

ECO499: UNDERGRADUATE THESIS

# Impact of change in labor composition on the gender wage gap of host countries

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Research Advisor  
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Respected Professor,

My paper, *Impact of change in labor composition on the gender wage gap of host countries* is presented in the submission for ECO 499: Undergraduate Thesis for your inspection. Kindly find the enclosure.

The purpose of the research conducted was to analyze how the gender wage gap is affected by the change in labor composition due to higher immigrant inflow. The analysis was conducted on OECD nations with gender wage gap as reported by the World Bank report. The data was collected from OECD and WDI Database over the years 2000 to 2016, given the availability of data on gender wage gap. The paper used panel fixed effects to analyze the plausible impacts.

The objective of the paper is to provide more into the existing literature of immigration and gender wage gap.

I would like to convey my gratefulness for having the opportunity to submit my paper to you. I would like to thank you for your patience with my paper.

Sincerely,

Afraim Karim

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Afraim Karim

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## Abstract

According to economic theory, gender wage gap is influenced by changing labor composition, whenever the laborers in the labor market are active and employed. The supply of female laborers can impact the gender wage gap in a nation, where the impact can be both positive and negative. The paper investigates whether the change in female labor supply due to higher female immigrant inflow has any impact on the gender wage gap of the host countries. Since female immigrant inflow has been on the rise compared to the past, the supply of female laborers within the labor market has been increasing as well. The paper uses fixed effects model to analyze the impact on gender wage gap caused by the labor force composition for females. No significant impact was observed on the gender wage gap of the host countries.

**Keyword:** Gender Wage Gap, Immigrant Inflow, Host countries

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## 1. Introduction

Historically gender wage inequality stems from gender inequality in all the other aspects (Parker and Aggleton, 2007). Studies on gender wage gap are widespread still the gap has been persistent over the years. According to Edo and Toubal (2016), the gap is often times related to the productivity of the labor and the unexplained discrimination that exists in the job market. However, the role of female immigration on gender wage gap has received less contemplation. As reported by United Nation Population Division (2013) approximately 50 percent of the immigrants around the world are females who tend to join the labor force, changing the supply of females in the labor market. The potential change in supply of females in the labor market affects the wage level in the labor market (Grusky, 2011), although the state of their current employment would determine the level of impact caused. There is a rising trend of female immigrants joining the labor force of the host countries (UNPD, 2013). Studies have been limited emphasizing on the role of female immigrant inflow and how much these female immigrants occupy the labor force composition in the host countries. Thus the paper attempts at analyzing how the gender wage gap is affected when the female immigrants in the labor market rise.

The paper has been motivated through the rising debate on immigrants replacing native laborers in the job market for low-skilled jobs (Constant, 2014). Moreover, the high rate of females immigrating mostly target the labor market for low-skilled jobs given their educational qualification (Hianmuller, Hiscox and Margalit, 2014). So the paper specifically looks into whether changes in female immigrant inflow affects the gender wage gap of the host country. The paper accounts for the low-skilled labor market by considering the female immigrants of lower educational qualification who have not completed more than their secondary education. Edo and Toubal (2016) report that the impact of female immigrants on gender wage gap can vary depending

on the educational qualification and the type of job targeted by the female immigrants. However, this paper only analyzes the impact on gender wage gap for laborers with lower educational qualification, taking into consideration that laborers for low skilled jobs are easily replaceable (Kalleberg, 2009), thus the incentive to cut down the existing gender wage gap with rising supply of female laborers might be low.

The previous studies on the issue is discussed in section 2, followed by the data and variable selection in section 3, methodology and model specification in section 4, results and discussion in section 5, conclusion in section 6 and appendix in section 7 respectively.

