictions determines the level of monopsony power of firms within a market.

One reason for the monopsony power is the geographical and regional features of the economy. For example, as mentioned above, the existence of a single or fewer number of firms within a region in the specified sector, the firm or firms will have monopsony power. This case can be an example of a single buyer conception of monopsony and a more modern perception of monopsony which includes many firms.

In that sense, to grasp the concept of monopsony in a modern sense, the reasons need to be considered beyond unique cases of classical monopoly and monopsony such as the single firm's case. Therefore, some other reasons for monopsony need to be analyzed to understand the concept beyond the perception provided by the cases with one or fewer firms within an industry or a region.

As Manning mentioned at the very beginning of his seminal book, workers' lack of knowledge is an important reason for the monopsony power of firms. Manning argues that the workers are ignorant about the conditions in the labor markets and their position in it (Manning, 2005). Manning uses the term ignorance in reference to John Robinson, who argues that ignorance prevents some workers from changing their workplace (Robinson, 1933, p. 296). This ignorance or incomplete information creates friction in the market as workers are not fully informed about existing opportunities in other firms. Also, they do not know all the available job openings and vacancies that suit their skills and capabilities. Because of these dynamics in terms of labor supply workers will respond to wage changes slowly and this condition will provide a monopsony power to the firm that the workers are employed (Manning, 2011).

Heterogeneous preferences of workers can be another reason for the monopsony power of the firms. Many jobs exist with some non-wage characteristics and these characteristics may prevent workers from changing their current jobs and shift other firms that will pay them a higher wage. These non-wage characteristics can be exemplified in many ways such as the working time, location of the firm and transportation costs, social and professional environment within the firm, assigned tasks to the worker, some amenities provided by the firm, and career plans of employees (Bhaskar et al., 2002). These non-wage characteristics can be widened by including some other elements of the working conditions and their personal life which need to be compatible with their job's non-wage characteristics.

Another reason that generates monopsony power for the firm is the cost of changing jobs for workers. Changing jobs also causes some costs to employers in terms of the cost of finding a new worker who has the required skill set and necessary training. For the

workers, finding a firm that is a substitute for the current firm, or a firm that provides better opportunities in terms of wage and non-wage characteristics takes time and possibly money. Also, after finding a suitable job position in the market, changing jobs can have some monetary and social costs (Manning, 2005; Ransom, 2022). If a risk averse worker is not fully informed about the working conditions in the firm that he or she can start to work, the worker may not shift from the current firm to the other firm even if the characteristics (which are known by the worker) of the second firm is better. These dynamics pull the market structure away from perfection and provide monopsony power to firms.

All of the reasons for monopsony that are mentioned above (except the first one which is about the geographical and sectoral context of the monopsony) involve worker-related issues that generate an imperfection in the labor markets. For these reasons, imperfections and monopsony power of firms increase as a result of unintended consequences of behaviours of the workers who act with some limited information and social and economic constraints. However, to fully grasp the imperfections in the labor market, it is essential to consider employers' actions that intentionally generate or enhance the imperfections and monopsony power.

One of these actions is the non-compete agreements which prevent workers from leaving their jobs and working for another firm that competes with the firm they left. Although these agreements are generally considered necessary to protect firms' trade secrets and provide firms with the opportunity to compensate for the training costs of workers, they largely restrict worker mobility and provide firms with monopsony power (Marx et al., 2009).

Similar to the non-compete agreements, non-poaching agreements between firms that prevent firms from hiring former workers of the other firm generate a monopsony power to firms (Krueger & Ashenfelter, 2022). These agreements may or not have a legal background and the legal basis for these can vary from country to country (or state to state within federal systems) but their effects generate imperfections in the labor market.

As non-poaching agreements can be an example, labor market collusions may introduce extra bargaining power to firms. Firms can increase the share of the rent from production by illegal applications of labor market collusions, such as agreeing on lower wages than the competitive market equilibrium wage.

As an action taken by firms, mergers can increase the monopsony power by increasing the concentration in the market. Similar to firms that collude without merging, merged firms can have the market power to reduce employment and lower wages. However, unlike colluding firms, they take action within the legal framework (Marinescu & Hovenkamp, 2018).

1.2.2. Related Literature on Monopsony, Minimum Wages, and Exploitation

Policies regarding labor market monopsony may focus on different aims and aspects in these markets. The aim of a policy can be directly decreasing or eliminating the monopsony power of firms by targeting the different reasons behind the monopsony power, or it can be aimed at decreasing the negative effects of the monopsony power of firms.

Policies that aim to decrease or eliminate the monopsony power of firms can target different aspects of the reasons behind the monopsony. For instance, to address the challenges that workers face, governments can implement some policies to decrease the costs in the job search and change processes to achieve a decrease in the frictions that affect labor mobility. On the other hand, to decrease the wage suppression resulting from firms' monopsony power, governments can provide new legislation and subsidies for unionization (Naidu & Posner, 2022).

On the firms' side, governments can implement (or increase) some penalties and antitrust policies both for the legal and illegal actions that cause a concentration in labor markets to decrease the monopsony power of firms. By implementing policies that decrease imperfections and frictions in the markets, the government can regulate the concentration, and supply elasticities in the market and decrease or eliminate the monopsony powers of

the firms. There could be limits to the effectiveness of these policies. However, these policies directly target the reasons behind the problem in the labor markets (Naidu & Posner, 2022).

Rather than decreasing or eliminating the monopsony power of firms in labor markets, some policies may aim to decrease the negative effects of it. These policies can be exemplified as wage subsidies, mandatory benefits, and minimum wages. These policies may be successful in regulating the redistribution of income, but they do not target the root of the problem. Also, in most cases these policies do not affect all of the workers in the economy, as most of them are designed to improve the conditions of the low wage or underprivileged workers. Subsidies and mandatory benefits (and some other policies) may affect a higher or lower number of workers, depending on the changing laws and legislation. However, minimum wage affects some workers which depends on the wage distribution in the economy.

Minimum wage is generally considered as a policy to resolve the income inequality problem, especially at the bottom of the distribution (Dube, 2019). Literature on minimum wages mostly focuses on the effects of it on employment. In literature, especially in the studies that built on the assumption of competitive labor markets minimum wage harms employment. However, studies on minimum wages that began in the 1990s shook the relative consensus in the literature regarding the effects of minimum wages on employment (Brown, 1999). A famous example is Card and Krueger's analysis on fast food restaurants in the state of New Jersey, which evaluates the effects of the increase in the minimum wage in 1992 and finds that there is no evidence of any negative effects of this increase on the employment in the fast-food restaurants (Card & Krueger, 2000). Especially after this extremely influential study, there has been a dramatic increase in the number of empirical studies that demonstrate that the negative effects of minimum wage on employment are either small or nonexistent (Schmitt, 2015).

During this period, the explanatory power of the concept of monopsony was employed in different ways to explain the effects of minimum wage policies, by combining it with various frameworks, especially search and efficiency wage models (Brown, 1999).

Similar to the literature built on the assumption of perfect competition in labor markets, studies on monopsony and the minimum wage have also focused on the employment effects of the minimum wage. A framework based on monopsony rather than perfect competition can provide analytical explanations to demonstrate that the minimum wage does not have to cause negative effects on employment.

According to Manning, the new wave of minimum wage research which started in the 1990s largely consists of empirical analyses, but the concept of monopsony provides a theoretical argument that the potential negative effects of the minimum wage may not be realized (Manning, 2021). Considering the existence of the conditions mentioned above that lead to monopsony (in line with the fact that these conditions distort perfect competition), monopsony becomes an essential framework for understanding labor markets and policy implications, especially the minimum wage.

As Manning argued, in the real-world scenario, employment tends to be lower in the case of monopsony with unrestricted equilibrium compared to the competitive environment. This is mainly because the curve representing the marginal cost of labor is above the supply curve and also steeper than it. When there are moderate levels of minimum wages, these effectively push the marginal cost curve downwards and make it flatter. As a result, this leads to higher employment than observed in unconstrained equilibrium, and employment becomes more sensitive to fluctuations in labor demand (Manning, 2005).

There are few studies in the literature that explicitly approach the effect of minimum wage on exploitation. Ashenfelter et al. (2010) emphasize that institutional mechanisms that increase wages (e.g. minimum wage or unions) can narrow the gap between workers' marginal productivity and wages. The authors argue that these mechanisms will not cause negative employment effects in the presence of monopsony, as mentioned in the literature on the employment impact of the minimum wage (Ashenfelter et al., 2010). Similarly, Popp (2023) claims that a minimum wage policy will increase wages and employment and reduce exploitation in concentrated labor markets (Popp, 2023).

Even though the concept of exploitation (wage productivity gap or as wage markdown, which is increasingly used in the literature) implicitly exists in the monopsony literature, the framework of analysis is mostly not shaped around exploitation. This study aims to contribute to the literature within this framework.

1.3. SEGMENTED LABOR MARKETS

Segmented Labor Market (SLM) theory proposes that labor markets are inherently divided into distinct segments, each characterized by different wage structures, employment conditions, and mobility barriers. This theory emerged as a critique of the neoclassical perspective, which assumed a homogeneous and competitive labor market in which wages and employment were determined solely by supply and demand dynamics. The development of SLM theory stemmed from the need to address persistent labor market inequalities and understand the structural factors that influence labor market outcomes.

1.3.1. Origins of Segmented Labor Market Theory

The origins of segmented labor market (SLM) theory date back to J.S. Mill and J.E. Cairnes. These thinkers opposed Adam Smith's ideas regarding the division of labor and the determination of wages (Leontaridi, 1998). Smith proposed that wages would be balanced according to the advantages and disadvantages of different employments in the same place, considering factors such as suitability of work, ease of learning, and continuity of employment. However, Mill and Cairnes offered a more critical perspective. Mill emphasized the role of custom and law in regulating wages and employment, arguing that the most strenuous and unattractive jobs were often the worst paid because they were held by those who had no choice. Cairnes expanded on this theme by emphasizing the existence of non-competitive industrial groups in which social conditions prevented effective competition between different labor groups (Leontaridi, 1998).

As in the reasoning of the economists who proposed imperfections that cause monopsony, Pigou emphasized the importance of workers' mobility in segmentation. Pigou stated that

segmentation in the labor market is caused not only by differences in skills, experience and competence, but also by the limited mobility of labor between and within industries. According to Pigou, there are centers of production and workers are not mobile enough between these centers. As a historical accident, workers are in certain centers and are connected to these centers. For this reason, a segmentation occurs in labor markets (Leontaridi, 1998).

SLM theory became popular in the 1960s and 1970s with the contributions of economists such as Doeringer and Piore, who introduced the dual labor market concept. They distinguished between the primary labor market, which offers stable, well-paid jobs with opportunities for advancement, and the secondary labor market, which is characterized by low-paying, unstable jobs with limited prospects. This dual market framework highlighted the limitations of the neoclassical approach and emphasized the role of institutional and structural factors in shaping labor market dynamics (Doeringer & Piore, 1985).

The theory was further developed with the contributions of radical economists such as Reich, Gordon and Edwards (1973), who took a more critical perspective on labor market segmentation. They argued that labor market divisions are not merely economic phenomena but are also deeply rooted in social structures and power relations, such as those based on race, gender, and class (Reich et al., 1973). This perspective expanded the analytical scope of SLM theory by connecting labor market outcomes to broader socioeconomic processes.

Ben Fine (1998) observed that over time SLM theory has become increasingly integrated into mainstream labor market theory, influenced by neoclassical concepts such as effective wages and insider-outsider models. According to Fine, while this integration helps recognize the role of market imperfections and information asymmetries in creating SLMs, it also dilutes some radical elements of the original SLM theory. He emphasized the importance of understanding labor markets from a disaggregated perspective, recognizing the different structures and dynamics in different segments, and the need for

a more structured theoretical approach to fully explain labor market segmentation (Fine, 1998).

1.3.2. SLMs and Labor Market Policies

Labor market segmentation can result from various factors. Structural characteristics and socio-economic processes often play an important role. Factors such as firm size, capital intensity, unionization and the education level of the workforce can significantly affect labor market structures. For example, large firms with high capital intensity and strong union presence tend to contribute to segmentation by offering better wages and job security. Additionally, social factors such as race and gender discrimination can perpetuate segmentation by creating barriers to entry for certain groups. These socio-economic variables interact to create complex labor market structures that go beyond simple dichotomies, highlighting the multifaceted nature of labor market segmentation (Leontaridi, 1998).

One of the distinctions addressed by SLM theory is the distinction between formal and informal labor markets. This duality addresses segmentation in labor markets, where formal sectors are regulated and often provide better job security, benefits and working conditions. In contrast, the informal sector is characterized by unregulated, insecure and often low-paid work (Leontaridi, 1998).

The existence of the informal sector as a segment in the labor markets has significant effects, especially on the policy effectiveness. Research on firms' transitions and choices between informality and formality underscores the important role of regulatory frameworks and economic incentives in shaping these decisions. Ulyssea (2010) develops a two-sector matching model that shows how reducing the costs of entry into the formal sector can significantly reduce informality and improve labor market performance in Brazil. Increasing enforcement significantly reduces informality but has high negative effects on unemployment and welfare. High entry costs and strict labor regulations are the main factors that lead firms to informality. The author argues that policy measures aimed at reducing these barriers can support formal sector growth (Ulyssea, 2010).

Agenor and Aizenman (1999) analyze the effects of fiscal and labor market policies in economies with SLMs. They claim that a sustained decline in government spending on non-tradable goods leads over time to a depreciation of the real exchange rate, a decline in market-clearing wages for unskilled labor, an increase in the production of tradable goods, and a decrease in the net stock of foreign assets. Their findings suggest that lowering minimum wages would expand the formal sector and show how labor market segmentation and informality are closely linked to macroeconomic policy decisions and have significant impacts on both wages and employment dynamics (Agénor & Aizenman, 1999).

Ferrero and Hisgen (2021) investigate geographical heterogeneities in labor markets in Argentina. They argue that local labor market conditions and levels of informality significantly influence the impact of minimum wage policies and that effective labor market policies should take regional differences into account (Ferrero & Hisgen, 2021).

In his analysis on Brazil, Parente (2024) argues that the minimum wage increases triggers informality and, as an unintended consequence, negatively affect income distribution. While he states that formal enforcement is insufficient to balance the increasing inequality with minimum wage, Parente argues that the improvement in skill composition significantly reduces informality (Parente, 2024).

Herrero Olarte (2021) examines the impact of minimum wage increases on poverty reduction in Ecuador, highlighting the role of informality. The study finds that minimum wage increases can positively impact low-income group, but their impact on poverty reduction is moderated by high levels of informality. This situation reveals that minimum wage policies alone are insufficient to deal with poverty and inequality (Herrero Olarte, 2021).

Saraçoğlu (2017) develops a dynamic model of a multi-sectoral economy with an informal sector and SLMs to analyze the impact of various labor market policies. The findings show that the share of informal employment increases with an increase in the minimum wage and decreases with a decrease in payroll taxes. In addition, reducing taxes

on employers is more effective in reducing the share of informal employment, while reducing taxes on employees is more effective in increasing consumer welfare (Saracoğlu, 2017).

Khamis (2013) examines the impact of labor legislation in developing countries on both formal and informal labor markets, focusing on the minimum wage. Using quasi-experiments and geographic differences in minimum wage changes, the study finds that informal workers without social security contributions experienced significant wage increases following minimum wage increases, but formal workers did not. This shows that non-compliance with social security contributions does not mean non-compliance with minimum wage laws. The findings highlight that the impact of minimum wage changes is stronger on the informal sector compared to the formal sector (Khamis, 2013).

The literature shows that informality profoundly affects the effectiveness of labor market policies, especially minimum wage policies. While firms' preferences towards informality are driven by regulatory and economic factors, minimum wage increases, although they may be beneficial for wage growth, often further increase informality. Overcoming these challenges requires a comprehensive approach where policies are implemented in a complementary manner.

CHAPTER 2

MODEL

This section presents a simple (one-sector) and static bargaining model with heterogeneous firms and workers. All firms produce the single all purpose commodity. They all have access to the same linear technology (constant returns to scale), but they have different productivity levels. All workers supply labor and they differ in their valuations of outside options. There is one-time randomized matching between workers and firms. Once the matching is completed, all firms enter into a multilateral wage bargaining with all of the matched workers. In the model, as there is one-time matching between workers and firms, and both parties enter the bargaining process with a certain bargaining power, both firms and workers have a certain market power.

Each firm chooses between being formal or informal, depending on the matching and bargaining processes and some variables which will be explained in the next section. If a firm is at a profit level below zero, it will shut down and the workers matched with the firm will not participate in the labor force. After all these calculations, the model will present results on wage distribution, number of exploited workers and exploitation distribution, and informality.

2.1. TIMING AND DEFINITIONS

In the model, the number of firms is $N_f > 0$ and the number of workers is $N_w > 0$. To be specific, suppose that $N_w > N_f$ because, even in an economy where very small firms are concentrated, the number of workers per firm will be greater than 1 on average.

Each firm, $i \in \{1, 2, \dots, N_f\}$, randomly draws a productivity level $x_i > 0$ from a continuous and stationary Pareto distribution with bounded support and a firm size $\ell_i > 0$ from a continuous and stationary distribution with bounded support which created as a mixture of lognormal and Pareto distributions.

