Spatial Effects of the Minimum Wage

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Abstract

Despite significant differences across local labor market outcomes within countries, most policies are set at the national level. This paper examines the reallocation effects of workers of uniform minimum wages across heterogeneous local labor markets. To achieve this, I introduce a spatial general equilibrium model with migration dynamics and job market frictions. By adjusting the minimum wage, we alter workers' incentives to migrate between local labor markets. This change could yield positive outcomes for two reasons: a potential reduction in the unemployment rate due to increased migration and the reallocation of workers towards higher-productivity labor markets.

The model is estimated using matched employer-employee data from France. I employ the estimated model to determine the optimal minimum wage level and describe its effects on welfare, unemployment, and migration rates.

1 Introduction

There exist significant and persistent differences across local labor markets in unemployment rates (Bilal (2021) Kuhn et al. (2021)) or wages (Schmutz and Sidibé (2019), Card et al. (2023)). Despite the evidence (Heise and Porzio (2022)) that workers could benefit largely by moving into more advantageous locations, we can observe how mobility rates in Europe are usually relatively low; some *mobility frictions* prevent individuals from moving to those areas.

This paper studies the effects of these moving costs on labor market outcomes. By construction, large moving costs will prevent workers from moving to more productive locations. What are the effects of this misallocation? Moreover, what instruments can we use to prevent it? This paper focuses specifically on the role of the minimum wage as a tool to reallocate workers between locations. By studying the interaction between moving costs and minimum wage, this paper answers the question, what is the minimum wage that reduces misallocation?
To answer this, I introduce a frictional labor market model with migration across multiple heterogeneous locations to determine the reallocation effects of the minimum wage.

I will use the estimated framework to find the optimal minimum wage level after considering its impact on location decisions and study its impact on welfare and unemployment.

The costly migration decision deters individuals from moving into more productive areas; in order to be compensated for these costs, they will only accept highly paid jobs, making it harder for them to find an acceptable offer. When the minimum wage is large enough for distant workers, it will compensate the worker for the moving costs; the jobs they would be willing to accept will be the same as a local worker, making it easier for workers to move across regions. This affects welfare and unemployment in the following ways. For intermediate minimum wage values, migration will be incentivized from less to more productive locations. In addition, the positive effect on job acceptance probability will make it easier for unemployed workers to find a job, thus rationalizing positive employment effects from an increase in minimum wages.

After introducing the model, I will estimate it in the French context to quantify the national minimum wage that will maximize the economy's welfare. I find that increasing the minimum wage from the 2016 level of 9.67€ /h to 10.50€ /h would increase welfare as it would induce more workers to find jobs in the most productive labor markets (around Paris). However, the less advantaged locations will suffer more from the detrimental effects of the minimum wage on employment.

Literature

This paper contributes to the study of the effects of the minimum wage by studying its effects on the location decision of agents. The minimum wage is a widely used policy in most economies; nowadays, 21 out of 27 European countries have a national minimum wage, a minimum wage enforceable by law to all employees in a country. Despite its relevance, the effects of minimum wage on migration are often overlooked, Monras (2019) showed that mobility is a relevant outcome to consider when studying it.

The addition of the spatial dimension is especially relevant in the case of the minimum wage. Starting with Card and Krueger (2000), several empirical studies used as controls nearby areas like counties or states where the minimum wage was not increased to account for the employment effects as in Allegretto et al. (2011) or Dube et al. (2016). However, these studies might fail to account for the interaction between these local labor markets; they are not entirely isolated markets; households could move to other regions for better job conditions, and firms could decide to open vacancies in a different labor market if they would expect higher profits by doing so.

Flinn (2006) introduces a model with the minimum wage in a frictional labor market. The monopsony power held by firms prevents the unemployment level from reacting as much as under the competitive market. Still, it presents itself incapable of rationalizing zero or negative unemployment effects.

This paper also relates to the literature on migration. In this paper, I introduce spatial frictions into a frictional labor market. As in Kennan and Walker (2011) and Schmutz and Sidibé (2019) the workers in the economy will be facing a location choice problem, but in order to properly study the effects of minimum wages on unemployment I expand by analyzing a general equilibrium model where the vacancy creation decision is endogenous. Monras (2019) studies the effect of minimum wages on migration in a framework with two regions with a competitive labor market. By introducing a frictional labor market, I am able to rationalize non-linear effects from minimum wages on unemployment. Todd and Zhang (2022) also study a two location framework of minimum wages with migration. My paper expands by generalizing the framework to an undetermined number of locations and introducing regional heterogeneity. The latter is critical, as the reallocation of workers across regions plays a crucial role in determining the optimal level of the minimum wage.