## 2. Literature review

There have been multiple studies on the plausible causes of gender wage gap. Altonji (1999) discusses how wages are always affected by the change in labor composition and participation. Whenever the female immigrants choose to join the labor force in the host countries, they are considered as a variable that can have an impact on the gender wage gap of the host nation, where the impact can be either positive or negative. Job suitability is a major deciding factor for employers while allocating their wages for their employees. Edo and Toubal (2016) in their study discuss how the wage gap changes with a change in the allocation of laborers in the labor market. As suggested by their study when the host countries have a high inflow of female immigrants, the wage gap for the upper income group, i.e. higher skilled jobs, decreases. Alternatively, the gender wage gap among lower income group, i.e. less skilled jobs, increases. This indicates that the substitutability among laborers determines the impact on gender wage gap. While for low skilled work, laborers are dispensable and the opportunity cost for the industry in replacing a laborer remains low, the opportunity cost for losing high skilled laborers is higher. Therefore employers

prefer giving higher wages, with low discrimination to the high skilled as suggested (Edo and Toubal, 2016)

On the contrary, Edo (2015) finds in his paper that the impact of higher immigrant inflow on the wage composition of the host nation remains insignificant. The inflow of female immigrants only induces change in terms of choices of employment. As he further elaborates, the choice of employment indicates that employers opt in for immigrant laborers more than native laborer since the female immigrants from lower educational qualification demand lower wages. Thus it propagates the idea that as the supply of female laborers increase for the low-skilled jobs, the substitutability of laborers in the low skilled jobs rise. Similarly, Dorantes and Rica (2007) conclude in their analysis that immigrants, both males and females, are more likely to be employed for laborers in low- skilled jobs provided the motivation of employers to keep immigrants in lower job positions than the natives. Even in situations where the immigrants are employed, they are offered lower wages, thus the gender wage gap for female immigrants tend to be higher than native female laborers.

Weichselbaumer and Ebmer (2005) discuss about the unequal endowment of resources, such as access to quality education and equal wages, in the labor market. They conclude that the countries with more diversified labor composition suffer from such unequal endowment of resources in the labor market more, where men are the highest beneficiaries of the unequal endowment. Immigrants diversify the labor markets further (Wilson and Portes, 1980), where the wage gap among genders rise for both the native and immigrant group.

Hainmuelle et Al. (2014) also discusses that immigration takes place due to the incentive to participate in the labor force of the host nation. In the case of female immigrants, observing how they have an impact on the gender wage gap is what the paper intends to substantiate on.



Gender wage gap was attributed to the skill level and qualification level difference among males and females. Becker (1993), along with Mincer (1974) and complementary literatures focused on the change over time due to the change in human capital accumulation between the two genders. As claimed by their studies, women gained greater access to education and more freedom to participate in the labor market overtime; this led to better training and skill development for women and narrowed down the gender wage gap significantly in the status quo when compared to the period of 1966, the time from which their dataset was collected. (Mincer and Polachek, 1974).

The role of the labor supply and changes in labor market due to immigrant inflow has received very low limelight. The paper attempts to contribute to the existing literature on gender wage gap and elaborate on investigating how gender wage gap changes when female immigrant inflow for low skilled labor market rises.

### 3. Data and variables

The data for the analysis is taken from two major sources, the OECD database and the WDI of World Bank. Gender wage gap, defined as the difference among male wage level and female wage level, number of female and total immigrant inflow variables were taken from OECD database, while indicators like unemployment and population variables were taken from WDI. The paper follows the World Bank report on gender wage gap and runs the analysis on 34 countries with existent gender wage gap. The countries include Australia, Austria, Belgium, Canada, Chile, Czech Republic, Denmark, Estonia, Finland, France, Germany, Greece, Hungary, Iceland, Ireland, Israel, Italy, Japan, South Korea, Luxembourg, Mexico, Netherlands, New Zealand, Norway, Poland, Portugal, Slovak Republic, Slovenia, Spain, Sweden, Switzerland, Turkey, United Kingdom and United States of America. The data has been taken for 17 years from a period of 2000-2016. The time period for the data has been chosen based on the availability of data and

whether gender wage gap was existent in the given countries during that time period. However, due to missing data, some of the years and countries were dropped during the analysis.

