Distributional Effects of Inflation in the Labor Market, Evidence From a Big Shock[*]

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Abstract

I propose and test a new mechanism for the distributional effects of inflation through the labor market. Using a natural experiment (sanctions) and household and firm level data in Iran, I show that after a sudden rise in inflation, women's wages rise less than those of (comparable) men. This can be attributed to the fact that women are less likely to bargain for higher wages than men during the renegotiation process that follows an inflation shock. I provide evidence for this explanation by showing that: 1) the effect is not present among women who work as freelancers; 2) it is more pronounced in the private sector; and 3) women's wages are negatively correlated with firm profits while men's are not. I interpret these findings as indicating a short-term redistribution from workers with weak bargaining power to firms, resulting from an inflation shock.

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1 Introduction

Almost all economists agree with Friedman (1968) on the fact that:

> "Our economic system will work best when producers and consumers, employers and employees, can proceed with full confidence that the average level of prices will behave in a known way in the future-preferably that it will be highly stable."

In short, stable and low inflation rate is crucial for a healthy economy. But what are the (welfare and distributional) consequences if the inflation is high and/or volatile? This paper explores an understudied mechanism by which inflation shocks can cause redistribution in the labor market.

Assume an economy with anchored and stable inflation. It is perfectly clear to workers how much pay raise they should ask for, and wages are set accordingly. Now if an inflation shock hits the economy, workers and employers need to renegotiate wages. If the magnitude of the inflation shock is not exactly known at the moment the inflation shock hits the economy, there is no single number that everyone knows that they should ask for. As a result, workers with higher bargaining power or tendency may be able to receive higher pay raises, while firms may take advantage of this uncertainty to raise the wages of those who do not bargain hard by a smaller amount than others.

While this difference in bargaining power/tendency may be present among many different groups, in this paper, I focus on this difference among men and women. Aside from its own importance, this has identification benefits that will be discussed in section 4. There is both lab and real-world evidence that suggests women are less likely to negotiate and bargain for higher pay. (Biasi and Sarsons 2022; Babcock and Laschever 2003; Dittrich et al. 2014; Exley et al. 2020). Given these pieces of evidence, as well as the suggested mechanism, I aim to investigate whether an inflation shock has the potential to exacerbate the gender pay gap in an economy.

I test this mechanism using a quasi-natural experiment in Iran. Following the US withdrawal from the nuclear deal and implementation of sanctions in 2018, the inflation - which was previously low and stable- jumped more than 40% and remained high and volatile till the current date (Figure 1).

Using the public data from "Household Income and Expenditure Survey" and administrative data from the "Survey of Manufacturing Firms" I compare the labor income of men and women, before and after the 2018 sanctions to estimate the effect of this big inflation shock on the (adjusted) wage difference between men and women.
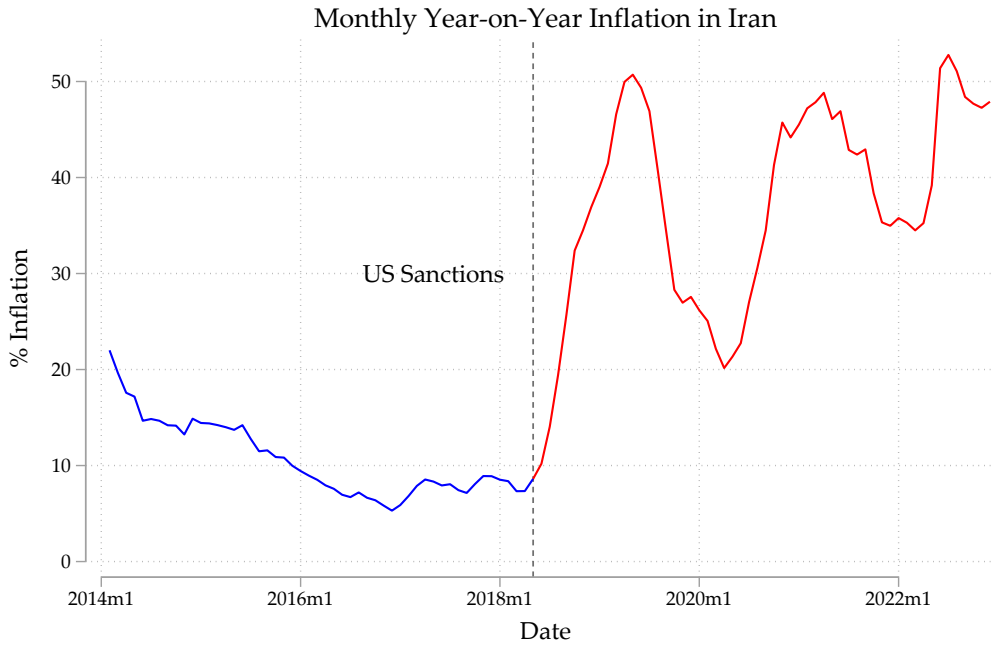
Figure 1: Monthly year-on-year inflation before and after 2018 sanctions