Some more recent papers introduced the spatial dimension into the canonical framework from Diamond (1982), Mortensen (1998), and Pissarides (1985). As in Bilal (2021) and Kuhn et al. (2021), this paper also examines the differences in unemployment rates across locations. However, my paper studies the effects of the minimum wage on migration, as they provide a framework without spatial frictions, a different theory is needed.

I structured the remaining of this paper in the following way. In Section 2, I describe the data used for this paper. Section 3 describes the empirical facts that motivate this paper's modeling choices. Specifically, migrants' wages depend on the differences in productivity between their origin and destination locations. Because of that, while I find that the minimum wage is more binding for local workers in less productive locations, I observe the opposite for workers who changed locations: more migrants are earning the minimum wage in more productive locations. Section 4 introduces a spatial general equilibrium model with migration dynamics and job market frictions. The model parameters are then estimated in section 5. The estimated model is then used to find the optimal minimum wage level. I then describe the heterogeneous effects of an increase in the minimum wage to the optimal level. Section 7 concludes.

2 Data

I used data from the French matched employer-employee dataset, *Panel tous salariés*, for 2009 to 2016, which contains the full job history of 1/12th of French workers. An observation from this panel consists of an "*individual * firm * year*" interaction, such that it allows me to follow transitions from and into unemployment. In addition, every observation contains rich information about the job in question, such as the salary and the location of the job, which allows us to follow migration decisions, and information about the individual, such as age, gender, or experience.

France is divided into 18 regions, 13 of which are in metropolitan France. It can also be divided into 108 *départements* and by *Zones Urbaines*, which are commuting zones where most of the population living there works in the same area.

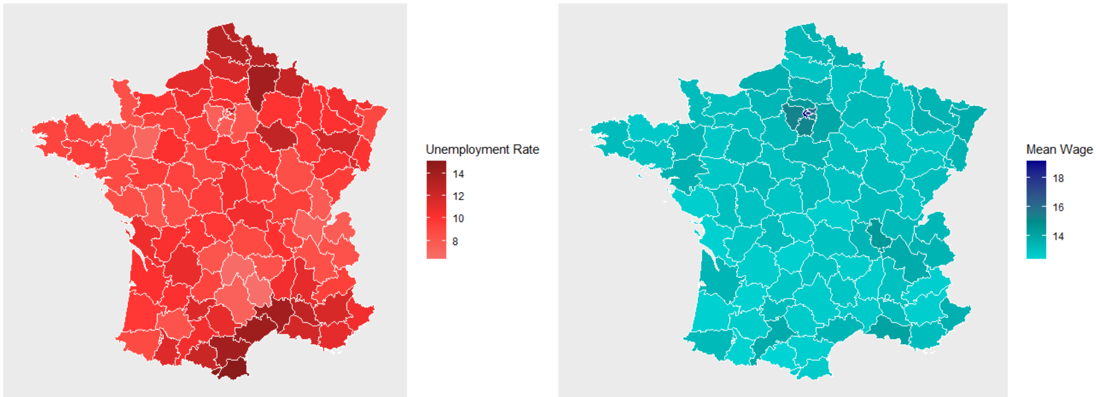
I restrict attention to individuals who lived only in continental France for the full period of analysis, thus excluding those who did at some point live in Corsica or the "Outre-mer" regions. Also, in order to reduce the possibility of individuals taking participation decisions in the job market, the sample is constrained to individuals from 20 to 60 years old.

I build yearly estimates for labor market outcomes. The unemployment rate values are directly extracted from INSEE. The number of employed is estimated to be the number of people who appear holding a job at the beginning of a year. From these, I derive the number of unemployed workers and the estimated population. Separation rates are estimated from the transitions into unemployment from the number of employed workers. A worker will transition into unemployment if there is a gap larger than 30 days between the time he was separated and a new job. Job finding rates are derived from the estimated number of unemployed workers and the number of workers who find a job that year.

Heterogeneous local labor markets

Figure 1 plots unemployment rates (left panel) and average wages (right panel) across departments. It shows significant gaps in labor market outcomes across locations.