Each worker $j \in \{1, 2, \dots, N_w\}$ randomly draws a valuation $v_j > 0$ from a continuous, stationary lognormal distribution with bounded support. Valuation refers to the threat point in the bargaining problem. Although this value represents the lowest wage that workers will accept to work for, it can be expanded to suit different contexts. Valuation can also be thought of as the unemployment benefit or leisure option that workers will receive. At the same time, non-wage income (unlike unemployment benefits) can also be considered as part of the valuation in a way that shows heterogeneity among workers. Although it can be generally considered as reservation wage or outside option, the choice to work which depends on the valuation can be expanded to be affected by different components of human capital, especially education and skills.

Firms and workers are matched randomly, resulting in a distribution of workers across firms. In this matching process, each firm matches with ℓ_i workers according to index order. While the first firm matches with the first ℓ_1 workers, the second firm matches the workers whose index numbers are from $\ell_1 + 1$ to ℓ_2 and so on. The number of workers matched by firm i denoted by $\ell_i > 0$.

Let $\underline{w} > 0$ denote the exogenously given minimum wage. An informal firm offers a contract to each worker such that the wage offered to worker j is any positive number not restricted by the minimum wage, $w_{ij} > 0$. A formal firm offers two types of contracts. If worker j 's valuation is lower than the minimum wage, this worker is offered a contract with the minimum wage. If worker j 's valuation is higher than the minimum wage, then this worker enters wage bargaining to obtain a wage level higher than the exogenous minimum wage, $w_{ij} > \underline{w} > 0$.

Each firm ranks its matched workers in terms of their valuation levels, v_j 's, and then each firm makes all calculations and predictions for its ex post profit and determines whether to become a formal or an informal firm according to their productivity level and threshold which depends on the minimum wage, anti-informality policies and the composition of the matched workers. If the firm has a negative profit, it will shut down and the workers matched with the firm will not participate in the labor force.

As a result of these processes, depending on the choice of firms to be formal or informal and the bargaining process, the wage distribution, the level of informality, the number of exploited workers and the distribution of exploitation will be predicted by the model.

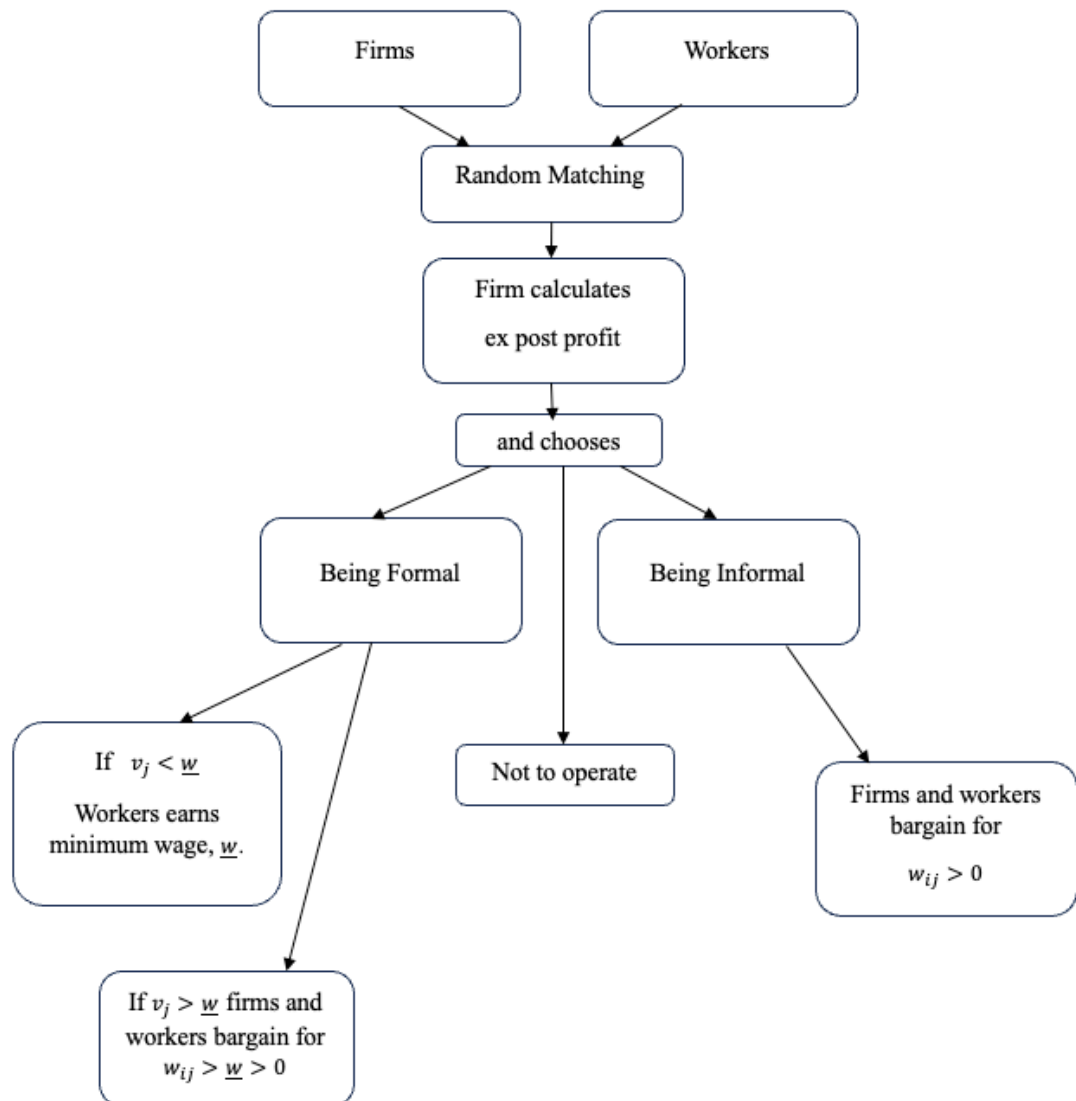


Figure 2: Flowchart of the Model

2.2. BARGAINING PROBLEM

2.2.1. Setup

The bargaining problem needs to be defined analytically. The bargaining process for wages is defined as a multilateral, noncooperative, asymmetric Nash bargaining for each worker and firm matched (Osborne & Rubinstein, 1990). Firm i and a number ℓ_i of randomly arrived workers bargain for a wage profile $\{w_{ij}\}_j$. In the model, as all of the firms have constant returns to scale as technology which comes from the distribution of productivity level and means that that firm i enters the market if the profit per worker is strictly positive.

The bargaining power of firm i is exogenous and equal to $(1 - \beta_i) \in (0,1)$ and bargaining power of worker j when s/he is bargaining with firm i is $\beta_{ij} \in (0,1)$ with

$$\sum_j \beta_{ij} = \beta_i \quad (2.1)$$

In the model, it is assumed that when the firm size gets higher, the bargaining power of an individual worker will fall. By showing the relationship described above in a different way,

$$\beta_{ij} = \frac{\beta_i}{\ell_i} \quad (2.2)$$

2.2.2. Solution

Where workers and firms aim to maximize their earnings, the bargaining problem and its solution can be written as follows.

$$\max_{\{w_{ij}\}} (1 - \beta_i) \ln \left(y_i - \sum_j w_{ij} \right) + \sum_j \beta_{ij} \ln(w_{ij} - v_j) \quad (2.3)$$

$$\pi_i = y_i - \sum_j w_{ij} \quad (2.4)$$

$$\frac{w_{ij} - v_j}{\beta_{ij}} = \frac{\pi_i}{1 - \beta_i} \quad (2.5)$$

$$w_{ij} = \beta_{ij} \left(y_i - \sum_j v_j \right) + v_j \quad (2.6)$$

$$\pi_i = (1 - \beta_i) \left(y_i - \sum_j v_j \right) \quad (2.7)$$

To define the wages and profits the average valuation $\bar{v}_i > 0$ of matched workers are necessary as in

$$\bar{v}_i \equiv \frac{1}{\ell_i} \sum_j v_j(i) \quad (2.8)$$

Profits are rewritten as follows, if the per worker productivity is bigger than the average valuation, the profit of the individual firm will be positive.

$$\pi_i = (1 - \beta_i)(x_i - \bar{v}_i)\ell_i, \quad x_i > \bar{v}_i \Rightarrow \pi_i > 0 \quad (2.9)$$

Similarly, as wages are defined as follows, if per worker productivity is bigger than the average valuation for an individual firm the workers matched with that firm will earn higher wages than their valuation as they are earning a portion of the gap between per

worker productivity and average valuation within the firm according to their bargaining power.

$$w_{ij} = \beta_{ij}(x_i - \bar{v}_i)\ell_i + v_j, \quad x_i > \bar{v}_i \Rightarrow w_{ij} > v_j \quad (2.10)$$

Worker heterogeneity in the bargaining power depends on the firm size as in Equation (2.1) and for a sharper characterization Equation (2.2). Recall that,

$$\sum_j \beta_{ij} = \beta_i \quad (2.1)$$

$$\beta_{ij} = \frac{\beta_i}{\ell_i} \quad (2.2)$$

Then worker j receives the wage, w_{ij} , as

$$w_{ij} = \beta_i x_i + (1 - \beta_i)v_j + \beta_i(\bar{v}_i - v_j) \quad (2.11)$$

If firm i has the bargaining power $(1 - \beta_i)$, then the bargained wage for worker j is

$$w_{ij} = \beta_i x_i + (1 - \beta_i)v_j + \beta_i(v_j - \bar{v}_i) \quad (2.12)$$

After some simplifications, wage becomes

$$w_{ij} = \beta_i(x_i - \bar{v}_i) + v_j \quad (2.13)$$

2.3. THE MINIMUM WAGE

Now, minimum wage ($\underline{w} > 0$) and firms' decisions about being a formal or an informal firm will be introduced into the model. Matched workers arrive at firm i , with a number of ℓ_i . They all have different valuations. Let \bar{v}_i be the average valuation of workers

matched with firm i . Firm i sorts the matched workers with respect to v_j 's before bargaining. If $v_j < \underline{w}$ (and if $x_i > \underline{w}$) worker j is employed at the minimum wage ($\underline{\ell}_i$ workers). If $v_j > \underline{w}$, worker j enters the bargaining process ($\ell_i - \underline{\ell}_i$ workers with average valuation $\bar{v}_i^b > \bar{v}_i$). After these steps, profit will become as,

$$\pi_i = (1 - \beta_i)(x_i - \bar{v}_i^b) (\ell_i - \underline{\ell}_i) + (x_i - \underline{w}) \underline{\ell}_i \quad (2.14)$$

Let's also write the bargained wage

$$w_{ij} = \beta_i(x_i - \bar{v}_i^b) + v_j \quad (2.15)$$

2.4. INFORMALITY

To analyze how a firm becomes informal defining the following measures for firm i is necessary:

$$\xi_i \equiv \frac{\ell_i}{\underline{\ell}_i} < 1 \quad (2.16)$$

$$\mu_i \equiv \frac{\bar{v}_i^b}{\bar{v}_i} > 1 \quad (2.17)$$

For each firm i , the ξ_i is the ratio of workers with a valuation lower than the minimum wage to all workers, and the μ_i is the ratio of the average valuation of workers with a valuation higher than the minimum wage to the average valuation of all workers.

If firm i chooses to be a formal firm, wages have to be more than or equal to the minimum wage as $w_{ij} \geq \underline{w} > 0$. If the firm chooses to be informal, as the firm doesn't have to follow legal measures (minimum wage) there will be no lower limit for wages as minimum wage, $\underline{w} > 0$.

Each firm has a constant probability of detection, $\psi \in (0, 1)$ and if a firm is detected, it faces a fraction of firm payoff loss as $\lambda \in (0, 1)$.

2.4.1. Two Conditions of Interest

Now, the difference between the formal and informal profits of the firms can be shown.

Informal profit without detection

$$\pi_i^{Informal} = (1 - \beta_i)(x_i - \bar{v}_i)\ell_i \quad (2.18)$$

And then the formal profit becomes

$$\pi_i^{Formal} = (1 - \beta_i)(x_i - \bar{v}_i^b) (\ell_i - \underline{\ell}_i) + (x_i - \underline{w})\ell_i \quad (2.19)$$

To decide between being formal and informal, each firm has two thresholds. The first one is the temptation to choose one. In this condition, the firm is tempted to be informal if $\pi_i^{Informal} > \pi_i^{Formal}$ vice versa. In this condition, the firm considers the profits in both scenarios but ignores the condition of being detected when it chooses to be informal. If the profit in the scenario where the firm chooses informality is higher than in the scenario where it is formal, the firm is tempted to be informal. However, this does not necessarily mean that the firm will choose to be informal. Here, the firm calculates the informal profit by taking into account the probability of detection and the potential penalties, which defines the second threshold. The second one is the choice between two options. To choose to be a formal firm, each firm checks for the following condition.

$$E_\psi(\pi_i|Informal) < \pi_i^{Formal} \quad (2.20)$$

Temptation to choose informality can be defined as the following condition.

$$x_i < \frac{(1 - \beta_i)\bar{v}_i[\mu_i(1 - \xi_i) - 1] + \xi_i w}{\beta_i \xi_i} \quad (2.21)$$

If the firm satisfies the following condition, chooses to be a formal firm.

$$x_i > \frac{(1 - \beta_i)\bar{v}_i[\mu_i(1 - \xi_i) - 1] + \psi\lambda + \xi_i w}{(1 - \beta_i)\psi\lambda + \beta_i\xi_i} \quad (2.22)$$

2.5. EXPLOITATION

As mentioned before, Pigouvian exploitation is defined as the condition when the marginal product of individual workers is greater than the wage the worker earns. In the model, e_{ij} represents the level of Pigouvian exploitation for each worker generated by dividing the marginal product of workers which comes from the per worker productivity of each firm by the wage of the worker.

$$e_{ij} \equiv \frac{x_i}{w_{ij}} \quad (2.23)$$

If the following condition holds, it will be $e_{ij} > 1$ which means worker j who is employed in firm i exploiting by the firm as the marginal product of the worker is bigger than the wage.

$$x_i > \frac{v_j - \beta_i\bar{v}_i}{1 - \beta_i} \quad (2.24)$$

Therefore, by looking at e_{ij} , the existence, magnitude, and distribution of the exploitation can be observed both for the benchmark calibration and after policy implementations.

CHAPTER 3

DATA AND CALIBRATION

3.1. DATA

In this thesis, 2019 was selected as the year to construct distributions and other calibration processes to avoid the effects of the shocks and distortions that arose because of the COVID-19 crisis.

Statistics of U.S. Businesses (SUBS) data and Public Use Microdata Sample (PUMS) data from the United States Census Bureau will be used together within a bargaining model in MATLAB, consisting of heterogeneous workers and firms. While SUBS data is used to calibrate the firm size distribution in the model, PUMS data is used to compare the wage distribution in the benchmark calibration of the model with the 2019 USA (United States of America) wage distribution (United States Census Bureau, 2020, 2022).

SUBS provides data of firm sizes in terms of number of employees. It provides the number of firms within intervals of number of employees as fewer than 5, in between 5 to 9, 10 to 19, 20 to 99, 100 to 499, and 500 employees or more. Moreover, it provides the number of workers employed in the firms within these firm size intervals for each interval. This gives the opportunity to compare the firms size distribution in the data and the model by using the number of firms and number of average firm size for each interval. Both data scaled down by dividing by 1000 and number of firms and workers generated as N_f equal to 6102 and the number of workers is N_w equal to 132990.

Different from the SUBS data, the Census Bureau provides a public micro-level data set on households. PUMS data includes an enormous number of variables. For this thesis, the variables necessary to create the wage distribution of 2019 were collected from the PUMS data set.

The data set was filtered using specific criteria to form a relevant subset for analysis. The following conditions were applied to 2019 PUMS data. Individuals who works full time

with usual weekly working hours of 35 or more in the past 12 months were selected. Additionally, to get rid of extremely low values for wages, only those with wages or salary income of at least \$1,000 over the past 12 months were included. The North American Industry Classification System recode was used to exclude individuals whose industry classification was -1, which corresponds to those who are not employed or have unspecified industry classification. The subset was further refined to include individuals classified under class of worker categories 1 (private for-profit company or business employee), 2 (private not-for-profit, tax-exempt, or charitable organization employee), 3 (local government employee), and 4 (state government employee). Lastly, only individuals with employment status recode of 1 (civilian employed, at work) or 2 (civilian employed, with a job but not at work) were selected. These criteria ensure that the subset comprises full-time employees with a reasonable income level, thereby providing a more consistent and meaningful basis for economic analysis.

Annual wages were converted into hourly wages, considering each person's working hour, multiplied by the adjustment factor, and a wage distribution was created by using each person's weight coefficient.

3.2. CALIBRATION

Firm size and firm productivity distributions were generated to be correlated using Gaussian copula and the correlation coefficient is taken as 0.75.

