Wage Effects of Immigration in a Bargaining Economy

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Abstract

Most empirical studies on wage effects of immigration disregard common labour market institutions like the requirement of job offer before entry to the host country and wage bargaining. The model presented here accounts for these institutions and finds a rationale for the empirical studies’ treatment of the migrant share as a determinant of natives’ wages. A higher migrant share is shown to lower the native’s wage but only temporarily. After assimilation the wage subsequently returns to its original level. The results suggest that empirical studies of wage effects of immigration should focus on unassimilated immigrants having low reservation wages.

Keywords: immigration, bargaining, institutions
JEL codes: J53, J61
INTRODUCTION

It is well known that studies on the wage effects of immigration are inconclusive in the sense that results vary considerably. When researchers have identified exogenous supply shocks in natural experiments like the cases of “the Mariel boat lift” (Card (1990)) or labour reallocations following the Katrina disaster (De Silva et al (2010)), only small effects are found and the suggested possible explanation is that regional factor adjustments following the inflows conceal much of the negative supply effects. Other studies that do not explicitly focus on obviously exogenous supply shifts yield widely differing results. A plausible reason could be that the supply effects have not been properly identified and that the wage outcome is a blend of supply and demand effects. For instance, in a much cited study, Borjas (2003) p. 1349 recognizes that demand may affect the results but this leads to the conclusion that the relatively large effects should be treated as lower bounds.

Much neglected in the literature are the effects of the labour market institutions. When it comes to the major labour migration flows a careful consideration of institutions, like those concerning the rights to immigrate, is called for. Most labour immigrants to developed countries must, in principle, have arranged with a job before entering the host country which precludes workers to enter with the purpose of underbidding along the demand curve. Instead, a vacancy is required implying that immigration is a result of demand and causes a positive supply shift in the host country. This principle is basic to e.g. the free labour mobility across the EU countries. The only possible exception is that migrants may arrive as tourists for at least three months to search for work but in this case a migrant does not enter the labour force unless a vacant job has been offered. Also US authorities require a labour immigrant to have a prearranged job offer before entrance is accepted.
These widely applied rules have important consequences as they imply that a migration increase represents a demand increase as well as supply increase. Unless natural experiments is at hand for identification, the requirement of prearranged job offer should preclude the empirical researcher from connecting immigration only with the supply side and the expected wage effect of immigration is indeterminate. The theorist may also mistakenly treat immigration as a simple supply shift.

Another neglected institutional arrangement concerns wage setting institutions. To understand how immigration affects natives’ wages and the impact of supply and demand it may be a serious mistake not to specify a structured model. Wage bargaining is widespread in European wage determination. Hall and Krueger (2008) provide survey evidence on wage bargaining in the US labour market. However, the literature is, to the best of my knowledge, silent on how bargaining determined wages are affected by immigration. This paper presents a bargaining model in which the effects of immigration on the individual worker’s wage can be explored.

To capture the immigrant supply shock it is common to specify the share of immigrants in overall supply of worker type $j$ as $M_j/(M_j + N_j)$ where $M_j$ is the number of immigrated workers and $N_j$ is the supply of native workers. (See e.g. Borjas (2003).) While this empirical specification seldom is rationalized, it will be shown that in the present model the ratio $M_j/(M_j + N_j)$ finds a natural place as a determinant of the bargained wage.

With a prearranged job required before entry to the US or EU labour markets an increase in $M_j$ would reflect a change both in demand and supply. This market expansion will have the same qualitative wage effect as a corresponding decrease in native labour supply, $N_j$. 


implying a market contraction. Thus, market size does not matter to the wage, only the migrant share does.