The main result is that prior to the inflation shock, there was no significant difference in the (adjusted) wage growth rate between men and women. However, following the high and volatile inflation, women's wages grew significantly less than men's. This result is identified using both our data sets for households and firms.[1]

I use two main strategies for estimating the effect of high and volatile inflation. First I show that controlling for other confounders and general trends in the economy, one percentage increase in inflation increases the labor income of women significantly less than men. I further show that this difference is only significant when I include the years of high and volatile inflation in our sample. Second, I estimate the adjusted gender pay gap in each year separately and show that it is only significant in the year after the inflation shock.

To support the suggested mechanism, I use three different methods. First, if the increase in the gender pay gap is really caused by uncertain inflation and lower bargaining participation by women, Then this effect shouldn't be seen among self-employed/freelancer women. These workers are free to reset their wages as frequently as they want (as they observe the new level of inflation) and do not have to negotiate their wages with a

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[1]As will be discussed in section 3, our data on firms stop at 2013, thus doesn't allow us to identify the effect of 2018 sanctions. I use a similar natural experiment caused by sanctions in 2012.

boss. Consistent with this, I show that the effect of inflation on the gender pay gap is small and insignificant among self-employed workers.

Second, we know that bargaining over wages is much more common in the private sector compared to the public sector; in the public sector, there are more well-defined rules for how much employees' salaries should be raised based on their experience and role, regardless of their gender. I show that this is also true in the data. The effect of the high inflation on the gender pay gap is driven by private sector workers.

Lastly, I take the distributional effects of this mechanism seriously. If firms are paying less to female workers than their male counterparts, controlling for confounding variables, we should be able to see a negative association between firm profits and the wage they pay to their female workers (In the period(s) after inflation shock). I use the data on manufacturing firms and show that controlling for a carefully chosen set of variables, while there is no correlation between men's wages and firms' profits, there is a negative correlation between women's wages and profits. I, cautiously, interpret it as the distributional effect of inflation shock in the labor market.

This paper is connected to three branches of literature. The first one is the distributional effects of inflation. Many papers have pointed to the distributional effect of inflation via its effect on asset prices (Doepke and Schneider 2006; Cardoso et al. 2022; Del Canto et al. 2023). Another strand of papers suggests the idea that inflation affects different income groups differently because of differences in consumption baskets (Jaravel 2021). I contribute to this literature by providing evidence on a labor market channel of distributional effects of inflation.[2]

A second pertinent strand of literature examines survey evidence on people's expectations and reactions during high inflation periods. Notably, two recent papers, Pilossoph and Ryngaert (2022) and Hajdini et al. (2023), are particularly relevant to this study. Hajdini et al. (2023) find that expected inflation only translates into a 20 percent increase in expected income growth. Crucially for my study, this pass-through effect is more pronounced among higher-income groups and *men*. Pilossoph and Ryngaert (2022) also demonstrates that individuals anticipate a decrease in their real wages if they stay in their current jobs amidst rising inflation.[3]

The third branch is the study of the causes and consequences of differences in labor

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[2]This mechanism is somehow related to the idea that inflation is a result of disagreement on wages and prices, by Lorenzoni and Werning (2023).

[3]Another related study by Jain et al. (2022), uses the Canadian Survey of Consumer Expectations and highlights the weak correlation between households inflation expectations and wage growth expectations, indicating a limited pass-through from consumers inflation expectations to their expected wage gains.