In line with the study of Kondo et al. (2018), the firm size distribution was created as a mixture of lognormal and Pareto distributions with the mixture parameter 0.89. The parameters for the lognormal part of the firm size distribution were derived from the SUBS dataset that classifies firms into discrete size categories. The mean and standard deviation values for the lognormal portion of the firm size distribution were calculated from a hypothetical distribution, which was constructed by weighting the average number of employees in each firm size interval by the number of firms within that interval. This weighting process involved repeating the average values of each interval according to the number of firms, thereby reconstructing the distribution based on these weighted

averages. With this hypothetical data set, mean and standard deviation values were calculated as, respectively 1.317 and 1.26 for the lognormal side of the firm size distribution, and these values do not deviate significantly from the calculations in Kondo et al. which does not cover years after 2012 (Kondo et al., 2018). When the scale parameter of the Pareto distribution for firm size is assumed as 45, the Pareto shape parameter is extracted from the study of Kondo et al. as 0.91 (Kondo et al., 2018).

The bargaining power of workers was determined to be 0.5 from Gertler and Trigari's work (Gertler & Trigari, 2006). The probability of detecting informality and the payoff loss, which is the penalty paid by the informal firm when informality is detected taken from the work of Di Porto et al. (Di Porto et al., 2017). Since the study was not related to the USA, relevant data about France was used as France is the most compatible country with the USA among the countries in the study. The probability of informality detection, expressed as the monitoring rate, is taken as 0.08 while the penalty fee is taken as 0.38.

Although there are discussions about this issue in the literature as in the firm size distribution, firm productivity distribution is created by using the Pareto distribution, which is widely used for firm productivity distribution (Nigai, 2017). While the shape parameter of the distribution was taken as 2 from the work of Nigai (2017), the scale parameter was assumed to be 15 (Nigai, 2017).

Although there is no data source for workers' valuation (outside option), which is one of the important variables in the study, studies in this field are also limited. As claimed in Krueger and Mueller's study (2016), it is assumed that the valuation is distributed as log normal (Krueger & Mueller, 2016). To fit the wage distributions in the model and data, the mean value of the valuation distribution is assumed to be 15 and the standard deviation value is assumed to be 6. The mean valuation value in Ryscavage's study was calculated as \$4.97 in 1984 (Ryscavage, 1988). When this value is adjusted for 2019 by using consumer price index, mean valuation for 2019 is calculated as \$12.28. The valuation mean value that fits the wage distribution in the data and model is very close to the adjusted value of mean valuation. When the mean and standard deviation values of the log normal distribution are calculated, the standard deviation (0.3853) corresponds to a

value that very close to the value calculated in Krueger and Mueller's study which is equal to 0.37 (Krueger & Mueller, 2016).

Table 1: Benchmark Parameters for the Model

Benchmark Parameters	Symbol	Support	Value	Source/Comment/Target
Bargaining Power Coefficient	β	(0, 1)	0.50	(Gertler & Trigari, 2006)
Probability of Detection for Informal Firms	ψ	(0, 1)	0.08	(Di Porto et al., 2017)
Penalty fee for Informality	λ	(0, $+\infty$)	0.38	(Di Porto et al., 2017)
Valuation Mean	-	(0, $+\infty$)	2.6338	Assumed
Valuation Standard Deviation	-	(0, $+\infty$)	0.3853	Assumed
Firm size (Lognormal) Mean	-	(0, $+\infty$)	1.317	Estimated from 2019 SUBS Data
Firm Size (Lognormal) Standard Deviation	-	(0, $+\infty$)	1.26	Estimated from 2019 SUBS Data
Firm Size (Pareto) Scale Parameter	-	(0, $+\infty$)	45	Assumed
Firm size (Pareto) Shape Parameter	-	(0, $+\infty$)	0.91	(Kondo et al., 2018)
Firm Size Distribution Mixture Parameter	-	(0, 1)	0.89	(Kondo et al., 2018)
Correlation Between Firm Size and Firm Productivity	ρ	(0, 1)	0.75	Assumed
Productivity (Pareto) Scale Parameter	-	(0, $+\infty$)	15	Assumed
Productivity (Pareto) Shape Parameter	-	(0, $+\infty$)	2	(Nigai, 2017)

CHAPTER 4

THE MODEL ECONOMY AND DATA

4.1. DATA AND THE BENCHMARK CALIBRATION OF THE MODEL

Although there are some differences, the model provides a compatible representation of the data. In the firm size distribution (ignoring the firms that shut down), the number of medium-sized firms is estimated to be slightly lower, while the number of large firms is estimated to be slightly higher, but the overall distribution is compatible with the data.

Table 2: Number of Workers Within Firm Size Intervals in Data and Model

Firm size intervals	Number of Total Workers Within Interval		Average Number of Workers Within Interval	
	Data	Model ²	Data	Model
<5	3777	3108 (3863)	1.59	1.5528 (1.4903)
5-9	1013	801 (827)	6.59	6.5868 (6.5913)
10-19	640	586 (595)	13.47	13.6928 (13.6941)
20-99	555	619 (621)	39.21	41.5784 (41.5362)
100-499	94	154	196.01	197.2532
500+	20	42	3416.50	1368.1666

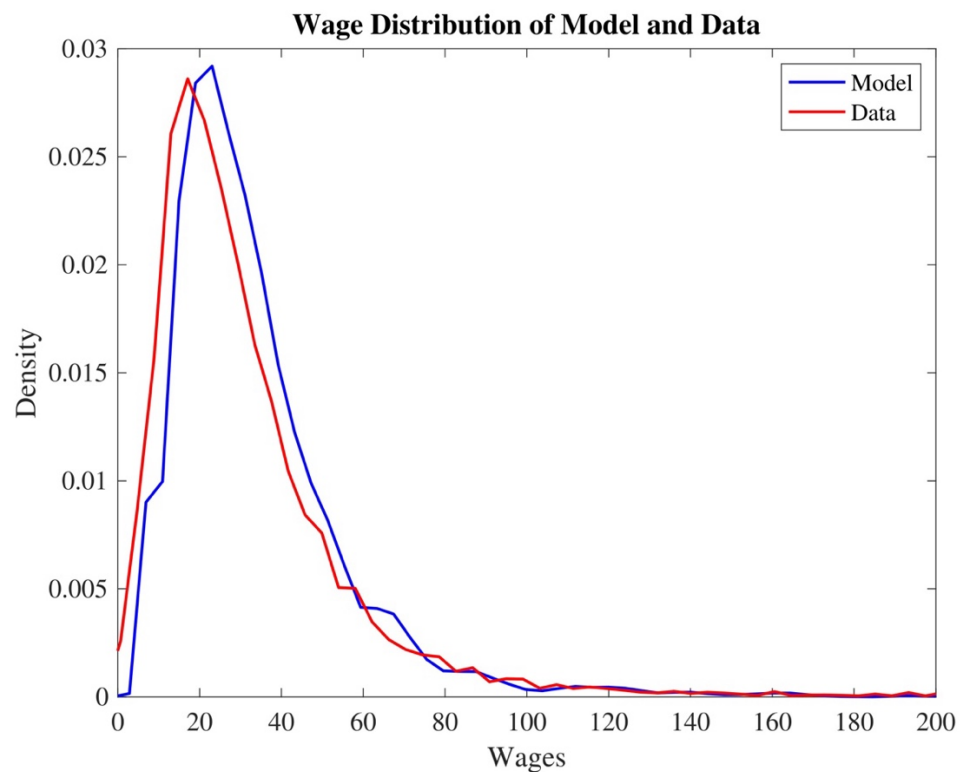
Firm size intervals are largely compatible in terms of average worker values, except for the largest firms.

² Values in paranthesis gives the number of firms in the initial firm size distribution and average firm sizes for each size. Each firm decides to operate or not to operate. While no change was observed in other ranges, some firms in the four firm size ranges choosed not to operate.

Table 3: Descriptive Statistics of Wages in Data and Model

Value	Data	Model
Mean	33.66	35.63
Standard Deviation	33.25	29.71
Variance	1105.76	882.44
Median	25.25	29.06
Maximum	397.95	393.94
Minimum	1.01	3.92

Although the wage distribution in the model still contains certain differences, it can represent the general trend of the data. A difference between the model and the data, which is also visible in the density distribution chart, is the ratio of minimum wage workers and workers earning below the minimum wage. However, since these rates are very low in terms of percentage, the difference between the model and the data is also low.

**Figure 3:** Distribution of Wages in Model and Data³

³ From here on, all distributions presented are created as Kernel Density distributions.

Table 4: Number and Percentage Ratio of Workers Earning Minimum Wage or Below Minimum Wage in the Model and Data

Value	Data	Model	Number of Workers in the Model
Workers Earning Minimum Wage or Below	6.19 %	3.16 %	4153

Although the percentage of workers earning minimum wage or below varies between model and data, both values are quite small. The importance of this value for the model is to better display the clustering of workers after policy implementations.

4.2. STRUCTURE PRESENTED BY THE MODEL

The model provides some insights for the conditions of formal and informal workers and firms, apart from wage and firm size distribution. First, the number of formal firms is higher than the number of informal firms.

Table 5: Number of Formal and Informal Firms and Workers in Model

Value	Firms	Workers
Formal	4526	103082
Informal	784 (1576)	28621 (29908)

As expected, formal firms tend to be more productive than informal firms. After a certain level of productivity, informal firms are not observed in the model. However, contrary to expectations, the firm size of informal firms is higher than formal firms on average.

Table 6: Descriptive Statistics of Firm Productivity and Firm Size by Formal and Informal Firms

Firm Productivity		
Value	Formal Firms	Informal Firms
Mean	32.11	25.86
Standard Deviation	36.44	8.52
Variance	1327.60	72.64
Median	22.31	23.74
Maximum	732.67	78.53
Minimum	15.00	15.10
Firm Size		
Value	Formal Firms	Informal Firms
Mean	22.78	36.51
Standard Deviation	160.78	95.18
Variance	25850.00	9059.10
Median	2	12
Maximum	4842	1375
Minimum	1	2

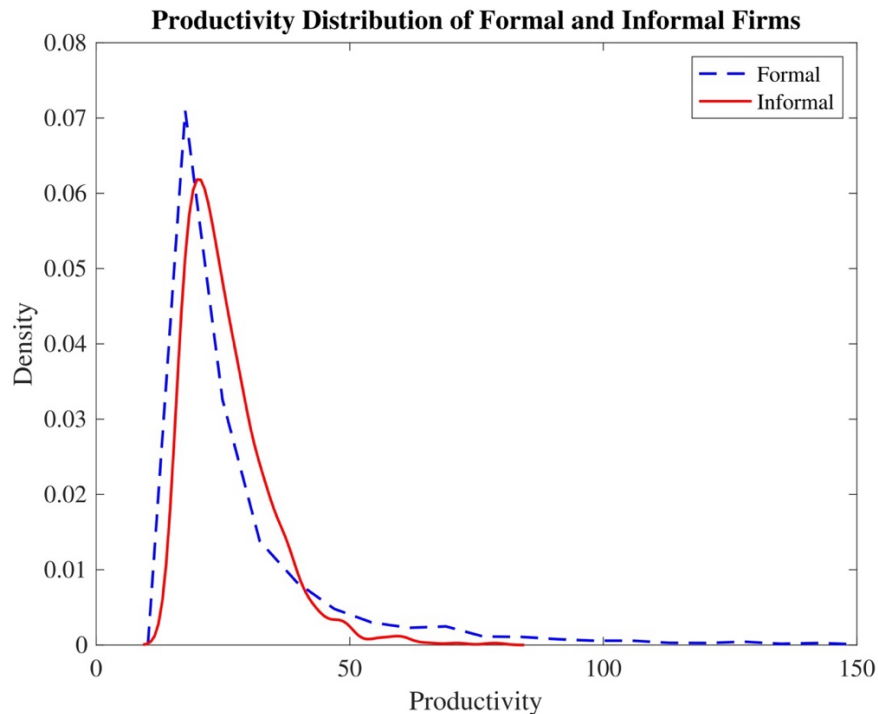


Figure 4: Distribution of Productivity per Worker in Formal and Informal Firms

Notes: Since the decision of firms to be formal or informal depends on their productivity levels, above a certain level of productivity there are no informal firms. Although there are formal firms with low productivity, on average formal firms are more productive than informal firms.

When looking at the distribution of exploitation for all workers in the model, a concentration between 1 and 2 is observed.

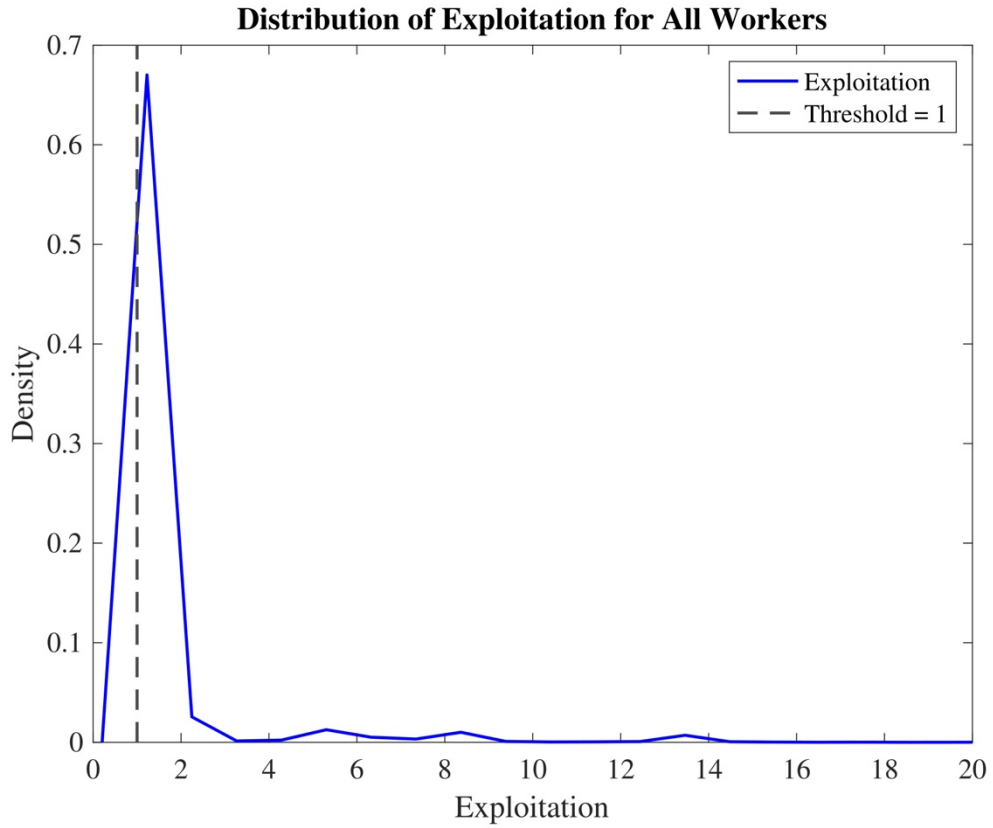


Figure 5: Distribution of Exploitation for All Workers

Table 7: Descriptive Statistics for Exploitation in Benchmark Calibration

Value	All Workers	Formal Workers	Informal Workers
Mean	1.78	1.91	1.34
Standard Deviation	2.09	2.34	0.41
Variance	4.38	5.48	0.17
Kurtosis	435.01	351.92	3.65
Median	1.58	1.63	1.30
Maximum	101.06	101.06	4.54
Minimum	0.31	0.38	0.31

In addition, according to the initial outputs of the model, the majority of workers are exploited. This rate is higher in formal workers than in informal workers. This difference is expected since productivity is higher in formal firms.

Table 8: Number and Percentage Ratio of Workers Exploited

Value	All Workers	Formal Workers	Informal Workers
Number	121707	99101	22606
Percentage Ratio	92.41%	96.14%	78.98%

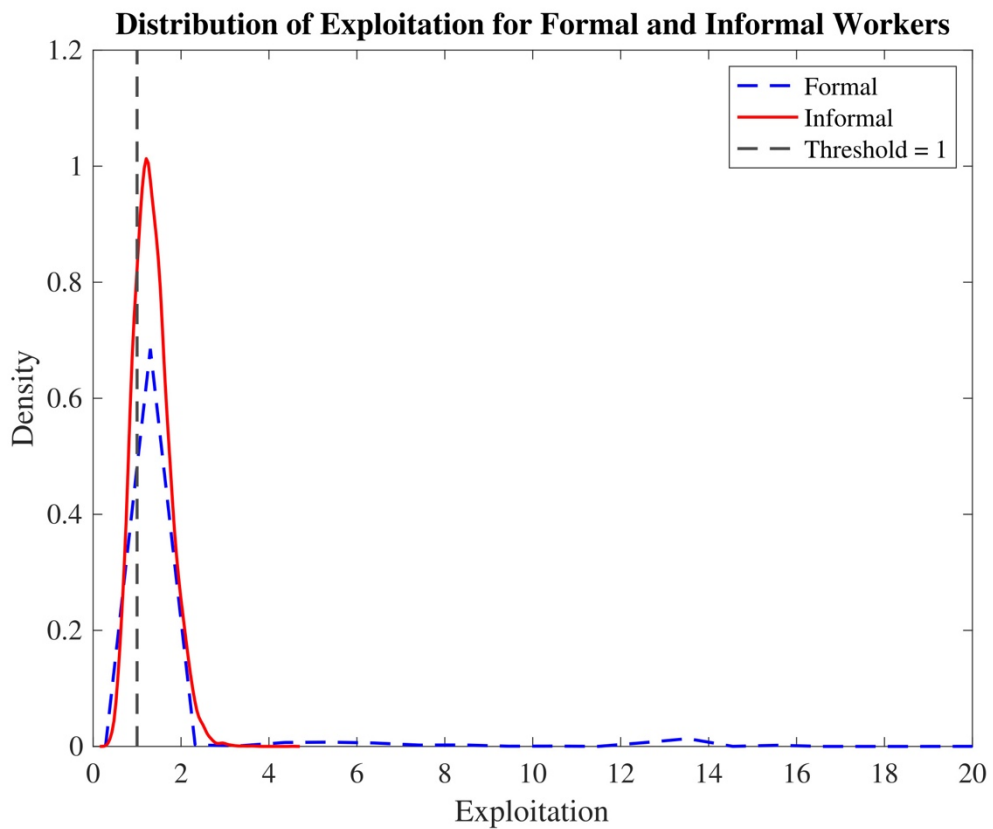


Figure 6: Distribution of Exploitation Rate for Workers in Formal and Informal Firms

When looking at the wage distribution, formal workers earn more than informal workers. Since informal wages are limited by firm productivity, they cannot rise above a certain level.