Figure 1 – Distribution of unemployment rates and wages (2016)



Some of this differences across local labor markets can be captured through differences in productivity across locations. In order to obtain a measure of productivity across locations, I ran the following regression that captures the differences in wages for workers who live in different *departéments*. Thus, I estimate a function of wages on individual characteristics with time and location fixed effects as described in 1:

$$w_{it} = x_{it}\beta + \gamma_t + A_j + \epsilon_{it}, \tag{1}$$

Where x_{it} controls for individual characteristics as age and experience. γ_t controls for time fixed effects and A_j, location fixed effects.
Thus, I consider A_j to be estimated by the region fixed effects parameters from 1. Despite these significant differences across local labor markets, transitions out of unemployment into another location are rare, as seen in Table 1. In this Table, I describe how many transitions from unemployment into employment included migration.

Table 1 shows that a significant proportion of transitions from unemployment do not involve mobility, highlighting the presence of strong spatial frictions in the labor market. Specifically, 85.65% of transitions out of unemployment occurred without mobility. This contrasts with transitions out of employment, where mobility is relatively higher at 22.88%. This suggests that employed individuals are more likely to move for better opportunities than unemployed individuals.

Table 1 – Number and share of transitions in the same location or in a different location

Event	Number
No transitions while employed	7,214,442
Out of unemployment	2,348,012
with mobility	337,129
without mobility	2,010,883
Out of employment	1,397,613
with mobility	252,752
without mobility	1,144,861
Full Sample	13,194,942
Unique Individuals	2,075,769

Table 2 further breaks down the transitions into new jobs, emphasizing the role of migration and minimum wage:

Table 2 – Transitions into a new job

Out of Unemployment			Out of Employment		
Event	Number	Share	Event	Number	Share
With Migration	337,129	14,35%	With Migration	252,752	22,88%
Without Migration	2,010,883	85,65%	Without Migration	1,144,861	77,12%
Below the Minimum Wage	319,762	13,62%	Below the Minimum Wage	72,725	5,20%
Above the Minimum Wage	2,028,250	86,38%	Above the Minimum Wage	1324888	94,80%
Migrants below the Minimum Wage	35,899		Migrants below the Minimum Wage	9,968	

Table 2 reveals that transitions out of unemployment have a higher share of minimum wage workers than transitions out of employment. Specifically, 13.62% of workers transitioning out of unemployment earned below the minimum wage, whereas only 5.20% of those transitioning out of employment did.
Additionally, of the migrants who transitioned from unemployed, over 10% accepted a wage below or equal to the minimum wage. In contrast, less than 4% of migrants who transitioned from another job accepted less than the minimum wage.

3 Motivating evidence

In this section, I analyze the nature of transitions into employment in a new location to provide four facts on migration patterns and the minimum wage. These facts motivate the modelling choices presented later in the paper.

Fact 1: Moving Costs Act as a Significant Barrier to Worker Mobility

First, to test Fact 1, I want to establish that there exist barriers to migration that prevent workers from freely accepting jobs in any location. To illustrate the presence and extent of these moving frictions, I employ a gravity equation commonly used in trade literature. This approach allows me to quantify the effect of distance on migration between regions. Absent any migration friction, we should not expect to observe any impact of distance on the number of migrants. The regression model is specified as follows:

$$ln(\pi_{odt}) = \beta ln(dist_{odt}) + \delta_{dt} + \delta_{ot} + \epsilon_{odt},$$

where π_{odt} a represents the share of migrating workers from origin o in destination d at year t and δ_{jt} are Destination/Origin-year fixed effects.

Table 3 – Gravity regression

Dependent Variable	log π_{odt}
Log distance	-0.19
	(0.001)***

Table 3 shows that an increase of 10% in the distance (in kilometers) from o to d decreases the number of migrants by 1,90%. These moving costs, *proxied* here by distance in kilometers, prevent workers from moving to more profitable areas. Second, to quantify the effects of moving costs, we need to explore the kinds of jobs that migrants secure after moving. If the migration frictions only affected mobility by reducing the probability of finding a job in another location, we should not expect wages to differ between local and migrant workers.
In order to test for moving costs preventing worker mobility, I analyze the wage

differences between migrants and local workers using the following regression:

$$ln(wage_{it}) = \alpha_{it} + \beta \mathbb{1}(migr_{it}) + \delta_{dt} + \delta_{ot} + \epsilon_{odt},$$

where wage$_{it}$ is the worker's i wage at year t; α_{it} captures individual characteristics, such as age, gender, or experience; $\mathbb{1}(migr_{it})$ is a binary variable equal to 1 if the worker migrated on year t, and δ_{jt} captures Destination/Origin-year fixed effects.