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market outcomes of men and women. A voluminous literature investigates the different causes of the labor force participation gap. Various studies have established a correlation between female participation and several economic factors. For instance, Heathcote et al. (2017) linked changes in female participation to economic growth, while Albanesi and Şahin (2018) associated it with unemployment. Moreover, business cycles have been shown to influence female participation, as observed by Albanesi (2019) and Fukui et al. (2023). Peters and Walsh (2019) also suggest a decline in dynamism as another factor affecting female participation. I contribute to this literature by first, focusing on the gender pay gap instead of the gender participation gap, and also by suggesting a new cause, macroeconomic volatility as the driver of the gap.[4]

2 Background

2.1 Inflation

Iran is a special country when it comes to inflation. Over the last 5 decades, average inflation has been over 25% and for most of the years, the country has experienced double digit inflation. Figure 2 shows monthly year-on-year inflation over the last two decades.

This high and persistent inflation is often attributed to the government running considerable budget deficits continuously. With the low or non-existent level of central bank Independence, fiscal dominance causes deficit monetizing, either directly or indirectly (borrowing from commercial banks).

2.2 Natural Experiment: Sanctions

2012 Sanctions

There are two jumps in inflation in Figure 1 which we will analyze in this paper, so it is worth giving some context about them. The first one happened in 2012, after the implementation of the US sanctions for Iran's nuclear program. Although Iran has been sanctioned for a long time (since 1979), this series of sanctions was completely different. First, although previous US sanctions banned only US entities from trading with Iran, these new sanctions asked all countries (their companies and banks) to stop

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[4]For papers focusing on pay discrimination, see Albanesi and Olivetti (2009), Flabbi (2010), and Amano-Patiño et al. (2020). None of these study the renegotiation after an inflation shock.
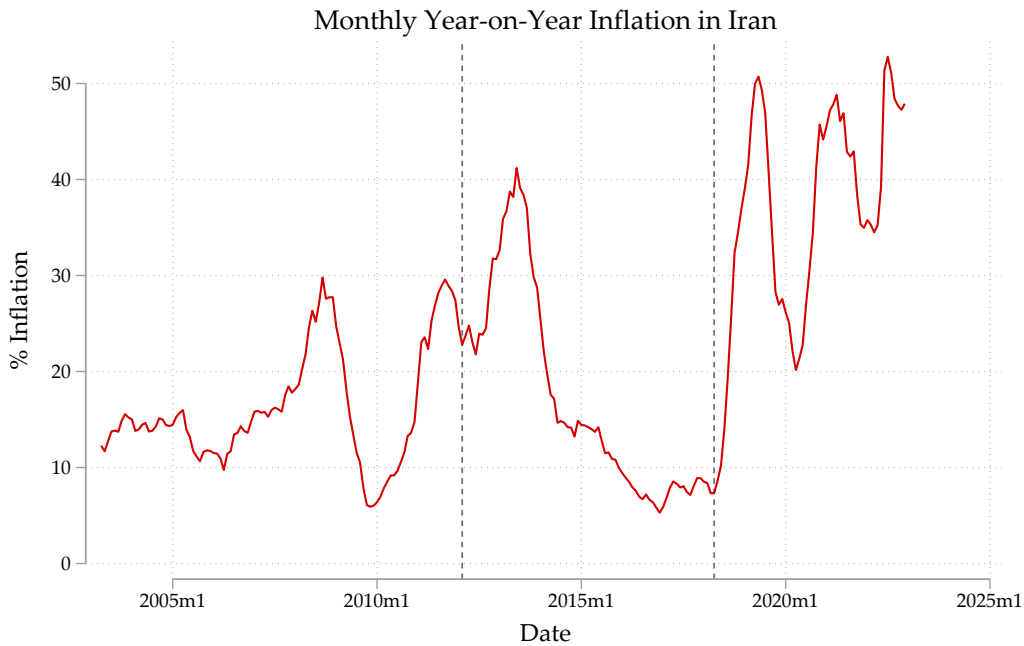
Figure 2: Monthly year-on-year inflation in Iran: 2003-2022.