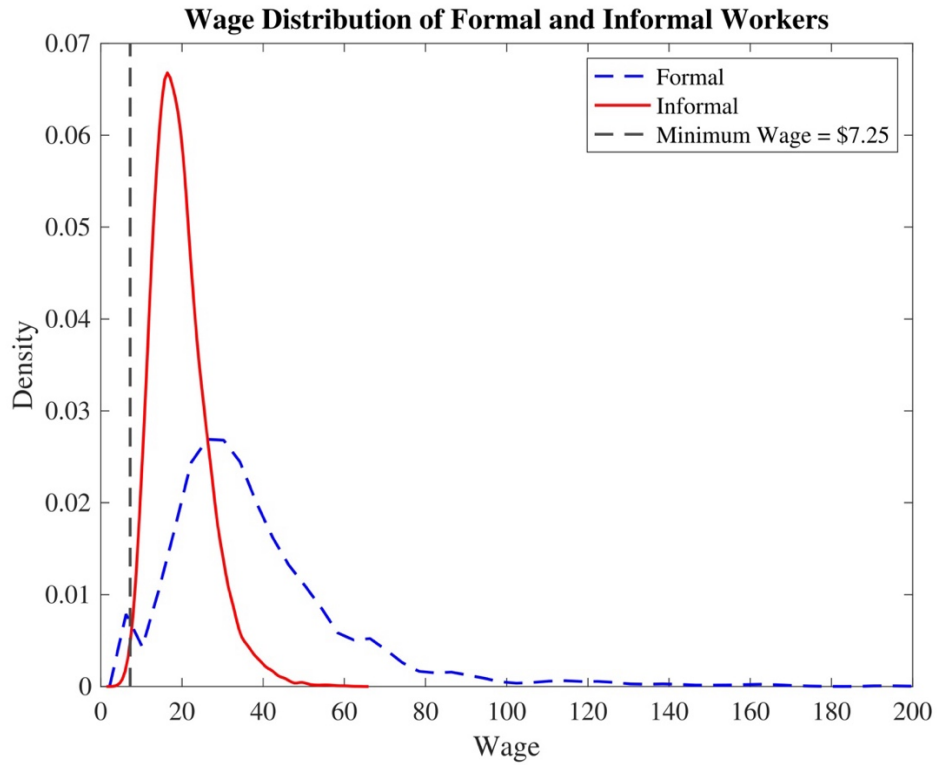


Figure 7: Distribution of Wages for Workers in Formal and Informal Firms

Table 9: Descriptive Statistics of Wages in Benchmark Calibration for Formal and Informal Workers

Value	All Workers	Formal Workers	Informal Workers
Mean	35.63	40.07	19.63
Standard Deviation	29.71	32.00	6.84
Variance	882.44	1023.73	46.76
Kurtosis	43.34	38.33	5.04
Median	29.06	33.32	18.59
Maximum	393.94	393.94	63.47
Minimum	3.92	7.25	3.92

CHAPTER 5

POLICY EXPERIMENTS AND RESULTS

In this chapter, the effects of minimum wage policy in the bargaining model environment with heterogeneous workers and firms with monopsony power will be measured⁴. First, a policy implementation in which only the minimum wage is increased will be examined. Afterwards, the minimum wage policy will be supported by various policies and the results will be presented. In the second policy (the First Policy Mix), in addition to the minimum wage policy, the detection and punishment of informality will be increased. Then, in the third policy (the Second Policy Mix), increasing the bargaining power of workers will be added to the policies in the second policy set. In this way, the effects of the minimum wage policy can be observed both when it is increased alone and when it is implemented together with different policies.

5.1. EFFECTS OF MINIMUM WAGE POLICY

The first policy intervention raises the minimum wage from 2019 Federal Minimum Wage level, \$7.25 to \$9.00. At first, to compare the condition of wages after the minimum wage policy, the wage density distribution graph and descriptive statistics before and after the policy are presented below for all workers. The graph and table are separated into formal and informal to present the dynamics of these two group of workers. The same method will then be followed for the level of exploitation and distribution of exploitation.

5.1.1. Effects of Minimum Wage Policy on the Wage Distribution and Informality

The number of informal firms increases from 784 to 1671, and the number of informal employees increases from 28621 to 71601. As noted above, this means that higher minimum wages drive more firms into the informal sector to avoid the effects of the

⁴ In order to present the results more clearly, graphs will be used in the sections explaining the effects of policies on wages, and tables will be used in the sections explaining their effects on exploitation. Descriptive statistics on wages, firm size and firm productivity, as well as density distribution figures of exploitation levels, can be found in the appendices.

minimum wage. Simultaneously, the number of formal employees decreases from 103082 to 60102. This reflects a significant shift from formal to informal employment.

Table 10: Number of Formal and Informal Firms and Workers in Model After Minimum Wage Policy

Firm / Worker Type	Firms	Workers
Formal	3639	60102
Informal	1671	71601

Notes: Due to some firms shifting to informality, the number of informal workers has increased.

Table 11: Number and Percentage Ratio of Workers Earning Minimum Wage or Earning Below Minimum Wage in Benchmark Calibration and After the Minimum Wage Policy

Value	Minimum Wage = \$7.25		Minimum Wage = \$9.00	
	Percentage	Number of Workers	Percentage	Number of Workers
Workers Earning Minimum Wage or Below	3.16 %	4153	5.68%	7477

Notes: After the policy, number of workers who earning minimum wage or below has increased. Most of this increase comes from the increase in the number of workers earning minimum wage.

After the minimum wage policy, an increase is observed in the number of workers earning minimum wage or below. The proportion of these workers increased from 3.16% to 5.68%. This increase is largely due to the increase in the number of workers earning minimum wage.

After the implementation of the policy, the average wage drops slightly from \$35.63 to \$34.45. The standard deviation also decreased from 29.71 to 28.98, meaning a small narrowing in the wage distribution. The median wage falls from \$29.06 to \$27.96, reflecting a small downward shift in the wage distribution.

While formal workers' mean wages increased from \$40.07 to \$47.28, informal workers experienced a rise from \$19.63 to \$23.67. This suggests that formal sector workers benefit

more significantly from the wage hike, whereas the wage benefits for informal workers are less.

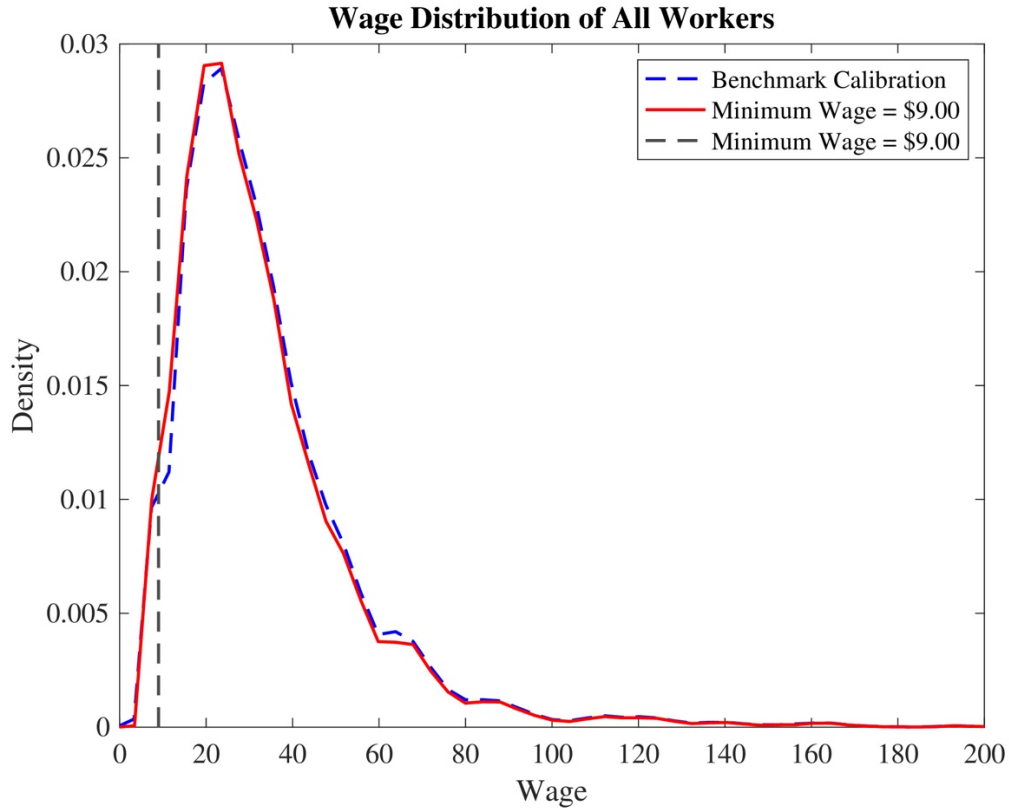


Figure 8: Distribution of Wages for All Workers Before and After Minimum Wage Policy

Notes: A small shift to the left is observed in the wage distribution of all workers.

The decrease in the wage distribution of all workers and the increase in the average wage of formal and informal worker groups seem contradictory at first glance. However, this dynamic is related to the impact of the minimum wage increase on informality. With the minimum wage increase, the wages of workers who fall between the first minimum wage and the new minimum wage (between \$7.25 and \$9.00) increase to the new minimum wage (if the firm remains formal). Thus, while the average wage of formal workers increases, the large increase in the number of informal workers and their relatively low wage levels pushes down the average wage of total workers. This is the weighted average effect of the increasing share of lower-paid workers in the total workforce.

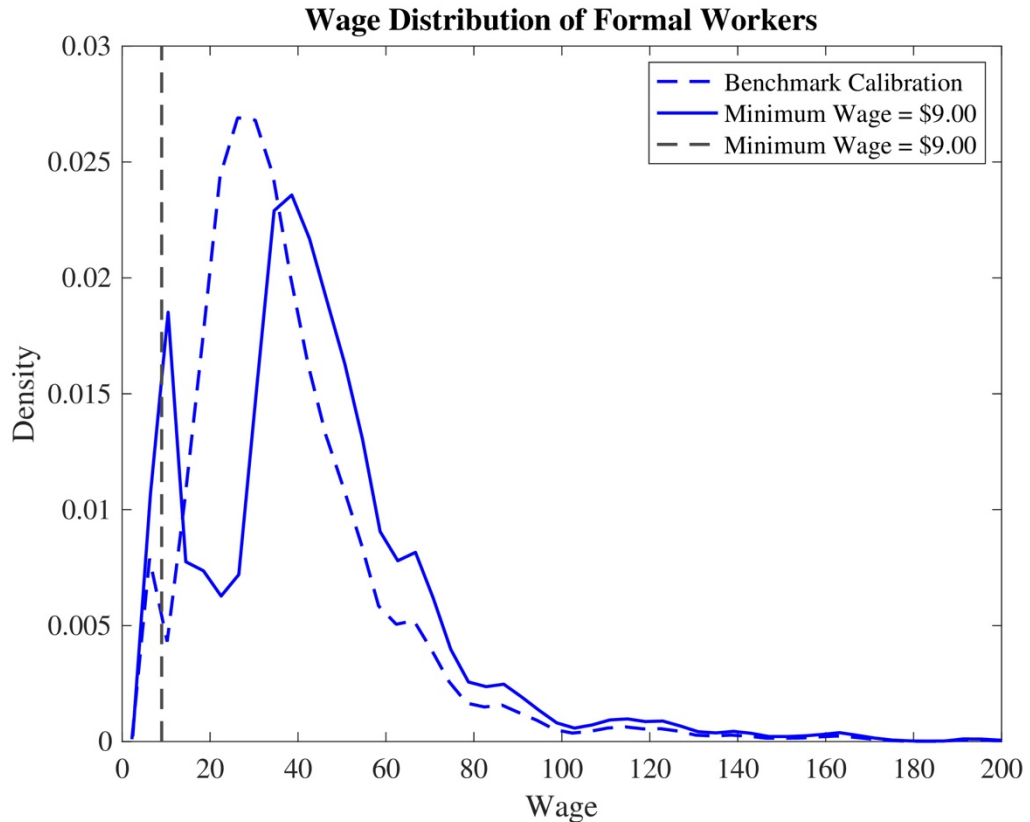


Figure 9: Distribution of Wages for Formal Workers Before and After Minimum Wage Policy

Notes: Due to formal firms with relatively low productivity shifting to informality, the wage distribution of formal workers has shifted to the right and its variance has increased. With the increasing minimum wage, more workers became minimum wage earners and the spike in the minimum wage increased.

In summary, while formal and informal workers experience wage increases in their respective categories, the large increase in the number of informal workers reduces the average wage of the all of workers.

The increase in informal wages with the increase in informal firms can be observed in the increase in the maximum informal wage as well as the increase in the median wage value. After the policy, the maximum informal wage increased from 63.47 to 78.42, while the maximum value of the formal wage decreased insignificantly.

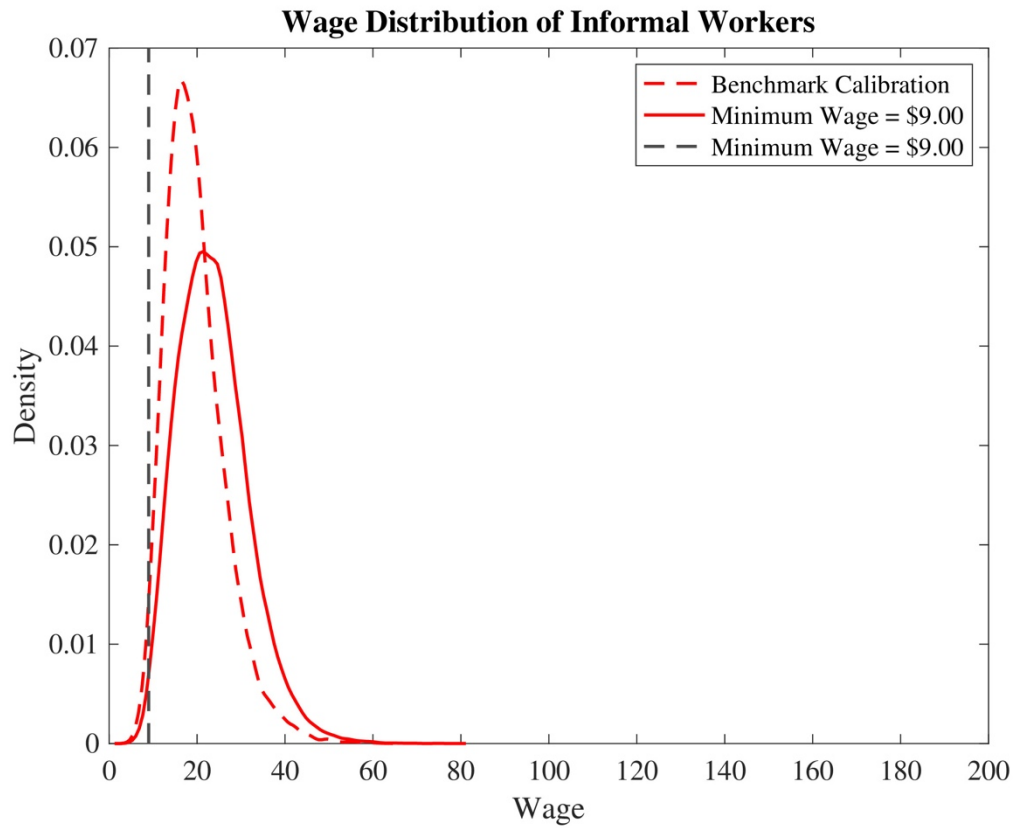


Figure 10: Distribution of Wages for Informal Workers Before and After Minimum Wage Policy

Notes: Due to relatively productive firms shifting to informality, the wage distribution of informal workers has shifted to the right and its variance has increased.