Since all the countries in the dataset have different demographic and economic set up, there is a large variance across all the countries present in the dataset. With a heterogeneous database, attaining biased estimators is highly likely. Thus the methodological setup of this paper attempts to deal with the heterogeneity present in the dataset. The variables used during the analysis are as follows:

### 3.1 Primary Variables of Interest:

#### Dependent Variable

##### Gender wage gap (GWG)

The dependent variable for the paper is the gender wage gap measure taken from OECD database. The variable is an unadjusted ratio of the difference between the median earnings of females and males relative to the median earnings of men. The earnings data is counted for individuals who are either full time employees or self-employed.

#### Primary explanatory Variables

##### Percentage of female immigrants out of the total population (Clabor)

Edo and Toubal (2016) discuss that a shift in the composition of labor force can have both positive and negative impact on the gender wage gap. The percentage of female immigrants with respect to the total population provides insight on how much of the economy in each of the nation has female immigrant workers. When there is a huge inflow of immigrants in the developed part of the world, the labor force composition changes, which will impact the gender wage gap as well. If

the proportion of immigrants compared to the whole labor force is very low, the existence of any effect is highly unlikely.

### Upper Secondary Education (USedF)

Edo and Toubal (2016) report that depending on the kind of job, the impact of higher immigrant inflow varies making the upper secondary education important to determine whether the impact of higher immigrant inflow is contingent on the level of education or not. The type of job is determined by their education level. For managerial positions which requires high qualification the impact had been reported to be positive, while for jobs that require low qualification the effect is negative. The paper only deals up to upper secondary education because immigration of females with lower educational qualification is very prominent from developing countries mostly. Furthermore, the low skilled jobs of the host countries are recently asserting claims of their jobs being hampered by the inflow of immigrants, according to the rising dialogues. Thus the paper empirically tests if, at all, the laborers in the host nation should be threatened by immigrants' inflow.

## 3.2 Control Variables

### Total female employment (EmpF)

The variable controls for the current number of females who are active in the working population to estimate a measure of how well is the nation equipped with hiring females. Moreover the variable is a proxy measurement of how much female human capital is present within the nation.

## Unemployment rate (UnempT)

Acemoglu and Autor (2004) predicted that while males were away during World War II females were permanently a part of the workforce. This indicates that the availability of labor supply influences the decision of the employers and thus the unemployment rate acts as an important control as the level of unemployment acts as a deciding factor for employers’.

## Number of days of paid maternal leave (Chd)

Blau and Kahn (2016) report employers’ preferences for hiring are also influenced by the benefits provided to the employees. Factors like motherhood and how much benefit the company has to provide to a female contributes to their decisions of wages or employing the female. Furthermore, the birth of a child reallocates the female’s working hours into wage hours and unpaid domestic work, which propagates the existing gap. (Klevin, Landais and Sogaard 2018).

## GDP growth rate (gdpgrowth)

Sbardella (2017) finds in her study that the wage level of a market changes along with the changes in GDP, due to changing expectations. Whether it affects the gap in wages for the two genders should be accounted for as well. The growth rate of GDP is calculated by taking the log of the difference between the current year GDP and its’ lagged term generated from the database.

The correlation between the total inflow of women and paid child leave depict an interesting observation<sup>1</sup>. The negative correlation is indicative of the fact that as the labor supply of females’ increases, employers are less willing to provide paid maternity leave to the female employees,

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<sup>1</sup> The correlation matrix is represented in the Appendix Section Table 10

compromising their rights further. However, this happens to be the case only for the women with lower education level. The correlations further substantiate the idea that women with lower education level barely are offered their rights to equal pay by the employers due to their low bargaining power.

*Table 1*

*Descriptive Statistics*

Variable	Mean	Standard Deviation	Minimum	Maximum
GWG	16.18	7.79	0.00	41.70
Clabor	0.40	0.31	0.00	1.80
EmpF	49.41	9.98	20.70	77.20
USedF	41.31	14.67	10.09	74.61
UnempT	7.50	4.04	1.80	27.47
gdpgrowth	0.01	0.03	-0.16	0.21
Chd	51.75	47.27	0.00	166

In Table 1, gender wage gap is represented by the variable GWG, change in labor composition due to immigrant inflow by Clabor, Upper Secondary education of female immigrants by USedF and Total employment of females in the host nation by EmpF. As the results depict, the average gender wage gap across all the 34 countries is approximately 16.2, reflecting how gender wage gap in developed countries is still a vital concern limiting the growth of females in the labor market (Rubery and Koukiadaki, 2016). The proportion of change caused by female immigrant inflow on

the labor force of the host country is extremely low nonetheless, with an average value of 0.40 percent. Among the total female immigrants for 33 countries, approximately only 41 % of them have completed their upper secondary education and the rest have a lower educational qualification.