Note: Vertical lines show the announcement of sanctions in 2012 and 2018

trading with Iran, or else be prepared to be sanctioned themselves. Secondly, it directly targeted Iran's oil extraction sector, with the aim of reducing the government's revenue from selling oil and other related products. After their implementation, the Iranian Rial depreciated sharply, and the inflation rate jumped to above 30%. The situation was ameliorated when President Rouhani's reformist government won the election in 2013, with the promise to negotiate with the West and lift the sanctions.

Controlled inflation period

With more optimistic expectations among the public about the government's future revenues and the general state of the economy after the election, inflation started to fall rapidly. After a nuclear deal, the Joint Comprehensive Plan of Action (JCPOA), was reached between Iran and the 6 world powers in 2015, the economy grew fast and inflation fell further. In particular, Inflation decreased to less than 10 percent in 2016 and 2017, which was a huge success for the government given the historical high and persistent inflation. Generally, the inflation was both low and stable between 2014 to 2017.

2018 Sanctions

On May 8, 2018, US President Donald Trump officially withdrew from the nuclear deal, announcing he would impose the harshest sanctions in history on Iran. Specifically, one of the main goals was to decrease Iran's oil exports to zero. At the same time, Rial depreciated very sharply and prices started to surge at a very high pace. between 2018 and 2022, in sharp contrast to the previous period, inflation has been both high and volatile. Figures 1 and 3 compare the periods 2014 to 2017 both in terms of inflation level and volatility.
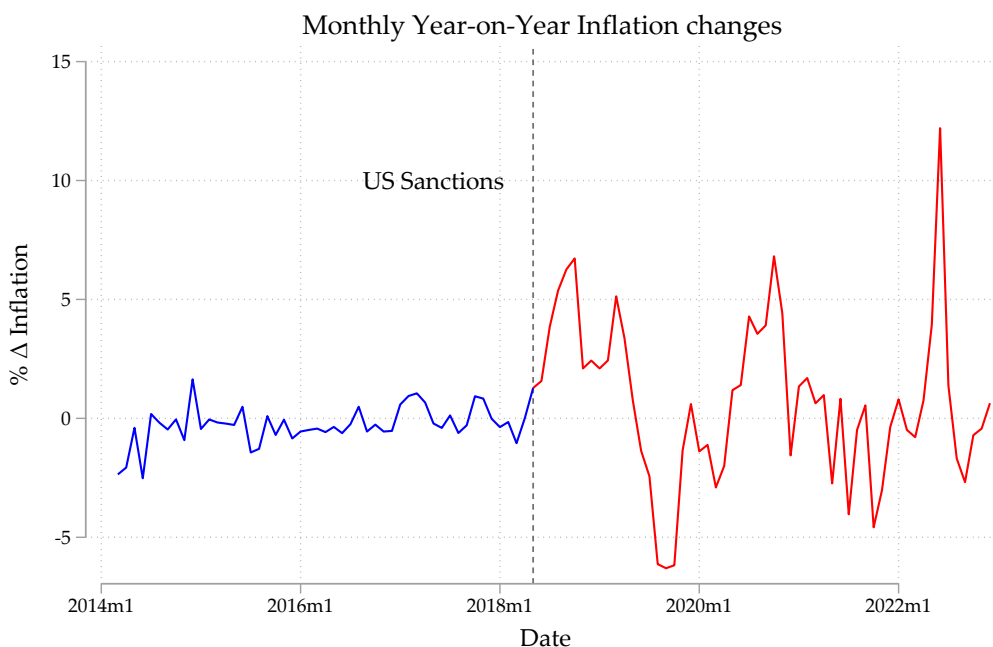

Figure 3: Changes in monthly year-on-year inflation before and after 2018 sanctions

As I will discuss in section 4, the identification strategy of this paper is essentially a difference-in-difference, comparing the outcomes of men and women, before and after the shock. One important question is which date should be selected as the beginning of the 'post' period in our difference-in-differences analysis? In particular, there are two prominent choices: When the sanctions were implemented and when the sanctions were announced (Typically months before their effective implementation.) I argue that since inflation is a forward-looking variable, we should use the announcement of sanctions as our start of the post period. One plausible objection is that people may have forecasted the sanctions before they were officially announced. Although there were

rumors about the US withdrawal from the JCPOA, inflation and other forward-looking variables (exchange rate, most importantly) did not show a huge increase before the announcement, so we can rule out this probability.