5.1.2. Effects of the Minimum Wage Policy on Exploitation

The median exploitation rate remains constant at 1.58 but the average rate of exploitation increases from 1.78 to 1.98, and the variability in rates of exploitation increases, indicating that the disparity in levels of exploitation among workers is increasing.

Table 12: Descriptive Statistics for Exploitation in Benchmark Calibration and After Minimum Wage Policy for All Workers

All Workers				
Value	After Policy (\$9.00)		Benchmark Calibration (\$7.25)	
Mean	1.98		1.78	
Standard Deviation	2.73		2.09	
Variance	7.44		4.38	
Median	1.58		1.58	
Maximum	81.41		101.06	
Minimum	0.31		0.31	
Formal and Informal Workers				
	Formal		Informal	
Value	After Policy (\$9.00)	Benchmark Calibration (\$7.25)	After Policy (\$9.00)	Benchmark Calibration (\$7.25)
Mean	2.64	1.91	1.43	1.34
Standard Deviation	3.92	2.34	0.36	0.41
Variance	15.34	5.48	0.13	0.17
Median	1.73	1.63	1.42	1.30
Maximum	81.41	101.06	4.54	4.54
Minimum	0.50	0.38	0.31	0.31

Notes: After the policy, average exploitation for all workers has increased. When workers are considered as formal and informal, it is observed that the reason for this increase is largely due to the increasing exploitation rate of formal workers.

However, the effects of exploitation separately for formal and informal workers checked, there is an increase of 0.09 in mean exploitation for informal workers, while an increase of 0.73 for formal workers. At the same time, the standard deviation of exploitation decreases insignificantly in informal workers, while it increases in formal workers. This shows that the increase in disparity in exploitation levels among workers is largely due to

formal workers. This can be a result of the transition from the formal sector to the informal sector by firms that receive a smaller share of the output, in other words, the firms cannot exploit enough.

Table 13: and Percentage Ratio of Workers Exploited

Value	All Workers	Formal Workers	Informal Workers
Number	121663	59204	62459
Percentage Ratio	92.38%	98.51%	87.23%

There is no significant change in the number and rate of exploited workers. While the number of formal workers has decreased, the proportion of exploited workers has increased slightly. While informality has increased, the number of informal workers and the rate of exploited workers have also increased. When these findings are considered together with the significant increase in the standard deviation of exploitation and the limited increase in its mean, it can be said that more workers are exploited at a relatively lower rate.

5.2. EFFECTS OF FIRST POLICY MIX

The increase in informality is seen as the main source of the inadequacy of the minimum wage policy. In order to make the minimum wage policy more effective, anti-informality policies can be implemented with a policy mix with the minimum wage increase. In this policy mix, the minimum wage policy will be implemented together with the policies of increasing the probability of detecting informal firms (enhanced monitoring) and punishing the detected informal firms more severely. The probability of detecting informal firms has been increased to 25%, and the penalty rate that detected informal firms will pay from their profits has been increased to 50%.

5.2.1. Effects of the First Policy Mix on Wage Distribution and Informality

Although it caused a larger number of informal firms, the First Policy Mix reduced the number of informal workers below the benchmark calibration level, despite the effect of

the minimum wage. Number of informal workers decreased from 28621 to 19399 after the policy mix.

Table 14: Number of Formal and Informal Firms and Workers After the First Policy Mix

Firm / Worker Type	Firms	Workers
Formal	4438	112304
Informal	872	19399

Notes: Due to the improvements in the policies against informality, the number of informal workers has decreased. Even if the number of informal firms increases, these firms are relatively smaller. This is consistent with the decline in the average informal firm size.

Table 15: Number and Percentage Ratio of Workers Earning Minimum Wage or Below Minimum Wage in Benchmark Calibration and After the First Policy Mix

Value	Benchmark Calibration		After the First Policy Mix	
	Percentage	Number of Workers	Percentage	Number of Workers
Workers Earning Minimum Wage or Below	3.16 %	4153	10.98%	14458

Notes: After the policy, number of workers who earning minimum wage or below has increased significantly. The majority of this increase comes from the increase in the number of workers earning minimum wage.

After the policy, the number of workers earns less than minimum wage and the number of minimum wage workers increased as a result of increasing formal employment and minimum wage. However, the policy reduced the mean wage below the benchmark calibration. The wage distribution, especially among formal workers, has shifted significantly to the left. There is smaller shift in the wage distribution of informal workers.

The reason behind these dynamics consists of some heterogeneous elements. In the minimum wage policy, there is a clear shift from formality to informality both in terms of firms and workers. However, as mentioned above, while the number of informal workers decreases after the First Policy Mix, the number of informal firms increases. This

shows that informal firms tend to become smaller firms (in terms of firm size) after the policy mix. After the policy, the number of workers earning both minimum wage and below increased. A significant part of this increase is due to the increase in the number of minimum wage workers.

After the policy mix, a decrease was observed in both mean and median wages. This decrease is seen both in all workers and in the statistics of worker groups separated into formal and informal. A portion of the decline in wages here is the firms' transition of informal to formal and the fact that some low-wage workers began to receive minimum wage instead of the informal bargained wage which can be higher than the minimum wage.

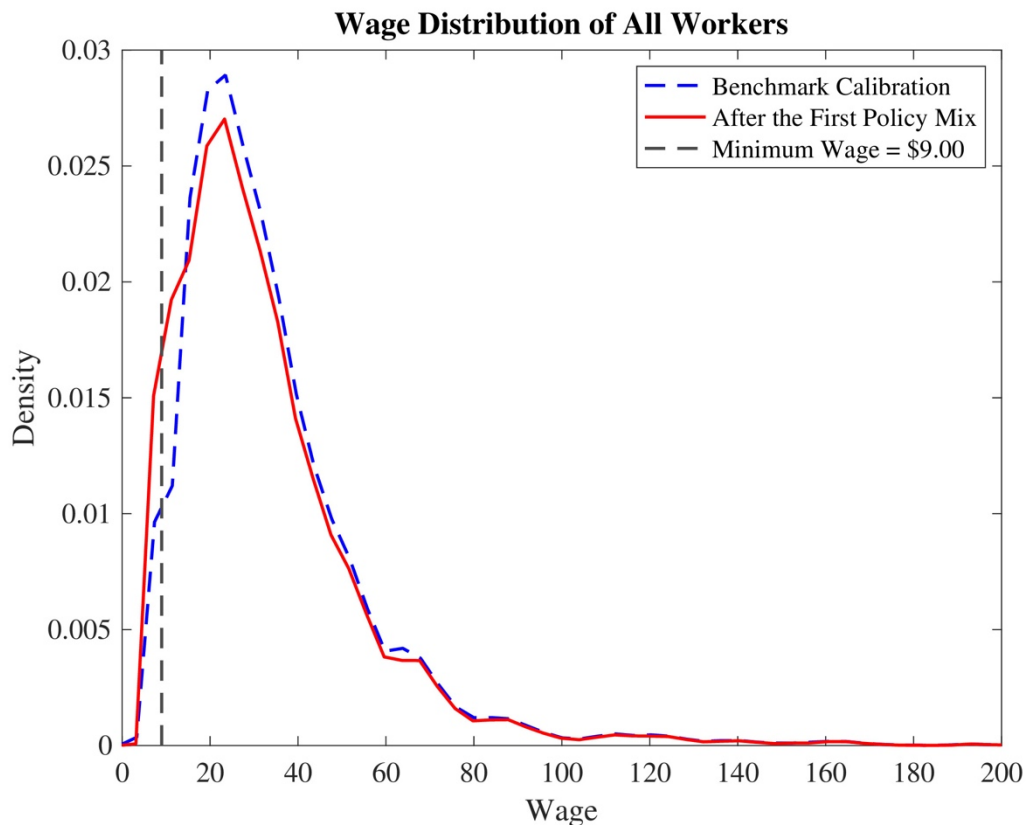


Figure 11: Distribution of Wages for All Workers Before and After the First Policy Mix

Notes: A small shift to the left and the concentration on the new minimum wage level are observed in the wage distribution of all workers after the First Policy Mix.

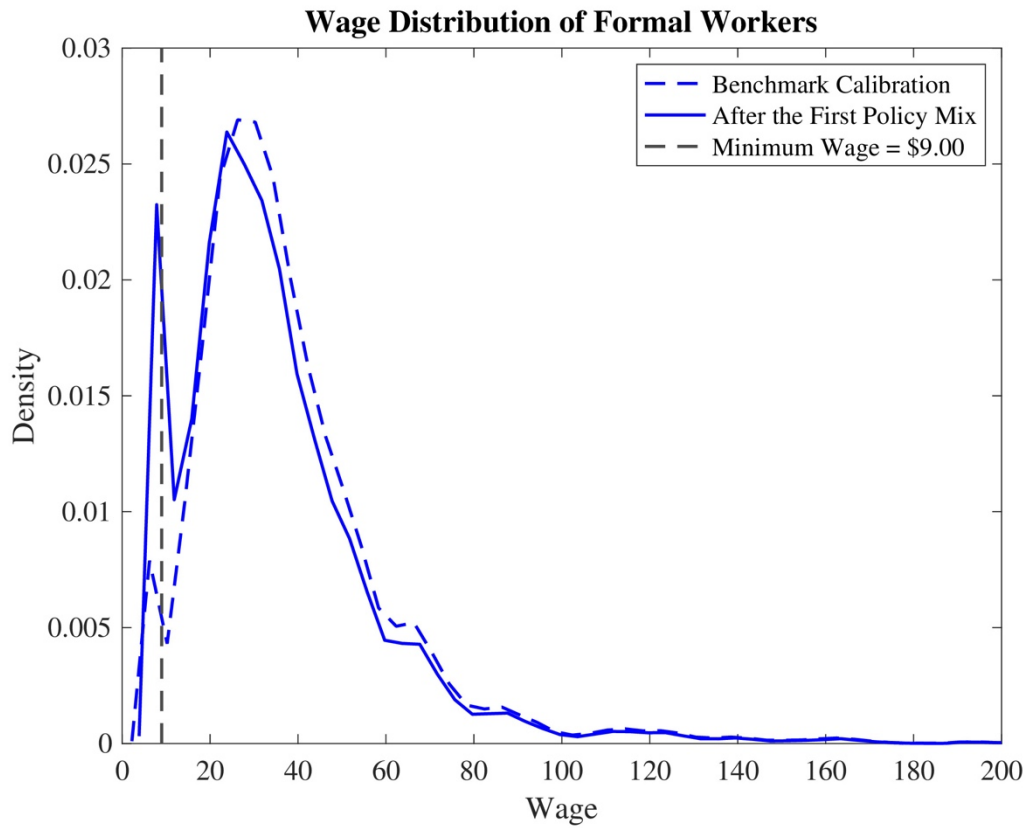


Figure 12: Distribution of Wages for Formal Workers Before and After the First Policy Mix

Notes: The relatively more productive informal firms shifted to formality after the policy. These firms have lower productivity than formal firms, and this has caused the average wage of workers employed in formal firms to decrease. With the increasing minimum wage, more workers became minimum wage earners and the spike in the minimum wage increased.

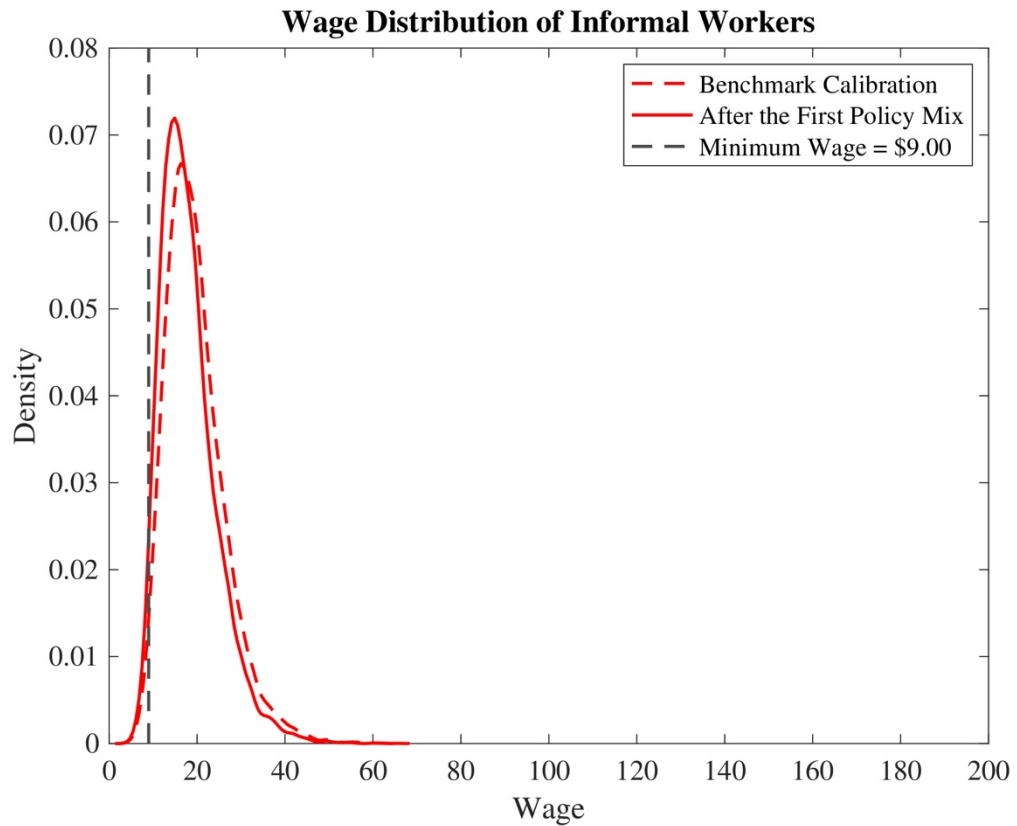


Figure 13: Distribution of Wages for Informal Workers Before and After the First Policy Mix

Notes: Due to relatively productive firms shifting to formality, the wage distribution of informal workers has shifted to the left and its variance has decreased.

5.2.2. Effects of the First Policy Mix on Exploitation

As it suppressed wages, the First Policy Mix has also increased the level of exploitation. Similar with its heterogeneous effects on wages, the policy made the situation of formal workers more harmful to informal workers. The policy increased the rate of exploitation in the formal economy because the reason for the increase in the exploitation of formal workers was that informal firms with low productivity decided to operate formally. As a result of this shift, ratio of exploited formal workers increased when the ratio of exploited informal workers declined to a level which is lower than the benchmark calibration.

Table 16: Descriptive Statistics for Exploitation in Benchmark Calibration and After the First Policy Mix

All Workers				
Value	After Policy (\$9.00)		Benchmark Calibration (\$7.25)	
Mean	2.11		1.78	
Standard Deviation	2.78		2.09	
Variance	7.73		4.38	
Median	1.60		1.58	
Maximum	81.41		101.06	
Minimum	0.31		0.31	
Formal and Informal Workers				
	Formal		Informal	
Value	After Policy (\$9.00)	Benchmark Calibration (\$7.25)	After Policy (\$9.00)	Benchmark Calibration (\$7.25)
Mean	2.25	1.91	1.29	1.34
Standard Deviation	2.98	2.34	0.42	0.41
Variance	8.90	5.48	0.18	0.17
Median	1.64	1.63	1.23	1.30
Maximum	81.41	101.06	4.54	4.54
Minimum	0.41	0.38	0.31	0.31

Notes: After the policy, average exploitation for all workers has increased. When workers are considered as formal and informal, it is observed that the reason for this increase is due to the increasing exploitation rate of formal workers. The average exploitation rate of informal workers has slightly decreased as the relatively productive portion of the informal firms has shifted to formal economy.

Table 17: Number and Percentage Ratio of Workers Exploited After the First Policy Mix

Value	All Workers	Formal Workers	Informal Workers
Number	122026	107814	14212
Percentage Ratio	92.65%	96.00%	73.26%

Notes: Except the decline in the share (and also the number as the number of informal workers declined) of informal workers exploited, there is no significant change after the policy in terms of share of exploited workers

5.3. EFFECTS OF THE SECOND POLICY MIX

The Second Policy Mix consists of the policy set of the First Policy Mix and an additional policy which increases the bargaining power of workers. This policy can be implemented in many different ways, such as encouraging unionization or reducing or eliminating labor market friction. It is assumed that the policy increases the bargaining power from 0.5 to 0.7.

5.3.1. Effects of the Second Policy Mix on Wage Distribution and Informality

This policy did not cause a significant impact on the wage dynamics of informal workers. While the number of informal firms increased, the number of informal workers decreased. This suggests that the policy tends to push smaller firms into informality. Even though it is higher than the benchmark calibration, there are fewer workers earning less than the minimum wage compared to other policies. In formal workers, while the number of minimum wage workers increases, wages remain well above the benchmark calibration.

Table 18: Number of Formal and Informal Firms and Workers After the Second Policy Mix

Firm / Worker Type	Firms	Workers
Formal	4438	112304
Informal	872	19399

Notes: As in the First Policy Mix, due to the improvements in the policies against informality, the number of informal workers has decreased. Even if the number of informal firms increases, these firms are relatively smaller. This is consistent with the decline in the average informal firm size.