In specifying \( M_j \) it is far from obvious that all immigrants should be included which actually seems to be the case in the literature. One may doubt if the retirement of immigrants who arrived a long time ago, say in the 1960s, and who are fully assimilated could have an impact on wages of today’s natives. My bargaining model, where I among other things aim at finding a rationale for the migrant share as a determinant, is here of guidance as it predicts that it is only unassimilated immigrants, here those having low reservation wages, who could be argued to have an impact. The crucial aspect is that immigrants with lower reservation wages than natives exert a downward pressure on natives wages in their bargaining process. This is shown formally in the following section.

\[ \text{A MODEL OF WAGE BARGAINING AND IMMIGRATION.} \]

I assume below that wages are determined by bargaining between the individual worker and representatives of the employer. Assume that the wage rate of worker \( i \), \( w_i \), is expressed as a fraction of the individual’s productivity \( P_i \), i.e. \( w_i \in (0, P] \). Productivity is thought of as effort times the market price of the individual’s service. Setting effort to unity, productivity will equal the consumers’ value of the worker’s service.

The wage is assumed to be determined by the outcome of asymmetric Nash bargaining (Binmore, et al (1986)). In this bargaining, the individual worker maximizes the difference between the wage and the expected alternative wage, \( A_i \). This represents the expected wage obtainable outside the firm and is assumed identical for all individuals with the
same characteristics. The employer maximizes the positive difference between productivity
and pay and the maximization problem specifies as:

\[ (1) \quad w_t = \arg \max [(w_t - A_t)^\beta (P_t - w_t)^{(1-\beta)}], \]

where \( \beta \) is the parameter representing the underlying bargaining power of workers, with \( 0 > \beta < 1 \). The payoff in case of disagreement is assumed to be zero for both the employee and
the employer. Maximization yields the well-known first order condition

\[ (2) \quad w_t^* = \beta P_t + (1 - \beta)A_t. \]

The determination of \( A_t \) is of central importance. Like in the standard model, the
unemployment rate is assumed to affect the alternative wage as a determinant of the
probability of employment. The unemployment risk of the individual native worker \( i \) is
assumed to be determined by the natives’ average unemployment rate, \( u_n \), in the absence of
immigration. The rate is taken as exogenous by the individual.

To get the employment probability, I also include the immigration rate. I assume
that immigrants differ from natives only in one crucial respect, namely that immigrants’
reservation wages are lower than natives’. This is a natural assumption to make for
immigrants from low wage countries applicable to e.g. the accession to the EU of the new
member countries from Eastern Europe or for any flow of workers from low-wage countries
to the US or the EU. Immigrant workers’ low reservation wages implies a willingness to
accept jobs at a lower wage level than native workers and for upcoming vacancies, this will
lower natives’ perceived probability of employment and hence lower the alternative wage.
Thus, I add the share of immigrants multiplied by one minus the relative reservation wage and
the alternative wage is then specified as:
where $M_i$ is the number of immigrated workers similar to $i$, $N_i$ is the supply of native workers similar to worker $i$ and $w^r$ is the relative reservation wage, i.e. immigrants’ reservation wage divided by natives’. Without any immigration of workers and at full employment, the alternative wage equals $\bar{w}_i$ which is an average wage for similar workers with unit productivity. $(1 - m(1 - w^r) - u_n)$ is now the perceived probability of obtaining a job at wage $\bar{w}_i$ and $m$ could be thought of as representing the supply effect of immigration.

Since workers with identical productivity and characteristics are paid the same wage,

$$w_i^* = \bar{w}_i$$

holds at the market equilibrium. Using (3) and (4) in the first order condition (2), yields:

$$\beta < w_i^* = \frac{\beta p_i}{1 - (1 - \beta)(1 - m(1 - w^r) - u_n)} \leq P_i.$$  

Thus, the wage is restricted between $\beta$ and productivity.

**COMPARATIVE STATIC RESULTS.**

Equation (5) states that the native workers can extract the maximum share of productivity, $w^* = 1$, at full employment ($u_n = 0$) and either with no immigrated workers ($M_i = m_i = 0$), or with a stock of immigrants with identical reservation wages as natives, $w^r = 1$. Differentiating (5) with respect to the migrant stock $m$, given $w^r < 1$, yields:

$$\frac{\partial w}{\partial m} = -\frac{(1 - w^r)(1 - \beta)w}{1 - (1 - \beta)(1 - m(1 - w^r) - u_n)} = -\frac{(1 - w^r)(1 - \beta)w^2}{\beta p_i} < 0$$
and the elasticity

\[ (6') \quad \frac{\partial w}{\partial m} = - \frac{(1-w^r)(1-\beta)wm}{\beta p_i}. \]

An increase in the stock of immigrant workers lowers the native worker’s wage if immigrant workers’ reservation wage is lower than native workers’ reservation wages, i.e. \( w^r < 1 \).