2.3 Labor Market

To be added.

3 Data

3.1 Household Data

My main data is coming from the "Survey of Household Income and Expenditure" which is conducted by the Statistical Centre of Iran. Around 12000 households in the whole country are paid by the government to record and report their consumption in very detailed categories, as well as their income by its source (wage income, non-wage income, interest, etc) in the last month and year. Given that there are no tax implications for reporting income, there is a reduced incentive to declare amounts lower than the actual earnings. Although it is supposed to be a rotating panel data, I mainly treat it as a repeated cross-section since the attrition rate is high.[5]

3.2 Firm Data

Our firm data comes from the Annual Survey of Iranian Manufacturing Plants conducted by the Statistical Centre of Iran. This data is administrative and confidential. Approximately 30,000 plants are surveyed annually, including most plants with more than ten employees and all plants with 50 or more employees. Plants are asked to report a wide range of variables, such as wages (by gender and by education), investments, sales, loans, and various expenditures. The data covers the period between 2003 to 2013.

4 Results

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[5]I cluster the standard errors at the household level as a robustness check.

4.1   Main Results

First I document the trend of gender pay gap by estimating the specification bellow using the household data:

$$\log(\text{wage}_{iot}) = \alpha + \delta Female_i + \beta_t I[year = t] \times Female_i + \lambda \omega_o + \varepsilon_{iot} \tag{1}$$

Where wage_{iot} is the hourly wage of individual i in occupation code o in year t, $I[year = t]$ is a dummy for year t, and $Female_i$ is a dummy equal to 1 for women and 0 for men. ω_o is also a set of dummy variables for occupation codes. By estimating the above specification, β_t will give us the adjusted difference between wages of men and women in each year. Figure 4 shows the results. I adjust for the constant part of the gender gap by controlling for the $female_i$, and the different concentrations of men and women in different occupations (and its effects on earnings) by controlling for occupation code fixed effects.
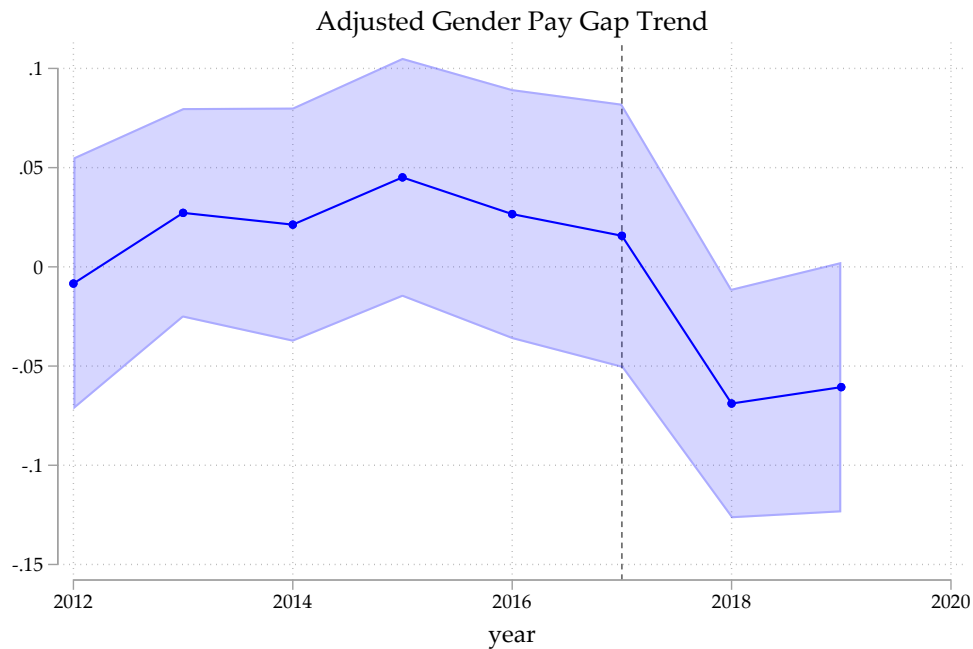

Figure 4: Dynamics of gender pay gap in Iran

Note: Vertical line shows the last year before the inflation shock. The shaded area represents the 95% confidence interval. Standard errors are clustered at the household level.