#### 4. Methodology

Given the information present in the database, the current employment of females present in the labor force, education level of the female immigrants, unemployment level in host countries and GDP growth has been taken as controls for gender wage gap. The OECD and WDI database have been merged with the OECD record on gender wage gap. In the database, the wage gap has been estimated by taking the ratio of female to male wages. As the ratio decreases for the countries the wage gap rises.

To estimate the impact of female immigrants on gender wage gap of the host nation as per the objective of the paper, it is important to know the percentage of female immigrants present in the labor market. The percentage of female immigrants present in the labor force, the total inflow of females in the host country have been taggken as a percentage of the total population. Thus the equation estimated is:

$$GWG_t = \beta_0 + \beta_1 Clabor_t + \beta_2 USedF_t + \beta_3 EmpF_t + \beta_4 UnempT_t + \beta_5 gdpgrowth_t + \beta_6 Chd_t + \varepsilon$$

The gender wage gap is defined as GWG, Percentage of female immigrants out of the total population as Clabor. The controls Upper secondary education of female immigrants is defined as USedF, total employment of female in the labor market is defined as EmpF and total unemployment rate is defined as UnempT respectively. GDP growth rate as gdpgrowth, and paid maternal leave as Chd.

After conducting the Mundlak test it was found that the time invariant errors have a relation with our regressors<sup>2</sup>. Thus the paper finally adapted the fixed effects model since it cancels out the serial correlation among our unobservable error terms. Furthermore, the Random effects model assumes that the unobservable errors are zero which is proven false by the Mundlak test and there exists time invariant factors which can be dealt through the fixed effects model.

Given there are different panels (countries) with different economic bases, heteroskedasticity was suspected and eventually tested for and was affirmed of heteroskedasticity nature of the data. Therefore a Huber estimator was incorporated in the fixed effects model to ensure robust measures of the coefficients along with time fixed effects for the presence of time variant factors. The robust measure deals with the large variances and outliers present within the data. The estimation, tests and further analysis has been performed using the statistical package of STATA13.

## 5. Results

The findings of the paper indicates that the female immigrants have no impact on the gender wage gap of the host countries. As observed in table 2, the impact on gender wage gap due to change in labor composition through female immigrant inflow is insignificant, which primarily arises due to the negligible change that takes place in the labor composition due to immigrant inflow. The maximum percentage of female immigrants out of the total population is roughly 2 percent as found in the dataset used by the paper. Unless the percentage of change is significantly high and the new potential laborers are active in the labor market as working laborers, having an impact on the wage composition of the labor market is difficult, as proven by the results of the paper.

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<sup>2</sup> The first estimation was done using the random effects model suited for a panel regression. However, after performing the Hausman test to check the most appropriate model for the estimation, fixed effects was adapted as the final model. Since Hausman assumes homoscedasticity within the estimators, it makes the test invalid. Thus in order to choose the appropriate methodological set up, the paper runs the Mundlak test. The Mundlak test tests the estimators without the assumption of homoscedasticity.

Although the labor market has labor unions and such bodies to ensure the protection of the laborers in the market, these unions barely argue for females alone. The aggregate impact of females on the bargaining for reducing gender wage gap for low-skilled jobs remains insignificant. Such structural changes are only possible with the support of sufficient political and manpower and as shown by the descriptive statistics of the paper, the manpower of females remains quite low even after the inflow of female immigrants. Thus when the immigrant female do not make up a large portion of the current labor market, their collective bargaining power still remains low making the possibilities of any change insignificant.