Like unemployment, immigration then exerts a restricting effect on wages. The larger the share of immigrants, the lower will be the wage expressed as the fraction of productivity accruing to the worker. The second order derivative is positive,

\[ \frac{\partial^2 w}{\partial m^2} = - \frac{(1-w^r)^2(1-\beta)^2 \partial w}{\beta p} > 0. \]

The relation between wages and the stock of migrants can be represented by the solid downward sloping line in Figure 1:

![Figure 1. Wages and immigration stock at different relative reservation wages.](image)
It is straightforward to derive the effect of an increase in immigrants’ relative reservation wage as \( \frac{\partial w}{\partial w^r} = \frac{m(1-\beta)w^2}{\beta P} > 0 \), stating that, given the stock of migrants, the rise in the reservation wage raises the wage level of natives. Immigration of workers with a high reservation wage, like immigrants from high-wage countries, will therefore have a less adverse wage effect than immigration of workers with a low reservation wage, like immigrants from low-wage countries. The broken line Figure 1 represents the case with a higher reservation wage and indicates a higher wage at any migrant stock. It also indicates that with a higher relative reservation wage a migrant share increase will have a more modest wage dampening effect and that a larger migrant stock is required for the wage to come down to its minimum level of \( \beta \).

The second order derivative of (7) is positive, \( \frac{\delta^2 w}{\delta w^r} = \frac{2m(1-\beta)w\frac{\partial w}{\partial w^r}}{\beta P} > 0 \), implying that, for a given level of migrant stock, the positive wage effects become larger with higher reservation wages. This is shown in Figure 2 for the migrant stock level \( m_1 \).
For a given level of relative reservation wages, a larger migrant stock, \( m_2 \), shifts the intercept in Figure 2 downwards. Comparing Figures 1 and 2 shows that the highest wage level \( w = \frac{\beta}{1-(1-\beta)(1-u_n)} \) is reached either at a zero migrant stock or at any positive migrant stock with unit relative reservation wages. The latter conclusion implies that immigrants with low reservation wages (recent immigrants from low wage countries) may exert a downward pressure on natives’ wage, while immigrants with high reservation wages (recent ones from high wage countries and workers having immigrated a long time ago) will not exert a downward pressure on natives’ wages.

**PUTTING NUMBERS ON THEORY**

Is it possible to say something about the empirical values involved? One may proceed by considering the effects of higher unemployment and refer to empirical estimates of the wage curve. Differentiate (5) to get the elasticity of wage with respect to unemployment:

\[
(7) \quad \frac{\partial w}{\partial u} \frac{u}{w} = \frac{-(1-\beta)u}{[1-(1-\beta)(1-m(1-w^r)-u_n)]} = \frac{-\beta(1-\beta)uw}{w}. 
\]

The slope of the wage curve has a more or less generally accepted value of -.10 (Blanchflower and Oswald (1996)). Rewriting the wage elasticity \( \frac{-(1-\beta)uw}{\beta} = -0.10 \) as \( \frac{-(1-\beta)uw}{\beta} = \frac{-0.10}{u_n} \) and using this expression in (6’) yields:

\[
(6’’) \quad \frac{\partial w}{\partial m} \frac{m}{w} = \frac{-(1-w^r)m}{u_n}. 
\]
No assumption about the unknown $\beta$-parameter is necessary. Table 1 summarizes the elasticities as the migrant share is varied for different relative reservation wages and unemployment levels.

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Table 1. Relations between elasticities and relative reservation wages, unemployment and immigrant share.