Figure 4 shows that consistent with what we expected, after the inflation shock in 2018, the (absolute value of the) gender pay gap increased.

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Now I focus on the effect of inflation. I first estimate the following specification:

$$\log(\text{wage}_{it}) = \alpha + \beta \log(CPI_t) \times Female_i + \lambda X_{it} + \gamma_t + \varepsilon_{it} \qquad (2)$$

Where CPI_t is the Consumer Price Index at the last month of year t, and X_{it} is a vector of other control variables, initially age and occupation code fixed effects. γ_t is also year fixed effect. Note that although CPI_t varies only between years, since I am interacting this with the female dummy, I can still control for time fixed effects.

In this specification, β estimates the unequal effect of one percent increase in CPI on men's and women's wages. If it is negative, then it means that when CPI rises by one unit, women's wages rise less than that of men. Since I am controlling for year fixed effect, we are absorbing all the variation in wages that are common between men and women (i.e I am controlling any macro shock, that has a homogeneous effect on both genders). Controlling for occupation fixed effects means that we are comparing men and women in the same occupation. (More precisely we are absorbing all constant differences between wages of people in different occupations)

Later, we will also add occupation-code-by-year fixed effects, to control for specific trends in occupations over time. In that specification, we will only use the deviation of individuals' wages from their occupation trend over time. Thus, if we assume that some other shocks (e.g. recessions) have heterogeneous effects on different sectors, and women are more concentrated in those sectors, as long as the effect of those shocks is equal on men and women workers, I am estimating the effect of inflation without bias. Table 1 shows the results for different control variables.

	(1) log(wage)	(2) log(wage)	(3) log(wage)
$Female_i$	0.283**	-0.0726	-0.0888
	(2.93)	(-0.97)	(-1.07)
$Female_i \times \log(CPI_t)$	0.0156	-0.0414*	-0.0373*
	(-0.75)	(2.56)	(2.09)
Occupation FE	No	Yes	Yes
Time FE	Yes	Yes	Yes
Occupation-by-year FE	No	No	Yes
Observations	52812	52811	52811

t statistics in parentheses. Standard errors are clustered at household level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 1: Unequal effect of inflation on women's wage

4.2 The Mechanism

I now provide evidence for the bargaining mechanism. First, I re-estimate the specification 1 using a sample of self-employed people in the household survey. Since these workers are free to set their wages without any need for negotiation with a boss, we expect not to see a rise in the gender pay gap in these individuals. The results are illustrated in Figure 5.
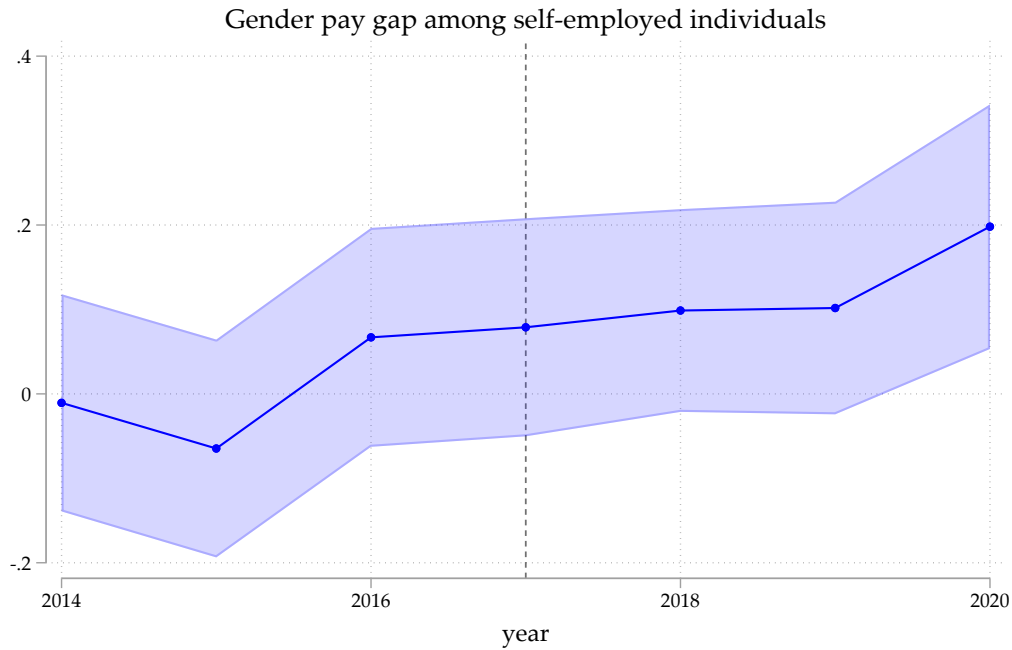