Table 19: Number and Percentage Ratio of Workers Earning Minimum Wage and Earning Below Minimum Wage in Benchmark Calibration and After the Second Policy Mix

Value	Benchmark Calibration		After the Second Policy Mix	
	Percentage	Number of Workers	Percentage	Number of Workers
Workers Earning Minimum Wage or Below	3.16 %	4153	10.80%	14226

Notes: As in the First Policy Mix, after the policy, number of workers who earning minimum wage or below has increased. Most of this increase comes from the increase in the number of workers earning minimum wage. Unlike the First Policy Mix, a non-significant increase in the number of workers earning less than the minimum wage is observed with the increase in bargaining power.

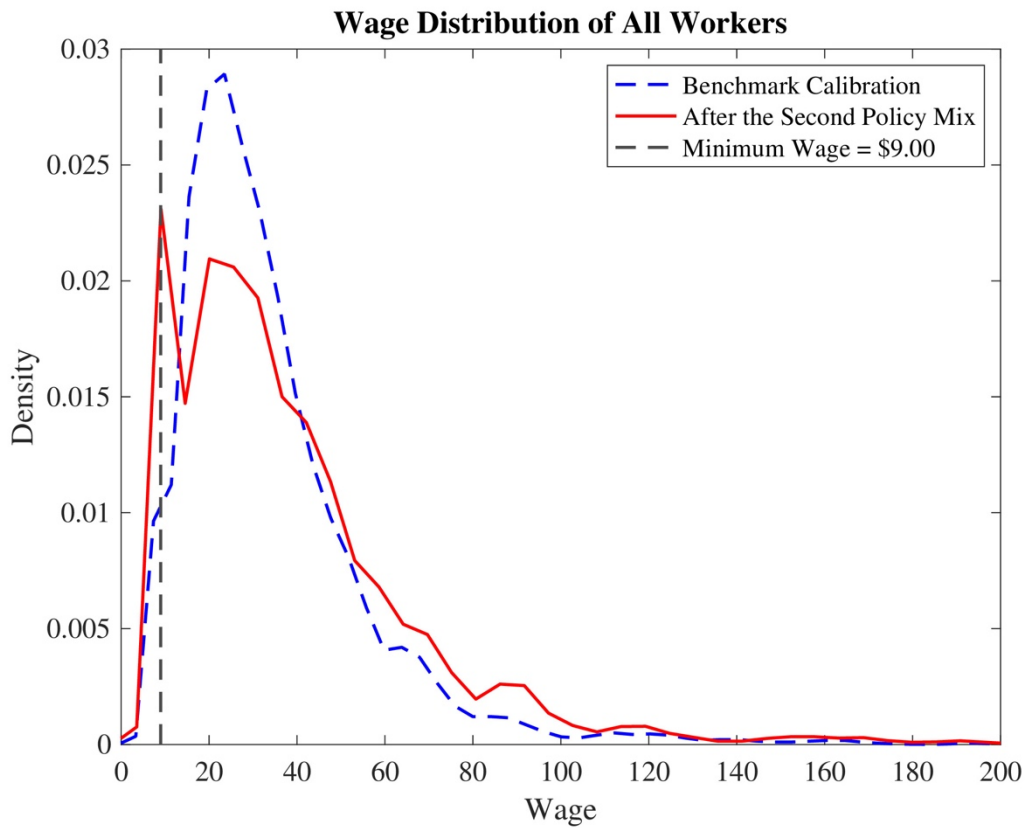


Figure 14: Distribution of Wages for All Workers Before and After the Second Policy Mix

Notes: The average wage of all workers and the variance of wages have increased significantly. As the density distribution shifts to the right, low-wage workers are concentrated at the minimum wage.

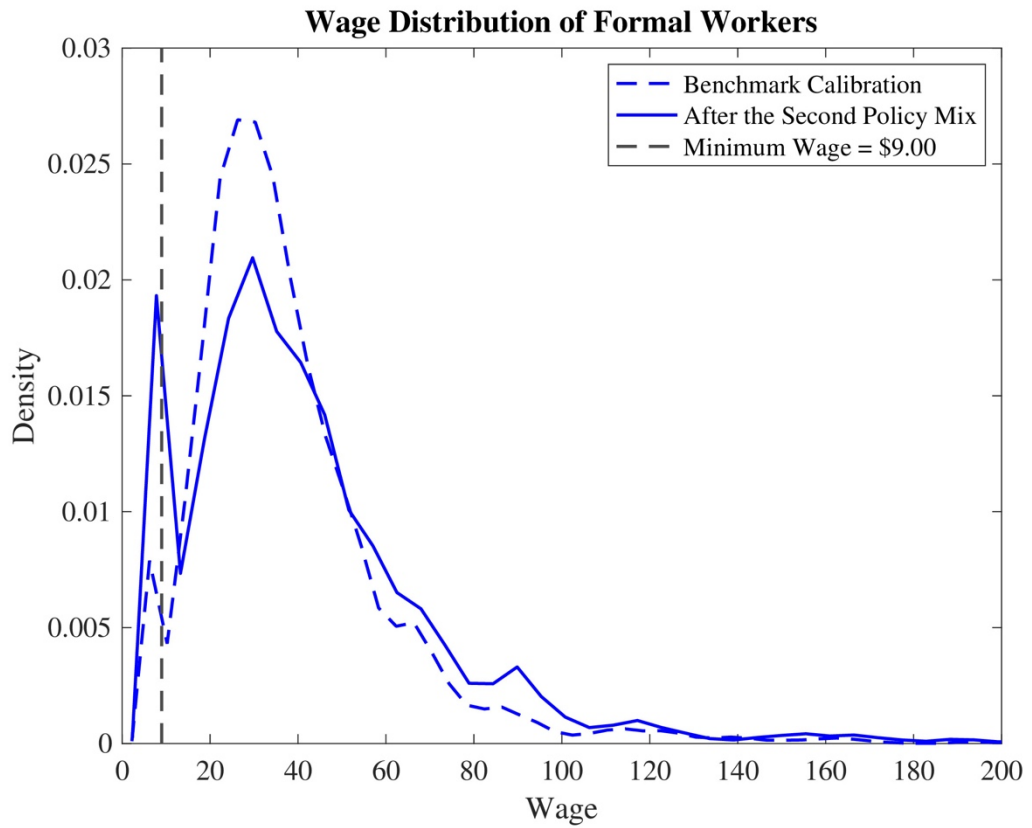


Figure 15: Distribution of Wages for Formal Workers Before and After the Second Policy Mix

Notes: The average wage of formal workers and the increase in the variance of formal wages are clearly observed in the graph. In addition to the increase in the number of workers earning minimum wage, the wage distribution of formal workers has shifted significantly to the right, towards higher wage levels.

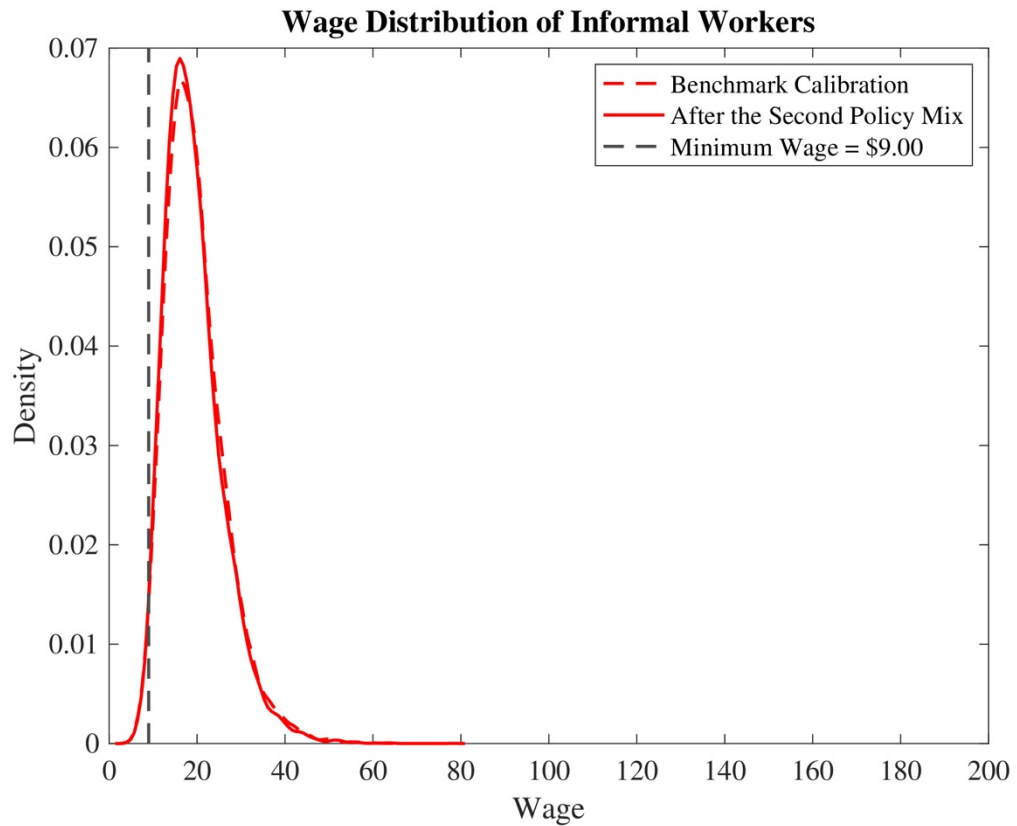


Figure 16: Distribution of Wages for Informal Workers Before and After the Second Policy Mix

Notes: There was almost no change in the wage distribution graph of informal workers, in line with insignificant decreases in the average wage of informal workers and the variance of wages.

5.3.2. Effects of the Second Policy Mix on Exploitation

The number of exploited workers has fallen in both categories. While the mean expansion of formal workers increased slightly (1.91 to 2.01), its standard deviation increased significantly. This is largely due to the increasing number of minimum wage workers. In addition, the fact that jobs that were exploited in small amounts in the benchmark calibration were not exploited after the policy with increased bargaining power created an upward push on the mean of exploitation. For informal workers, there is a slight decrease in both the mean and standard deviation of exploitation.

Table 20: Number and Percentage Ratio of Workers Exploited After the Second Policy Mix

Value	All Workers	Formal Workers	Informal Workers
Number	117079	103954	13125
Percentage Ratio	88.90%	92.56%	67.66%

Table 21: Descriptive Statistics for Exploitation in Benchmark Calibration and After the Second Policy Mix

All Workers				
Value	After Policy (\$9.00)		Benchmark Calibration (\$7.25)	
Mean	1.89		1.78	
Standard Deviation	2.82		2.09	
Variance	7.94		4.38	
Median	1.32		1.58	
Maximum	81.41		101.06	
Minimum	0.31		0.31	
Formal and Informal Workers				
	Formal		Informal	
Value	After Policy (\$9.00)	Benchmark Calibration (\$7.25)	After Policy (\$9.00)	Benchmark Calibration (\$7.25)
Mean	2.01	1.91	1.20	1.34
Standard Deviation	3.03	2.34	0.36	0.41
Variance	9.20	5.48	0.13	0.17
Median	1.34	1.63	1.15	1.30
Maximum	81.41	101.06	4.12	4.54
Minimum	0.40	0.38	0.31	0.31

Notes: After the policy, average exploitation for all workers has increased slightly. When workers are considered as formal and informal, it is observed that the reason for this increase is due to the increasing exploitation rate of formal workers. The average exploitation rate of informal workers has decreased slightly.

5.4. OVERALL ASSESSMENT OF POLICIES

The minimum wage policy alone leads to higher informality and mixed impacts on wages and exploitation. While formal workers benefit from higher wages (due to the changing composition of formal and informal firms and workers.), the informal sector expands, and overall exploitation rates rise. The policy, while aiming to improve wages, inadvertently pushes many workers and firms into informality and exploitation pressures increase.

Even if it is successful to alleviating the informality and its negative effects, the First Policy Mix has suppressed wages and increased exploitation especially for the formal workers. With this set of policies, formal workers are worse off compared to the initial situation

The Second Policy Mix has been successful in reducing informality and raising wages. Additionally, even if there was a small increase in mean exploitation, it reduced the proportion of workers exploited in both categories.

The Second Policy Mix is clearly the most successful of these three policies. Under conditions where informality and heterogeneity (for both firms and workers) exist, individual policies can create problems that are not visible at first glance. The Second Policy, together with its components, positively affected the variables intended to be improved by balancing the unintended consequences of the policies.

CONCLUSION

This thesis investigated the effectiveness of minimum wage policy in labor markets where heterogeneity, exploitation, monopsony, and informality exist. The analysis built its arguments on the literature on neoclassical exploitation theory, monopsony, and segmented labor markets.

A bargaining model consisting of heterogeneous firms and workers was constructed and used. In the model, firms have heterogeneity in their firm size and productivity levels, and workers have heterogeneity in their valuation levels. Firms and workers are matched one time and bargain for wages. Just as firms have market power, workers have bargaining power in the model. As a result of the bargaining process, firms choose to be formal, informal, or shut down. A heterogeneous and segmented market structure is formed due to the heterogeneity of firms and workers, the bargaining process, and the decisions of firms. This structure is crucial for showing the non-homogeneous effects of policy practices. When the heterogeneity of workers and firms is taken into consideration and the violation of the perfection of markets is added to this, as in reality, a complex structure emerges. Therefore, heterogeneous models of the labor market arise as a necessity to capture reality which consists of heterogeneity and segmentation between firms and workers.

The outcomes of the minimum wage policy in this type of labor market structure have been analyzed through policy experiments. In the first policy experiment, a minimum wage policy was implemented. When implemented alone, the minimum wage policy caused a sharp increase in informality. It has also led to an increase in total exploitation and a slight decline in wages on average for all workers. Many firms, and therefore workers, have shifted to the informal economy. Although wages appear to have increased for both formal and informal workers on average, this is due to the changing composition of formal and informal firms and workers.

To eliminate the ineffectiveness of the minimum wage policy, a policy mixture (the First Policy Mix) was applied in the second policy experiment. In this mixture, the minimum wage, the probability of detecting informality, and the penalties imposed on detected informal firms were increased. Although this policy reduced informality, it suppressed wages and increased exploitation, especially for formal workers.

To solve the ineffectiveness of these policies, the third policy experiment (the Second Policy Mix) was implemented. In addition to the policies in the second experiment, workers' bargaining power was increased in the Second Policy Mix. This policy reduced informality and raised wages. Although it resulted in a small increase in average exploitation, it reduced the proportion of those exploited among both formal and informal workers.

In an environment where heterogeneity, informality, exploitation, and monopsony exist, policy practices can cause many unintended consequences. Therefore, an accurate analysis of the given structure and policy sets for potential problems is required. In this context, it is a necessity to use multi-layered policy sets to avoid unintended consequences of minimum wage policies and increase policy effectiveness.

For future research, some of the assumptions made by the model can be modified and the model can be improved to become more complex. For example, the assumptions that firms have constant returns to scale and the lack of information frictions can be reviewed and improved. Additionally, the model can be reconstructed to be a dynamic model. At the same time, instead of a one-time matching between firms and workers, a structure can be created in which the matching is repeated at every step. There are also limitations in the study due to the lack of data. For example, the absence of a public use matched worker-firm data prevents access to the insights and findings that can be obtained from such data. Another deficiency in terms of data is the lack of a satisfactory data set to correspond to valuation. In future research, the valuation of workers can be defined by various human capital variables, especially education and experience or it can be estimated by analytical methods.

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APPENDIX 1: ADDITIONAL FIGURES AND TABLES FOR MINIMUM WAGE POLICY

Table 22: Descriptive Statistics of Wages in Benchmark Calibration and After Minimum Wage Policy

All Workers				
Value	After Policy (\$9.00)		Benchmark Calibration (\$7.25)	
Mean	34.45		35.63	
Standard Deviation	28.98		29.71	
Variance	840.08		882.44	
Median	27.96		29.06	
Maximum	393.62		393.94	
Minimum	3.92		3.92	
Formal and Informal Workers				
	Formal		Informal	
Value	After Policy (\$9.00)	Benchmark Calibration (\$7.25)	After Policy (\$9.00)	Benchmark Calibration (\$7.25)
Mean	47.28	40.07	23.67	19.63
Standard Deviation	38.22	32.00	8.03	6.84
Variance	1460.90	1023.73	64.55	46.76
Median	41.47	33.32	22.97	18.59
Maximum	393.62	393.94	78.42	63.47
Minimum	9.00	7.25	3.92	3.92

Notes: While there is a decrease in the mean and median wages of all workers, when workers are separated into formal and informal, an increase in wages is observed in both groups. This situation is due to the increasing number of firms and workers shifting to informality and the changing composition of worker groups.