Assume that markets recently have been opened up so that the migrant stock level is low, at, say, 2 per cent ($m=2$) and that the relative reservation wage consequently is low, at, say, 50 per cent ($w^r = 50$) and that unemployment is at, say, 5 per cent ($u=5$). This yields an elasticity of -.02 implying that an increase in immigration that raises the supply of workers by ten per cent would lower wages by .2 per cent.

Consider instead a situation long after opening up of free immigration. The migrant stock has now increased to 15 per cent ($m=15$), the relative reservation wage to 90 per cent ($w^r = 90$) while unemployment is constant at five per cent. This yields an elasticity of -.03. The effect is now stronger since I assumed that migrant stock had increased much more than relative reservation wages. Assume instead that the migrant stock had risen to only
5 per cent, \( m=5 \), while the relative reservation wage and unemployment remain at 90 per cent and five per cent, respectively. I then obtain an elasticity of -.01. Thus, what matters is how migration and relative reservation wages change over time. Should the migration rate be fifteen per cent and relative reservation wage fifty per cent, the elasticity is considerably higher (at the same unemployment rate) namely .15.

To conclude: One should expect higher (in absolute terms) elasticities the larger is the migrant stock, the lower is unemployment, and the lower are the immigrants’ relative reservation wages.

**MODEL DYNAMICS: OPENING UP FOR FREE IMMIGRATION**

So far I have assumed that both migration and relative reservation wages are exogenous in the model. In this section I analyse how wages develop over time as a high wage country opens up for free immigration. In this section I therefore discuss the model in terms of this enlargement.

When the EU opened up for free immigration from new member countries having considerably lower wages there were expectations of a long run real wage convergence. Such a convergence occurred when the EU opened up for free immigration from southern European countries in the 1980’s. When Eastern European countries entered in 2004 and 2007 real wage convergence was again expected.

When labour markets open up for free immigration, the real wage differences are initially large and large flows can therefore be expected since migration is a function of real wage differences. As long as wages are relatively low in the home country, the relative reservation wages are initially low. However, over time, as real wages even out, migration
flows decrease and relative reservation wages will approach unity implying counteracting effects on the wage. It therefore becomes of some interest to understand the wage profile over time.

To proceed with the analysis, I could assume that both migration and relative reservation wages are functions of real wage differences across the emigration and immigration countries, and that, in turn, real wage differences are functions of time. A more straightforward approach is simply to assume that migration rises at a decreasing rate with time, \( m(t) \), where \( \delta m/\delta t > 0 \) and \( \delta m/\delta t > 0 \) and reservation wages rise at an increasing rate with time, \( w^r(t) \), where \( \delta w^r/\delta t > 0 \) and \( \delta w^r/\delta t > 0 \). Both effects come implicitly via higher real wage growth in the emigration country. Therefore, I rewrite (5) as:

\[
(5') \quad \beta < w^*_i = \frac{\beta}{1-(1-\beta)(1-m(t)(1-w^r(t))-u_n)} \leq 1.
\]

Differentiating (5’) with respect to time yields:

\[
(8) \quad \frac{\partial w}{\partial t} = \frac{[-\frac{\partial m}{\partial t}(1-w^r) + \frac{\partial w^r}{\partial t}m](1-\beta)w}{1-(1-\beta)(1-m(1-w^r)-u_n)} \geq 0.
\]

There are two counteracting effects in brackets in the numerator that determine the sign. The first term, \(-\frac{\partial m}{\partial t}(1 - w^r)\), states that as long as the relative reservation wage is lower than one and when more migrants arrive over time an adverse effect on wages obtains. The second term in brackets, \(\frac{\partial w^r}{\partial t}m\), states that, over time, the reservation wages of the migrant stock, \( m \), tend to converge to those of natives and hence that \( w^r \) rises yielding a positive effect on wages. The relative strength of these to forces determines how wages develop over time. The migrant stock, \( m \), and the relative reservation wage are both concave in \( t \). If \( \frac{\partial m}{\partial t}(1 - w^r) > \)
\[ \frac{\partial w^r}{\partial t} m, \] the wage falls and if \[ \frac{\partial m}{\partial t} (1 - w^r) \leq \frac{\partial w^r}{\partial t} m, \] the wage rises. At some point in time, when

\[ \frac{\partial m}{\partial t} = \frac{\partial w^r}{\partial t} \frac{m}{(1-w^r)}, \]  

the two forces are equally strong and the wage does not change. In the long run, the wage will return to its original level. The wage drop due to immigration of substitutable labour, is thus of a temporary kind.