Table 4 shows the results. The first column does not include individual controls. Workers who migrate have, on average, 11% higher wages than local workers, which is consistent with the existence of the moving costs; workers only make mobility decisions if they are compensated for them.
Further analysis, taking into account individual characteristics, reveals a nuanced picture. The second column of Table 4 shows that the wage gain associated with migration is considerably smaller. This suggests that migrants earn more not solely due to compensation but because they are the ones who secure well-paying jobs in new locations, which effectively offsets their moving costs.

TABLE 4 – Selection

Dependent Variable	log wage$_{it}$	log wage$_{it}$
Migrant	0.11	0.02
	(0.0009)***	(0.0006)***
Origin x Year FE	Yes	Yes
Destination x Year FE	Yes	Yes
Individual controls	No	Yes

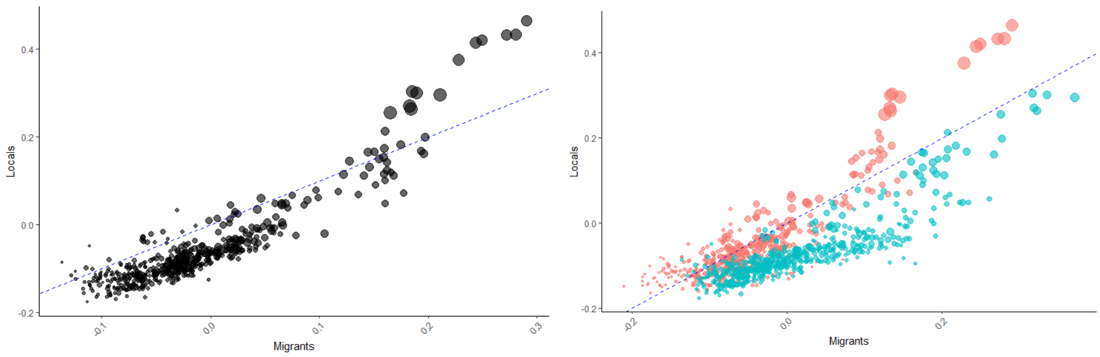
These results highlight the importance of considering migration costs when evaluating labor market policies, such as the minimum wage.

Fact 2: The Origin of a Migrant Worker Affects its Wage

I now document that migrants who relocate to less productive locations earn higher wages than local workers in those areas. However, as the destination's productivity increases, the wage advantage of migrants diminishes, eventually resulting in migrants earning less than local workers in highly productive areas. This phenomenon underscores the crucial role of location productivity in determining wage differentials.

To establish this fact, I compare the average wage of migrants to the average wage of locals in each location. Figure 2a illustrates this dynamic; the graph compares the mean of the log of the wages of locals to that of migrants for every year-location combination. The size of each dot corresponds to the number of observations for each combination. I include the 45-degree line for comparison.

FIGURE 2 – Wage Comparisons Between Migrants and Locals Across Different Productive Locations



(a) Wages of Migrants vs. Locals Across Locations

(b) Wage Differentials by Origin Productivity Level

Note: The left panel compares the wages of migrants to locals across locations. Each observation represents a year-location combination. The size of each dot corresponds to the number of observations of each data point. The wages are expressed in 2015 levels and normalized by the log average wage of all the sample. The right panel differs by splitting the sample of migrants by origin. Red (blue) dots correspond to migrants whose origin location had a higher (lower) measure of productivity.

Source: Panel tous salaries 2009-2016

In less productive locations, migrants earn significantly higher wages than locals. As productivity increases, this wage differential decreases, with locals eventually earning more than migrants in the most productive locations. Absent any moving friction, we would expect the points to revolve around the 45-degree line. In order to understand these differences in migrants workers across locations, I split the sample of migrants by the productivity of their origin location; migrant workers improving their local labor market by moving from less into more productive areas, and migrants who potentially worsen their local labor market by moving into less productive areas. In order to determine whether a location is more or less productive I make use of the measure of productivity defined in the previous section by running equation 1.