Table 23: Descriptive Statistics of Firm Productivity and Firm Size by Formal and Informal Firms Before After the Minimum Wage Policy

Firm Productivity					
Benchmark Calibration			After the Minimum Wage Policy		
Value	Formal Firms	Informal Firms	Value	Formal Firms	Informal Firms
Mean	32.11	25.86	Mean	32.42	28.50
Standard Deviation	36.44	8.52	Standard Deviation	40.16	11.11
Variance	1327.60	72.64	Variance	1612.60	123.46
Median	22.31	23.74	Median	21.19	25.44
Maximum	732.67	78.53	Maximum	732.67	111.02
Minimum	15.00	15.10	Minimum	15	15.10
Firm Size					
Benchmark Calibration			After the Minimum Wage Policy		
Value	Formal Firms	Informal Firms	Value	Formal Firms	Informal Firms
Mean	22.78	36.51	Mean	16.52	42.85
Standard Deviation	160.78	95.18	Standard Deviation	154.59	147.76
Variance	25850.00	9059.10	Variance	2389.70	2183.20
Median	2	12	Median	1	10
Maximum	4842	1375	Maximum	4842	2516
Minimum	1	2	Minimum	1	2

Notes: Due to relatively productive firms shifting to informality, the average productivity of informal firms has increased when the average productivity of formal firms increased slightly. After the policy, the average firm size of the informal firms increased while the average firm size of formal firms decreased.

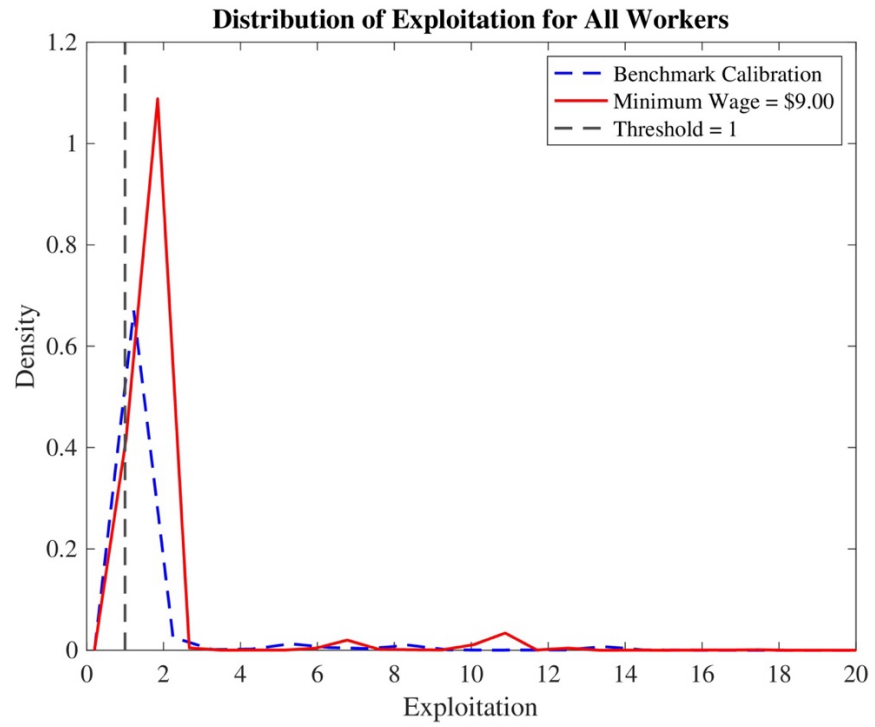


Figure 17: Distribution of Exploitation for All Workers Before and After Minimum Wage Policy

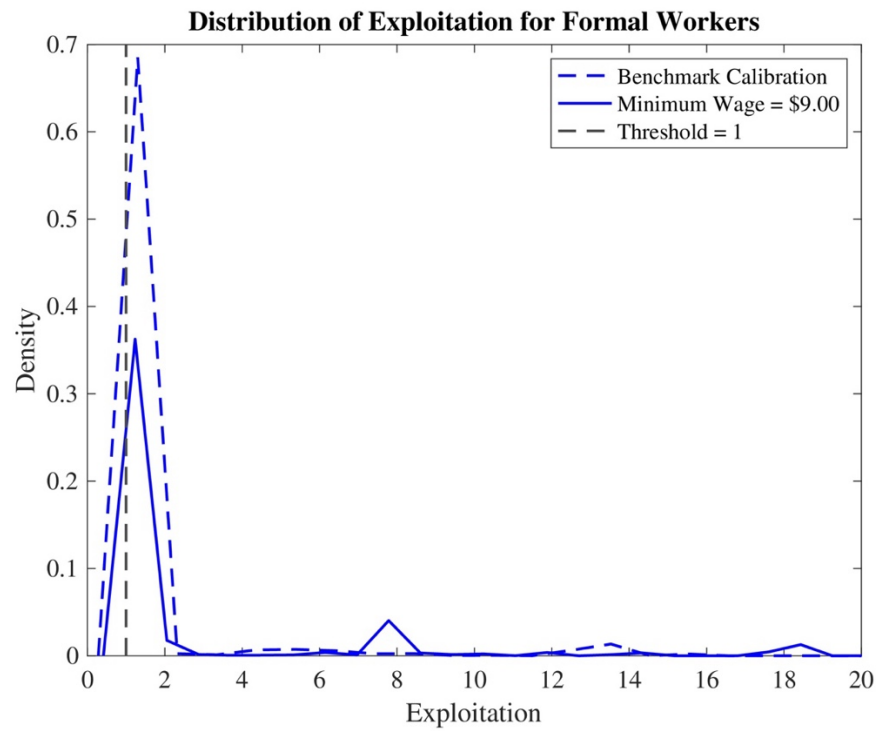


Figure 18: Distribution of Exploitation for Formal Workers Before and After Minimum Wage Policy

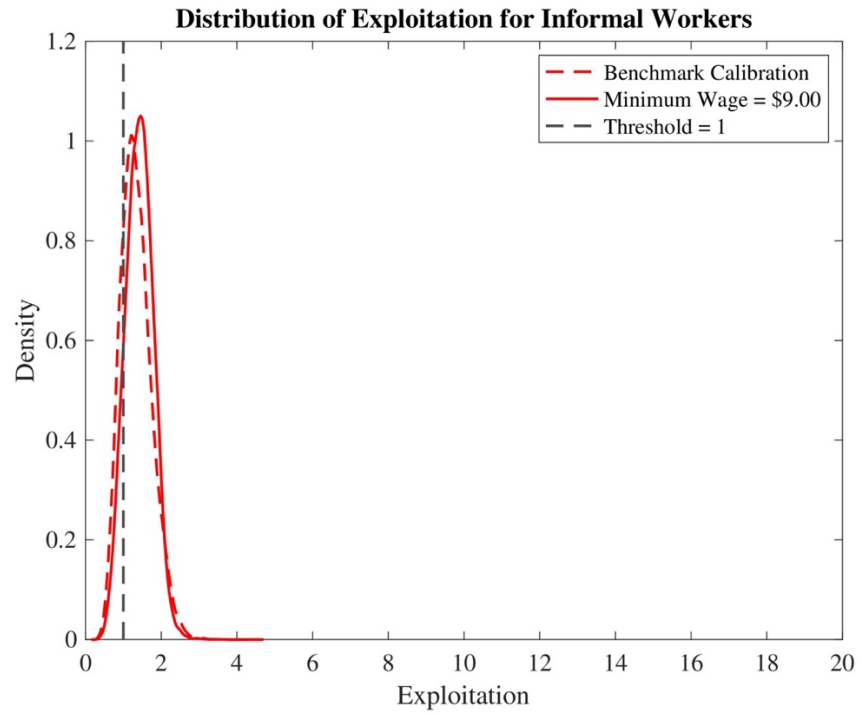


Figure 19: Distribution of Exploitation for Informal Workers Before and After Minimum Wage Policy

APPENDIX 2: ADDITIONAL FIGURES AND TABLES FOR THE FIRST POLICY MIX

Table 24: Descriptive Statistics of Wages in Benchmark Calibration and After the First Policy Mix

All Workers				
Value	After Policy (\$9.00)		Benchmark Calibration (\$7.25)	
Mean	33.73		35.63	
Standard Deviation	29.37		29.71	
Variance	862.63		882.44	
Median	27.46		29.06	
Maximum	393.62		393.94	
Minimum	3.92		3.92	
Formal and Informal Workers				
	Formal		Informal	
Value	After Policy (\$9.00)	Benchmark Calibration (\$7.25)	After Policy (\$9.00)	Benchmark Calibration (\$7.25)
Mean	36.44	40.07	18.02	19.63
Standard Deviation	30.90	32.00	6.43	6.84
Variance	954.54	1023.73	41.38	46.76
Median	30.44	33.32	16.96	18.59
Maximum	393.62	393.94	65.78	63.47
Minimum	9.00	7.25	3.92	3.92

Notes: Since shifts to informality are limited by policy mix, unlike the minimum wage policy, both the average wages of all workers and the average wages of worker groups separated as formal and informal have decreased. A significant decrease is observed in formal workers.

Table 25: Descriptive Statistics of Firm Productivity and Firm Size by Formal and Informal Firms Before After the First Policy Mix

Firm Productivity					
Benchmark Calibration			After the Minimum Wage Policy		
Value	Formal Firms	Informal Firms	Value	Formal Firms	Informal Firms
Mean	32.11	25.86	Mean	32.90	22.44
Standard Deviation	36.44	8.52	Standard Deviation	36.71	6.05
Variance	1327.60	72.64	Variance	1347.40	36.60
Median	22.31	23.74	Median	23.17	20.99
Maximum	732.67	78.53	Maximum	732.67	79.61
Minimum	15.00	15.10	Minimum	15.00	15.10
Firm Size					
Benchmark Calibration			After the Minimum Wage Policy		
Value	Formal Firms	Informal Firms	Value	Formal Firms	Informal Firms
Mean	22.78	36.51	Mean	25.31	22.25
Standard Deviation	160.78	95.18	Standard Deviation	165.29	58.29
Variance	25850.00	9059.10	Variance	27321.00	3397.30
Median	2	12	Median	2	7
Maximum	4842	1375	Maximum	4842	710
Minimum	1	2	Minimum	1	2

Notes: Due to relatively productive informal firms shifting to formality, the average productivity of informal firms has decreased when the average productivity of formal firms increased slightly. After the policy, the average firm size of the informal firms decreased significantly while the average firm size of formal firms increased.

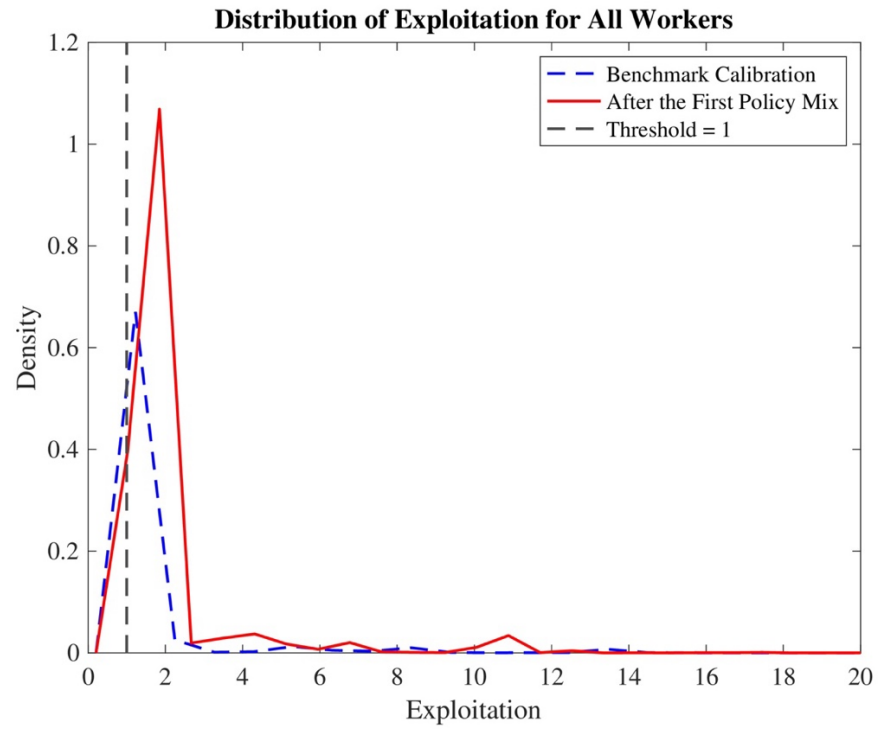


Figure 20: Distribution of Exploitation for All Workers Before and After the First Policy Mix

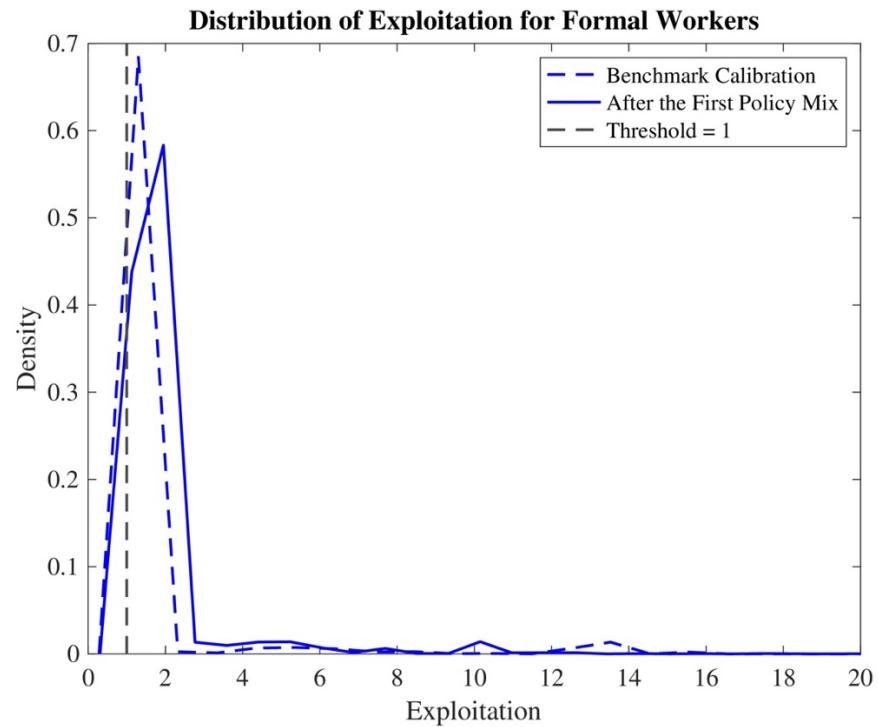


Figure 21: Distribution of Wages for Formal Workers Before and After the First Policy Mix

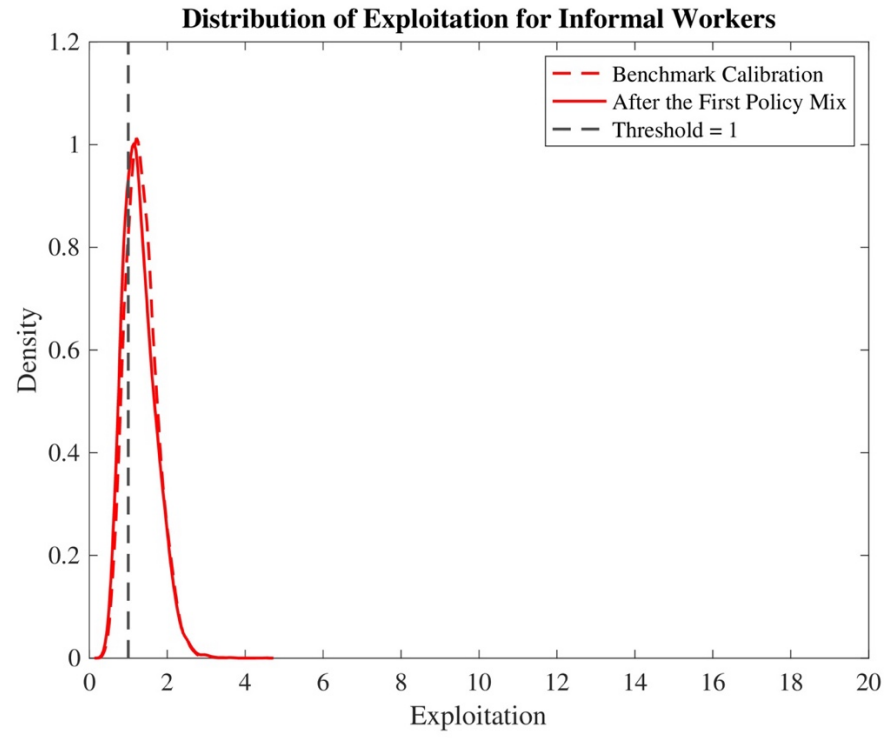


Figure 22: Distribution of Wages for Informal Workers Before and After the First Policy Mix

APPENDIX 3: ADDITIONAL FIGURES AND TABLES FOR THE SECOND POLICY MIX

Table 26: Descriptive Statistics of Wages in Benchmark Calibration and After the Second Policy Mix

All Workers				
Value	After Policy (\$9.00)		Benchmark Calibration (\$7.25)	
Mean	41.18		35.63	
Standard Deviation	40.50		29.71	
Variance	1639.93		882.44	
Median	31.87		29.06	
Maximum	537.14		393.94	
Minimum	4.31		3.92	
Formal and Informal Workers				
	Formal		Informal	
Value	After Policy (\$9.00)	Benchmark Calibration (\$7.25)	After Policy (\$9.00)	Benchmark Calibration (\$7.25)
Mean	44.97	40.07	19.27	19.63
Standard Deviation	42.64	32.00	6.69	6.84
Variance	1818.22	1023.73	44.77	46.76
Median	36.03	33.32	18.19	18.59
Maximum	537.14	393.94	78.28	63.47
Minimum	9.00	7.25	4.31	3.92

Notes: After the Second Policy Mix, there is a significant increase in the mean wages of all workers. When workers are considered separately as formal and informal, a very small decrease is observed in the average wage of informal workers, while a significant increase is observed in the wage of formal workers. This situation can be explained by the increase in bargaining power as well as the shift of relatively more productive informal firms to formality.