Could it be safely stated that Equation (10) is fulfilled at some point in time i.e. that there exists a point when the downward wage trend is replaced by an upward trend? Yes, initially, before free immigration, \( m = 0 \), and in the long run \( (1 - w^r) = 0 \). Hence the right hand side of (10) goes from zero to infinity in time. Since \( m \) rises monotonously in \( t \) there exists a point where the wage effect turns from being negative to positive.

This is illustrated in Figure 3 in which I measure \( w, m \) and \( w^r \) along the vertical axis since all these variables are restricted between 0 and 1. The migrant stock curve starts out at origin at \( t=0 \) and approaches asymptotically some level <1. The reservation wage curve starts out at some positive level at \( t=0 \) and reaches one after some time of higher growth in the emigration country. The wage is initially at the level \( \beta \frac{1}{1-\alpha(1-u)} \) but as immigrants with low reservation wages enter, the wage starts to fall according to the wage curve \( w \). The drop, though, comes to a halt. At time \( t \), the slope of the \( m \)-curve \( \frac{\partial m}{\partial t} \) equals \( \frac{\partial w^r}{\partial t} \frac{m}{(1-w^r)} \) implying that the wage effect shifts from negative to positive. Eventually, the reservation wages become unity and the wage rate is back to its original level.
Figure 3. Effects of immigration on wages over time.

This implies that the negative wage effect of immigration of substitutable labour is of the temporary type. This result occurs without workers changing employment as a result of the inflow of immigrants.

The basic mechanism is that unassimilated immigrants exert a downward pressure on natives' wages while the assimilated ones do not. Assimilation in the labour market is here represented by the reservation wages having equalized with those of natives. Labour immigrants who arrived to European countries or the US more than, say, fifteen or twenty years ago, might be expected to have assimilated in this respect and could be expected to have no or very limited impact on natives' wages of today. Moreover, the assimilation period would depend on the wage level at the country of origin and the education level of the
migrants. It is therefore an empirical question as to what immigrants should be expected to affect natives’ wages and earnings.

CONCLUSIONS

While there is a fairly vast empirical literature on the wage effects of immigration, the theoretical literature is scant. This reflects that the empirical literature, dominated by studies on the US economy, implicitly assumes competitive labour markets. However, neither for the United States nor for the European Union can one disregard the basic institutions of the labour market, particularly, that a wage has to be negotiated between workers and firms and that labour immigrants are prevented from entry without a job offer.

I therefore present an analysis of immigration effects on the wage negotiated between individual workers and firms. It shows that immigration of workers having a reservation wage as high as that of natives does not lower wages. Hence immigrants from countries of similar income level as the host country should not exert a downward pressure on wages. Immigration of workers with a lower reservation wage than that of natives will, however, exert a downward pressure on wages. The empirical conclusion from this is that highly different effects should be expected by immigration from high-wage and low-wage origin countries.

Moreover, opening up for free immigration from low-wage countries to a high-wage country is predicted to result in a wage drop in the host country in the short run. In the long run, as wage levels even out between sending and receiving countries, the wage level will recover in the host country. Not only will immigration come to a halt, but in the long run as the reservation wages of those who have immigrated catch up on natives’ reservation
wages the natives’ wages will return to the original level. The empirical conclusion is that one should not expect immigrants who arrived a long time ago to exert a downward pressure on wages. Hence in terms of expected wage effects of immigration, the empirical studies should not only consider the wage level of the origin country but also the time in the host country.
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