This new comparison of wages between locals and migrants from more or less productive locations is illustrated in Figure 2b; this graph compares the mean of the log of wages of locals to that of migrants for every year-location combination; the red dots consist of the comparison between local workers in a year-location and migrants for whom their origin location was less productive than the location they migrated into; blue dots correspond to the comparison between locals and migration from more into less productive locations. These results align with the well-established compensating differential theory, which posits that workers who move to less desirable (less productive) locations must be compensated with higher wages, while those who move to more desirable (more productive) locations are willing to accept lower wages.

These findings highlight the importance of considering location-specific productivity when evaluating wage differentials and the impact of migration.

Fact 3: There are less minimum wage workers in the more productive locations.

I document how less productive locations have a larger share of minimum wage workers. To illustrate this result I run the following regression:

$$ln(\pi_{jt}^{MW}) = ln(prod_j) + \delta_t + \epsilon_{jt},$$

where π_{jt}^{MW} represent the share of minimum wage workers in location j at year t; $prod$ is a measure of productivity for location j, and δ_t are year fixed effects. Results are shown in Table 5. I use three measures of productivity: the average wages, the median wages, and the productivity measure of each location described in the previous section by running regression 1.. These results demonstrate that the minimum wage is more binding in less productive locations:

Table 5 – Share of Minimum Wage Workers

Dependent Variable	Log average wage$_j$	Log median wage$_j$	Log A_j
log π_j^{MW}	-1.18	-1.24	-2.58
	(0.041)***	(0.045)***	(0.10)***

As it can be seen above, an increase of a location's average wage by 10% corresponds to a decrease of 11,80% in the share of minimum wage workers. The result highlights the relevance of introducing location heterogeneity to capture the location-specific effects of a change on the national minimum wage level.

Fact 4: There are more migrants earning the minimum wage in more productive locations.

Fact 3 showed how less productive locations have a larger share of minimum wage workers. Fact 1, however, showed how, because of migration frictions, the average wage of locals and migrants could differ, making the negative relationship between the productivity of a location and the share of minimum wage workers not necessarily true for the subsample of migrants. Moreover, in Fact 2, I established that workers accept a wage penalty to move to more productive locations and accept a wage premium if they move to less productive locations. By combining Facts 1 and 2, we can form the following hypothesis: as migrants who move towards less productive locations should receive a wage premium, we would expect fewer migrants into low productivity locations who earn the minimum wage; as migrants who move towards more productive locations receive a wage penalty, we would expect more migrants towards high productivity locations willing to accept only the minimum wage. In order to test for this hypothesis, I run the following regression on the subsample of migrants:

$$ln(\pi_{jt}^{MW}) = ln(prod_j) + \delta_t + \epsilon_{jt},$$

which is analogous to the regression run previously for the sample of local workers; I regress the share of minimum wage migrants in each location to a measure of productivity in that location.

Table 6 – Share of Minimum Wage Migrants

Dependent Variable	Log average wage$_j$	Log median wage$_j$	Log A_j
$\log \pi_{jt}^{MW}$	0.480	0.532	0.685
	(0.073)***	(0.077)***	(0.17)***

Results are in Table 6, which shows a higher proportion of migrants earning the minimum wage in more productive locations, consistent with the predictions from the previous section.

As stated before, migrants accept lower wages on average than locals in more productive regions, while the reverse is true for workers who make the opposite move, from more to less productive locations. Thus, the less productive location will have a higher share of minimum wage workers; however, workers will only migrate there if they receive a large enough compensation for this disadvantageous move. Therefore, we could expect fewer people to move to less productive locations for the minimum wage. Conversely, as workers who moved from less to more productive locations can be associated with lower wages on average, we could expect to see more minimum wage workers among this group of migrants.

The evidence presented in this section underscores the critical role of moving costs and productivity in shaping migration decisions and wage outcomes. The significant barriers to mobility created by moving costs hinder workers from relocating to more productive areas, leading to persistent disparities in local labor market outcomes. Moreover, the compensating differentials theory explains how wage disparities between migrants and local workers are influenced by the productivity of their origin and destination locations.

Understanding these dynamics is essential for designing effective labor market policies, such as minimum wage adjustments, that aim to optimize worker allocation and improve overall welfare.