Furthermore, a major portion of the females registered as immigrants do not necessarily participate in the labor market. Many female immigrants moving to the host countries settle with families, choose to involve their time solely on domestic work, not making any contribution to the labor market. The proportion of such female immigrants tends to be higher with females who have obtained up till the upper secondary education, that is, the proportion of female immigrants considered in this paper. Moreover, females are also likely to leave the labor market and take up family responsibilities during their child bearing days, making the employers more reluctant and unwilling to provide equal wages to both males and females. The past literatures however were able to find an impact for the low-skilled jobs from female immigrant inflow using micro level dataset which captures job individual variables and characteristics of each of the countries. Getting a proper estimate of the immigrant females that are involved in the labor market is beyond the capacity of a macro dataset.

The impact of current employment of females in the labor market has an impact on the gender wage gap of the host nation at a significance level of 10 percent, as depicted in table 2. The results indicate that as higher number of females are employed in the low-skilled job market, the gender



wage gap is negatively affected. This happens since the number and proportion of females within the laborers rise, they can collectively bargain for demolishing or reducing the gender wage gap as explained earlier.

*Table 2*

*Impact of female immigrant inflow on Gender Wage Gap*

VARIABLES	Fixed Effects
Clabor	-1.368 (1.900)
UnempT	-0.264*** (0.0823)
USedF	0.276** (0.114)
EmpF	-0.338* (0.180)
gdpgrowth	-0.988 (3.394)
Chd	-0.0244 (0.0223)
Country Dummies	YES
Time Dummies	YES
Constant	27.28*** (9.868)
Observations	249
Number of Countries	30
R-squared	0.382

Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1

Similarly, as the unemployment rate in the host country rises, the gender wage gap declines by 2.6 percent. The results are significant at a significance level of 1 percent. High rates of unemployment can be a result of two circumstances. Whenever the labor supply is greater than the labor demand, the unemployment level can rise, which is an unlikely situation in our analysis, given the coefficient. The alternative explanation to the decline in gender wage gap with rising unemployment can be that the level of skill level required for the targeted job market is not matching with the current labor supply where the industries do not have diverse options in terms of employment. As we know, in developed countries majority of the population aims for higher educational qualification and thus choose to participate in the market where they demand skilled laborers. However, the demand for such skilled laborers remains the same as the supply keeps rising, simultaneously there might be a deficiency of laborers for the unskilled job market, causing the gender wage gap to fall and forcing the employers to give a certain degree of power to the employees. The result of the paper suggests that female immigrants occupy very less portion of the labor market in the host countries, as a result of which their impact on gender wage gap remains insignificant.

## 6. Conclusion

The objective of the paper was to investigate how inflow of female immigrants can change the gender wage gap of the host nation by initially changing the labor supply. Previously, most of the studies on gender wage gap have focused on education level or other factors like access to jobs and trainings that impact the wage gap. Among the rare studies where immigration on wage level was focused on, however, exclusively analyzing its impact on gender wage gap was lacking. Thus the paper substantiated on the lacking of previous studies by finding that female immigrant inflow has an insignificant impact on the gender wage gap of the host nation. The findings of the paper

contradicts the previous studies where it was found that for low-skilled jobs higher female immigrant inflow induces a rise in the gender wage gap. It is essential to understand that the conclusion of the previous studies were derived from micro datasets, which could capture the individual labor market characteristics and also for a longer period of time. The paper has faced limitations in terms of data availability and in accounting for individual employer preferences while hiring employees in the low-skilled job market. Therefore, given the changes in female immigrant inflow, it is necessary to have further research into its national benefits and drawbacks. The results of the paper implies that the argument of immigrants having adverse effect on native's earnings is not necessarily true.