Table 27: Descriptive Statistics of Firm Productivity and Firm Size by Formal and Informal Firms Before After the Second Policy Mix

Firm Productivity					
Benchmark Calibration			After the Minimum Wage Policy		
Value	Formal Firms	Informal Firms	Value	Formal Firms	Informal Firms
Mean	32.11	25.86	Mean	32.90	22.44
Standard Deviation	36.44	8.52	Standard Deviation	36.71	6.05
Variance	1327.60	72.64	Variance	1347.40	36.60
Median	22.31	23.74	Median	23.17	20.99
Maximum	732.67	78.53	Maximum	732.67	79.61
Minimum	15.00	15.10	Minimum	15.00	15.10
Firm Size					
Benchmark Calibration			After the Minimum Wage Policy		
Value	Formal Firms	Informal Firms	Value	Formal Firms	Informal Firms
Mean	22.78	36.51	Mean	25.31	22.25
Standard Deviation	160.78	95.18	Standard Deviation	165.29	58.29
Variance	25850.00	9059.10	Variance	27321.00	3397.30
Median	2	12	Median	2	7
Maximum	4842	1375	Maximum	4842	710
Minimum	1	2	Minimum	1	2

Notes: As in the First Policy Mix, due to relatively productive informal firms shifting to formality, the average productivity of informal firms has decreased when the average productivity of formal firms increased slightly. After the policy, the average firm size of the informal firms decreased significantly while the average firm size of formal firms increased.

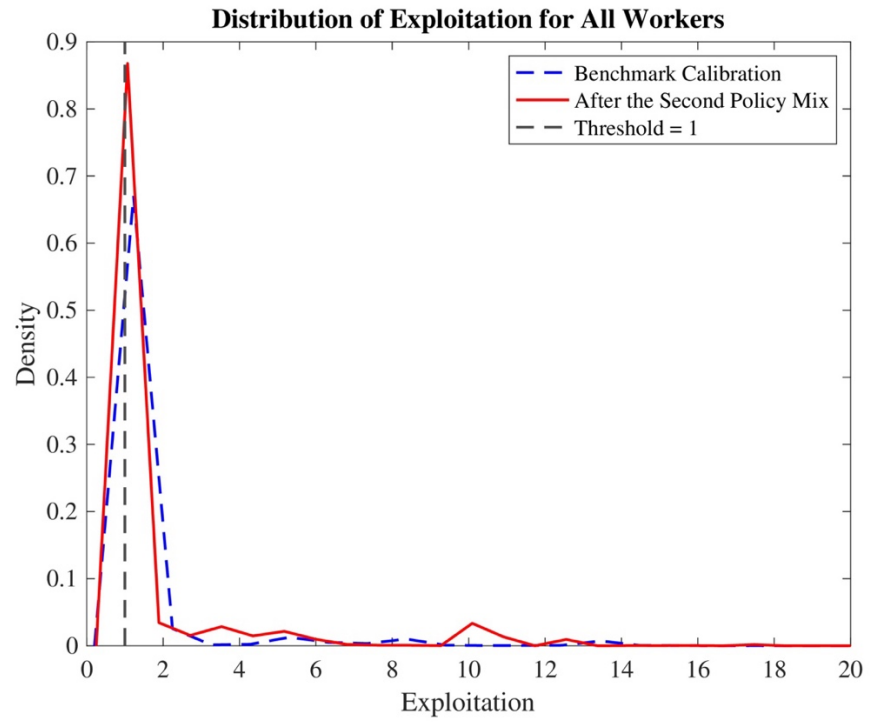


Figure 23: Distribution of Exploitation for All Workers Before and After the Second Policy Mix

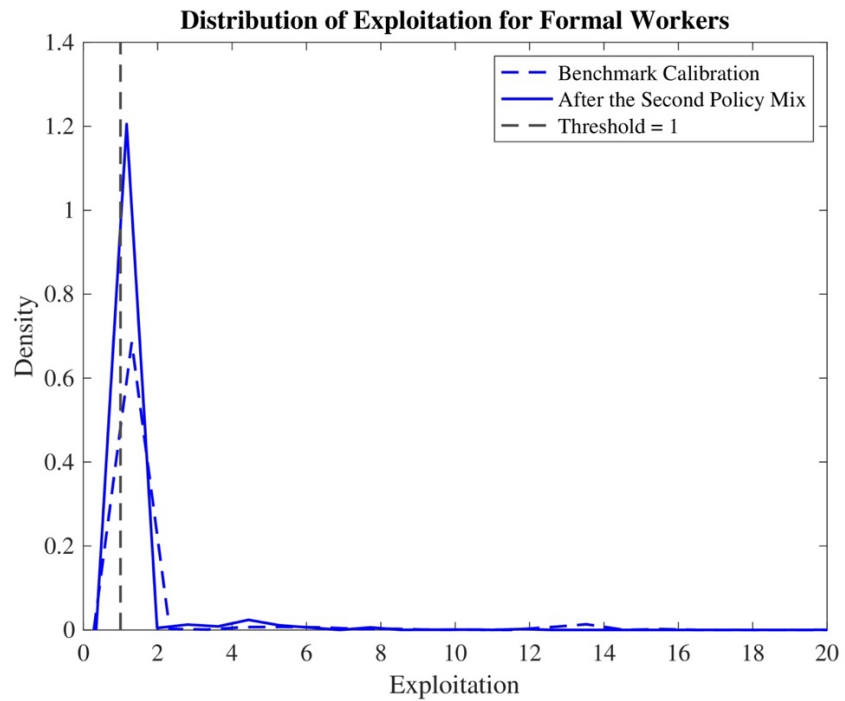


Figure 24: Distribution of Exploitation for Formal Workers Before and After the Second Policy Mix

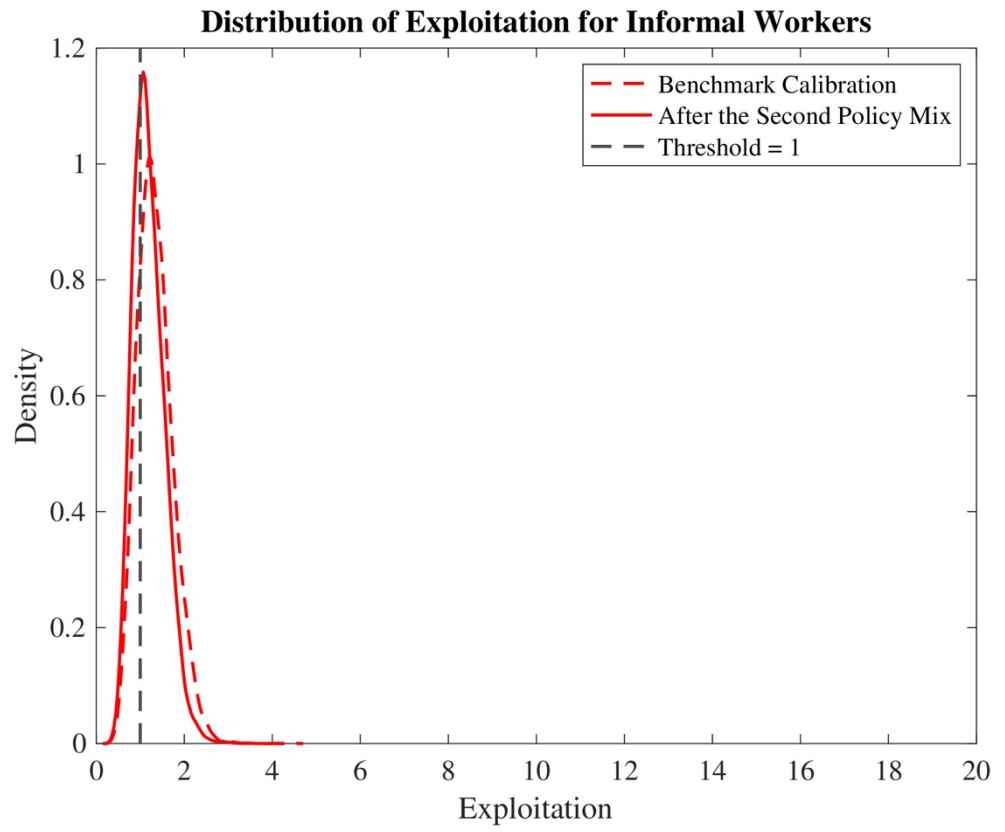


Figure 25: Distribution of Exploitation for Informal Workers Before and After the Second Policy Mix

APPENDIX 4: ETHICS COMISSION FORM

	HACETTEPE ÜNİVERSİTESİ SOSYAL BİLİMLER ENSTİTÜSÜ	Doküman Kodu Form No.	FRM-YL-09
		Yayın Tarihi Date of Pub.	22.11.2023
	FRM-YL-09	Revizyon No Rev. No.	02
	Yüksek Lisans Tezi Etik Kurul Muafiyeti Formu <i>Ethics Board Form for Master's Thesis</i>	Revizyon Tarihi Rev.Date	25.01.2024

**HACETTEPE ÜNİVERSİTESİ
SOSYAL BİLİMLER ENSTİTÜSÜ
İKTİSAT (İNGİLİZCE) ANABİLİM DALI BAŞKANLIĞINA**

Tarih: 04/06/2024

Tez Başlığı (Türkçe): Neoklasik Sömürü: Heterojen Firmalar ve İşçilerle Bir Pazarlık Modeli
Tez Başlığı (Almanca/Fransızca)*:

Yukarıda başlığı verilen tez çalışmam:

1. İnsan ve hayvan üzerinde deney niteliği taşımamaktadır.
2. Biyolojik materyal (kan, idrar vb. biyolojik sıvılar ve numuneler) kullanılmasını gerektirmemektedir.
3. Beden bütünlüğüne veya ruh sağlığına müdahale içermemektedir.
4. Anket, ölçek (test), mülakat, odak grup çalışması, gözlem, deney, görüşme gibi teknikler kullanılarak katılımcılardan veri toplanmasını gerektiren nitel ya da nicel yaklaşımlarla yürütülen araştırma niteliğinde değildir.
5. Diğer kişi ve kurumlardan temin edilen veri kullanımını (kitap, belge vs.) gerektirmektedir. Ancak bu kullanım, diğer kişi ve kurumların izin verdiği ölçüde Kişisel Bilgilerin Korunması Kanuna riayet edilerek gerçekleştirilecektir.

Hacettepe Üniversitesi Etik Kurullarının Yönergelerini inceledim ve bunlara göre çalışmamın yürütülebilmesi için herhangi bir Etik Kuruldan izin alınmasına gerek olmadığını; aksi durumda doğabilecek her türlü hukuki sorumluluğu kabul ettiğimi ve yukarıda vermiş olduğum bilgilerin doğru olduğunu beyan ederim.

Gereğini saygılarımla arz ederim.

Volkan AHISKALI

Öğrenci Bilgileri	Ad-Soyad	Volkan AHISKALI
	Öğrenci No	N21138877
	Enstitü Anabilim Dalı	İktisat (İngilizce)
	Programı	İktisat (İngilizce) Tezli Yüksek Lisans

DANIŞMAN ONAYI

Doç. Dr. Mustafa Aykut ATTAR

UYGUNDUR.

	HACETTEPE ÜNİVERSİTESİ SOSYAL BİLİMLER ENSTİTÜSÜ	Doküman Kodu Form No.	FRM-YL-09
		Yayın Tarihi Date of Pub.	22.11.2023
	FRM-YL-09 Yüksek Lisans Tezi Etik Kurul Muafiyeti Formu <i>Ethics Board Form for Master's Thesis</i>	Revizyon No Rev. No.	02
		Revizyon Tarihi Rev.Date	25.01.2024

HACETTEPE UNIVERSITY GRADUATE SCHOOL OF SOCIAL SCIENCES DEPARTMENT OF ECONOMICS	
Date: 04/06/2024	
ThesisTitle (In English): Neoclassical Exploitation: A Bargaining Model with Heterogeneous Firms and Workers My thesis work with the title given above:	
<ol style="list-style-type: none"> Does not perform experimentation on people or animals. Does not necessitate the use of biological material (blood, urine, biological fluids and samples, etc.). Does not involve any interference of the body's integrity. Is not a research conducted with qualitative or quantitative approaches that require data collection from the participants by using techniques such as survey, scale (test), interview, focus group work, observation, experiment, interview. Requires the use of data (books, documents, etc.) obtained from other people and institutions. However, this use will be carried out in accordance with the Personal Information Protection Law to the extent permitted by other persons and institutions. 	
I hereby declare that I reviewed the Directives of Ethics Boards of Hacettepe University and in regard to these directives it is not necessary to obtain permission from any Ethics Board in order to carry out my thesis study; I accept all legal responsibilities that may arise in any infringement of the directives and that the information I have given above is correct.	
I respectfully submit this for approval.	
Volkan AHISKALI	

Student Information	Name-Surname	Volkan AHISKALI
	Student Number	N21138877
	Department	Economics
	Programme	Master of Arts in Economics

SUPERVISOR'S APPROVAL

Associate Professor Mustafa Aykut ATTAR

APPROVED

APPENDIX 5: ORIGINALITY REPORT

	HACETTEPE ÜNİVERSİTESİ SOSYAL BİLİMLER ENSTİTÜSÜ	Doküman Kodu Form No.	FRM-YL-15
		Yayın Tarihi Date of Pub.	04.12.2023
	FRM-YL-15 Yüksek Lisans Tezi Orijinallik Raporu <i>Master's Thesis Dissertation Originality Report</i>	Revizyon No Rev. No.	02
		Revizyon Tarihi Rev.Date	25.01.2024

HACETTEPE ÜNİVERSİTESİ SOSYAL BİLİMLER ENSTİTÜSÜ İKTİSAT (İNGİLİZCE) ANABİLİM DALI BAŞKANLIĞINA
Tarih: 26/06/2024
Tez Başlığı: Neoklasik Sömürü: Heterojen Firmalar ve İşçilerle Bir Pazarlık Modeli Tez Başlığı (Almanca/Fransızca)*:.....
Yukarıda başlığı verilen tezin a) Kapak sayfası, b) Giriş, c) Ana bölümler ve d) Sonuç kısımlarından oluşan toplam 79 sayfalık kısmına ilişkin, 26/06/2024 tarihinde şahsım tarafından Turnitin adlı intihal tespit programından aşağıda işaretlenmiş filtrelemeler uygulanarak alınmış olan orijinallik raporuna göre, tezin benzerlik oranı % 6'dır.
Uygulanan filtrelemeler*:
1. <input checked="" type="checkbox"/> Kabul/Onay ve Bildirim sayfaları hariç
2. <input checked="" type="checkbox"/> Kaynakça hariç
3. <input checked="" type="checkbox"/> Alıntılar hariç
4. <input type="checkbox"/> Alıntılar dâhil
5. <input checked="" type="checkbox"/> 5 kelimedenden daha az örtüşme içeren metin kısımları hariç
Hacettepe Üniversitesi Sosyal Bilimler Enstitüsü Tez Çalışması Orijinallik Raporu Alınması ve Kullanılması Uygulama Esasları'nı inceledim ve bu Uygulama Esasları'nda belirtilen azami benzerlik oranlarına göre tezin herhangi bir intihal içermediğini; aksinin tespit edileceği muhtemel durumlarda doğabilecek her türlü hukuki sorumluluğu kabul ettiğimi ve yukarıda vermiş olduğum bilgilerin doğru olduğunu beyan ederim.
Gereğini saygılarımla arz ederim.
Volkan AHISKALI

Öğrenci Bilgileri	Ad-Soyad	Volkan AHISKALI
	Öğrenci No	N21138877
	Enstitü Anabilim Dalı	İktisat (İngilizce)
	Programı	İktisat (İngilizce) Tezli Yüksek Lisans

DANIŞMAN ONAYI

Associate Professor Mustafa Aykut ATTAR
UYGUNDUR.

	HACETTEPE ÜNİVERSİTESİ SOSYAL BİLİMLER ENSTİTÜSÜ	Doküman Kodu Form No.	FRM-YL-15
		Yayın Tarihi Date of Pub.	04.12.2023
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TO HACETTEPE UNIVERSITY
GRADUATE SCHOOL OF SOCIAL SCIENCES
DEPARTMENT OF ECONOMICS

Date: 26/06/2024

Thesis Title (In English): Neoclassical Exploitation: A Bargaining Model with Heterogeneous Firms and Workers

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Kindly submitted for the necessary actions.

Volkan AHISKALI

Student Information	Name-Surname	Volkan AHISKALI
	Student Number	N21138877
	Department	Economics
	Programme	Master of Arts in Economics

SUPERVISOR'S APPROVAL

Associate Professor Mustafa Aykut ATTAR
APPROVED