Figure 5: Dynamics of gender pay gap among self-employed workers

Note: Vertical line shows the last year before the inflation shock. The shaded area represents the 95% confidence interval.

Consistent with what we would expect, there is no rise in the gender gap after the inflation shock in this sample.

Second, bargaining over wages is mostly common in the private sector, whereas in the public sector there are specific rules for the increase in the salaries of workers based on criteria other than gender (role, education, experience, etc.). I re-estimate specification 2 while I add an extra interaction term as below

$$\log(\text{wage}_{it}) = \alpha + \beta \log(CPI_t) \times Female_i \times \text{Public}_{it} + \xi \text{Public}_{it} + \phi \text{Public}_{it} \times Female_i + \gamma_t + \varepsilon_{it}$$

$$(3)$$

	(1) log(wage)	(2) log(wage)
Female × Public=1 × log(CPI)	-0.0372	-0.0510*
	(-1.59)	(-2.57)
Female × Public=0 × log(CPI)	-0.0793*	-0.0650*
	(-2.21)	(-2.24)
Occupation FE	No	Yes
Time FE	Yes	Yes
Observations	52811	52811

t statistics in parentheses. Standard errors are clustered at household level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 2: Comparing the effect of inflation on wages in public and private sectors

Where Public_{it} is a dummy equal to one if individual i is working in the public sector at time t. Adding the extra interaction term will capture the unequal effect of inflation between men and women *and* between the public and private sectors. Table 2 shows the results. As seen in the first column, the coefficient for private sector workers is twice as large in absolute terms compared to that in the public sector, indicating a more severe unequal effect of inflation on women in the private sector.

Lastly, I directly test the suggested distribution from female workers to firm owners. If firms are paying their female employees less than the marginal product of labor, this gap could be identified either as an extra profit or extra wage for male workers. Here I focus on the firm side. (I show that the latter is not observed in the data in a forthcoming appendix).

The specifications are:

$$\text{Women Salary}_{it} = \alpha + \beta_1 \log(\text{real profit}_{it}) + \beta_2 \log(\text{real profit}_{it}) \times \pi_t + \gamma_i + \varepsilon_{it} \quad (4)$$

$$\text{Men Salary}_{it} = \alpha + \beta_1 \log(\text{real profit}_{it}) + \beta_2 \log(\text{real profit}_{it}) \times \pi_t + \gamma_i + \lambda X_{it} + \varepsilon_{it} \quad (5)$$

Where real profit is the real profit (revenue minus costs) of firm i in year t, and Women Salary is the real value of all the money firm paid to its female workers. I control for firm fixed effect in order to compare the same firm over time, alleviating concerns on endogeneity of wages and profits to firm-specific characteristics. If some firms/sectors always discriminate against women and pay them less than their men counterparts, that variation will not be used in our identification. Table 3 presents the results for β_1.

	(1)	(2)
	wage women	wage men
Real Profit$_{it}$	-0.00185***	-0.0273
	(-3.69)	(-1.11)
Firm FE	Yes	Yes
Time FE	Yes	Yes
Observations	34732	36660

t statistics in parentheses. Standard errors are clustered at ISIC4 level.
* $p < 0.05$, ** $p < 0.01$, *** $p < 0.001$

Table 3: Wages and firm profits: Men vs Women

This shows that a decrease in the salary a firm pays to its female workers is associated with a significant increase in its profits, while this is not the case for men. This can be interpreted as suggestive evidence for the short-term distribution from female workers to firm owners, caused by the inflation shock.