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## Appendix

Table 3: Complete Regression output

Variables	Fixed Effects
Clabor	-1.368 (1.900)
UnempT	-0.264*** (0.0823)
USedF	0.276** (0.114)
EmpF	-0.338* (0.180)
gdpgrowth	-0.988 (3.394)
Chd	-0.0244 (0.0223)
2002	-0.128 (0.457)
2003	-0.533 (0.531)
2004	-0.890 (0.674)
2005	-2.149*** (0.588)
2006	-1.954*** (0.677)
2007	-1.464**

	(0.676)
2008	-2.077**
	(0.891)
2009	-2.490**
	(0.941)
2010	-2.776***
	(0.805)
2011	-3.261***
	(0.974)
2012	-2.842***
	(0.954)
2013	-2.667**
	(1.022)
2014	-3.012***
	(1.044)
2015	-2.638**
	(0.971)
Country dummies	YES
Constant	27.28***
	(9.868)
Observations	249
Number of Countries	30
R-squared	0.382

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Robust standard errors in parentheses

\*\*\* p<0.01, \*\* p<0.05, \* p<0.1



Table 4: Collinearity Test

Variable	VIF	SQRT VIF	Tolerance	R- Squared
Clabor	1.35	1.16	0.7409	0.2591
UnempT	1.:48	1.22	0.6745	0.3255
USedF	1.80	1.34	0.5569	0.4431
EmpF	1.47	1.21	0.6818	0.3182
gdpgrowth	1.04	1.02	0.9625	0.0375
Chd	1.94	1.39	0.5149	0.4851
Mean VIF		1.46		

Eigenvalue	Condition Index
6.1370	1.0000
0.8414	2.7007
0.5242	3.4215
0.2348	5.1125
0.1568	6.2552
0.0551	10.5529
0.0434	11.8948
0.0073	28.9573
6.1370	1.0000
Condition Number	28.9573

Eigenvalues & Cond Index computed from scaled raw sscp (w/ intercept)

Det (correlation matrix) 0.0938

Table 5: Hausman Test

	(b)	(B)	(b-B)	sqrt(diag(V_b-V_B))
	gwgfe	gwgre	Difference	S.E.
Clabor	-3.362976	-4.658403	1.295426	.4005406
UnempT	-.5248563	-.458676	-.0661803	.
USedF	.2932061	.1670463	.1261598	.043455
EmpF	-.5622983	-.2309052	-.331393	.0593383
gdpgrowth	-.5675641	-.6069729	.0394088	.
Chd	-.012586	-.0027987	-.0097874	.0093654

b = consistent under Ho and Ha; obtained from xtreg

B = inconsistent under Ha, efficient under Ho; obtained from xtreg

Test: Ho: difference in coefficients not systematic

$$\text{chi2}(20) = (b-B)'[(V_b-V_B)^{-1}](b-B)$$

$$= 32.55$$

$$\text{Prob}>\text{chi2} = 0.0000$$

(V\_b-V\_B is not positive definite)

*Table 6: Mundlak Test*

(1) mean\_TW = 0

(2) mean\_EmpF = 0

(3) mean\_UnempT = 0

(4) mean\_USedF = 0

(5) mean\_gdpgrowth = 0

(6) mean\_popgrowth = 0

(7) mean\_Chd = 0

chi2 (7) = 32.90

Prob > chi2 = 0.0000

*Table 7: Time Fixed Effects Test*

(1) 2002.year = 0

(2) 2003.year = 0

(3) 2004.year = 0

(4) 2005.year = 0

(5) 2006.year = 0

(6) 2007.year = 0

(7) 2008.year = 0

(8) 2009.year = 0

(9) 2010.year = 0

(10) 2011.year = 0

(11) 2012.year = 0

(12) 2013.year = 0

(13) 2014.year = 0

(14) 2015.year = 0

F (14, 198) = 2.45

Prob > F = 0.0033

*Table 8: Test for heteroskedasticity*

Modified Wald test for group-wise heteroskedasticity in fixed effect regression model

H0:  $\sigma^2(i) = \sigma^2$  for all i

chi2 (30) = 6.6e+30

Prob>chi2 = 0.0000

*Table 9: Test for Serial Correlation*

Wooldridge test for autocorrelation in panel data

H0: no first order autocorrelation

F (1, 18) = 1.600

Prob > F = 0.2220

*Table 10: Correlation Matrix*

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	Clabor	EmpF	Chd	USedF	UnempT
Clabor	1.0000				
EmpF	0.1358	1.0000			
Chd	-0.2934	0.0378	1.0000		
USedF	-0.1466	-0.0209	0.6016	1.0000	
UnempT	-0.2969	-0.4662	0.0950	-0.0863	1.0000

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