5 Conclusion

In this paper, I used a significant inflation shock in Iran and tested a new mechanism through which inflation causes a redistribution in the labor market, adversely affecting

the workers with less bargaining power/tendency. Following an inflation shock, negotiations between workers and employers become crucial to ensure that wages keep pace with rising prices. If so, (at least) In the short-run, workers like women who are less likely to bargain over their wages will fall behind. Consistent with this mechanism, I showed that after the inflation shock in 2018, women's wages grew significantly less than men's. I further provided evidence for the mechanism by showing that the effect is more pronounced among the workers in the private sector (where the bargain over wages is more common) and also by showing that there is no similar effect among self-employed workers who do not bargain over their wages with an employer.

References

Albanesi, Stefania (2019) "Changing business cycles: The role of women's employment,"Technical report, National Bureau of Economic Research.

Albanesi, Stefania and Claudia Olivetti (2009) "Home production, market production and the gender wage gap: Incentives and expectations," *Review of Economic dynamics*, 12 (1), 80–107.

Albanesi, Stefania and Ayşegül Şahin (2018) "The gender unemployment gap," *Review of Economic Dynamics*, 30, 47–67.

Amano-Patiño, Noriko, Tatiana Baron, and Pengpeng Xiao (2020) "Equilibrium wage-setting and the life-cycle gender pay gap."

Babcock, Linda and Sara Laschever (2003) *Women don't ask: Negotiation and the gender divide*: Princeton University Press.

Biasi, Barbara and Heather Sarsons (2022) "Flexible wages, bargaining, and the gender gap," *The Quarterly Journal of Economics*, 137 (1), 215–266.

Cardoso, Miguel, Clodomiro Ferreira, José Miguel Leiva, Galo Nuño, Álvaro Ortiz, Tomasa Rodrigo, and Sirenia Vazquez (2022) "The heterogeneous impact of inflation on households balance sheets," *Red Nacional de Investigadores en Economıa Working Paper*, 176.

Del Canto, Felipe N, John R Grigsby, Eric Qian, and Conor Walsh (2023) "Are Inflationary Shocks Regressive? A Feasible Set Approach,"Technical report, National Bureau of Economic Research.

Dittrich, Marcus, Andreas Knabe, and Kristina Leipold (2014) "Gender differences in experimental wage negotiations," *Economic Inquiry*, 52 (2), 862–873.

Doepke, Matthias and Martin Schneider (2006) "Inflation and the redistribution of nominal wealth," *Journal of Political Economy*, 114 (6), 1069–1097.

Exley, Christine L, Muriel Niederle, and Lise Vesterlund (2020) "Knowing when to ask: The cost of leaning in," *Journal of Political Economy*, 128 (3), 816–854.

Flabbi, Luca (2010) "Gender discrimination estimation in a search model with matching and bargaining," *International Economic Review*, 51 (3), 745–783.

Friedman, Milton (1968) "The Role of Monetary Policy," *The American Economic Review*, 58 (1), 1–17.

Fukui, Masao, Emi Nakamura, and Jón Steinsson (2023) "Women, wealth effects, and slow recoveries," *American Economic Journal: Macroeconomics*, 15 (1), 269–313.

Hajdini, Ina, Edward S Knotek, John Leer, Mathieu Pedemonte, Robert W Rich, and Raphael Schoenle (2023) "Low passthrough from inflation expectations to income growth expectations: why people dislike inflation."

Heathcote, Jonathan, Kjetil Storesletten, and Giovanni L Violante (2017) "The macroeconomics of the quiet revolution: Understanding the implications of the rise in womens participation for economic growth and inequality," *Research in Economics*, 71 (3), 521–539.

Jain, Monica, Olena Kostyshyna, and Xu Zhang (2022) "How do people view price and wage inflation?"Technical report, Bank of Canada Staff Working Paper.

Jaravel, Xavier (2021) "Inflation inequality: Measurement, causes, and policy implications," *Annual Review of Economics*, 13, 599–629.

Lorenzoni, Guido and Iván Werning (2023) "Inflation is conflict,"Technical report, National Bureau of Economic Research.

Peters, Michael and Conor Walsh (2019) "Declining dynamism, increasing markups and missing growth: The role of the labor force," *Increasing Markups and Missing Growth: The Role of the Labor Force (November 6, 2019)*.

Pilossoph, Laura and Jane M Ryngaert (2022) "Job Search, wages, and inflation."