4 A Minimum Wage Model

4.1 Setup

The following section develops a spatial version of the Diamond-Mortensen-Pissarides search and matching canonical framework with migration dynamics from Schmutz and Sidibé (2019) with a national minimum wage, using the framework presented in Flinn (2006)
Time is continuous. The economy consists of a discrete number of regions, labeled by $j \in \mathcal{J}$, each with its local labor market. Each region has its own exogenous, location-specific productivity A_j. The labor force comprises L risk-neutral and infinitely lived workers who maximize utility with a discount rate r.

Workers

The national labor force is fixed and composed of L workers who are ex-ante homogeneous. However, workers differ in employment status (employed or unemployed) and location $j \in \mathcal{J}$. Define L_j to be the population in location j, which consists of the sum of employed ($\mathcal{E}_j$) and unemployed ($\mathcal{U}_j$) workers such that $L_j = \mathcal{U}_j + \mathcal{E}_j$.
Unemployed individuals in j receive a flow utility of b_j. They can move to any other region $k \in \mathcal{J}_{-j}$ by incurring a moving cost $c_{jk} \in \mathbb{R}^+$. Unemployed workers are always searching for a job. They can receive job offers from any region; however, commuting between two regions is not possible, so an employee who holds a job in region j must reside in that region. Employed workers do not engage in search or mobility decisions. Workers consume all their income each period.

Firms

There is a positive mass of profit-maximizing firms at each location. Firms can decide to open a vacancy in one of the regions by paying a cost of k. The output produced by a match between a worker and a vacancy, a job, will be given by a match-specific productivity y determined by a draw from a distribution $F(y)$, which is the same for all regions, and location-specific productivity A_j, such that the final production of the match is the product of the location-specific productivity

and the match-specific productivity, $A_j y$.
Jobs face an exogenous probability δ_j to be separated, such that the match will be destroyed, the job will cease to exist, and the worker will change her status to unemployed.

The Matching Function

The flow of encounters between an unemployed worker and a vacancy is given by a constant returns to scale matching function $M(\mathcal{V}_j, \hat{\mathcal{U}}_j)$, where $\mathcal{V}_j$ are the number of vacancies in region j. Define $\mathcal{U}$ as the total number of unemployed. As stated before, every unemployed person simultaneously applies to all open vacancies, local or abroad. Define $s_{jk} \in (0, 1)$ as a spatial search inefficiency, such that workers from region j may have a lower chance of receiving offers from location $k \neq j$. Then we can define $\hat{\mathcal{U}}_j$ as j's pool of unemployed, consisting in the sum of all local unemployed in j and a share s_{kj} of the unemployed in $k \neq j$ for every other location different than j:

$$\hat{\mathcal{U}}_j = u_j L_j + \sum_k s_{kj}(u_k L_k).$$

The matching function is defined as:

$$M(\mathcal{V}_j, \hat{\mathcal{U}}_j) = \hat{\mathcal{U}}_j^{\eta} \mathcal{V}_j^{(1-\eta)}$$

And define $\theta_j = \mathcal{V}_j / \hat{\mathcal{U}}_j$ to be local labor market tightness in region j, which is the ratio of number of vacancies in j to the pool of unemployed people in j. Define as well u_j to be the unemployment rate such that the sum of employed workers in region j is given by $\mathcal{E}_j = (1 - u_j)L_j$ and the sum of unemployed workers in j by $\mathcal{U}_j = u_j L_j$.

Given this, we can define the job finding probability by:

$$f(\theta_j) = \frac{M(\mathcal{V}_j, \hat{\mathcal{U}}_j)}{\hat{\mathcal{U}}_j} = \left(\frac{\hat{\mathcal{U}}_j}{\mathcal{V}_j}\right)^{(\eta-1)}$$

And the vacancy filling probability:

$$q(\theta_j) = \frac{M(\mathcal{V}_j, \hat{\mathcal{U}}_j)}{\mathcal{V}_j} = \left(\frac{\hat{\mathcal{U}}_j}{\mathcal{V}_j}\right)^{\eta}$$

with $f(\theta_j) = \theta_j q(\theta_j)$.

Wages

After a match between an unemployed worker and a vacancy, some positive surplus is generated by the job given by the draw of productivity. To determine the wage paid to the employee in that job, the worker and the firm will bargain over the surplus according to a Nash Bargaining process where workers have a bargaining power equal to $\alpha \in (0, 1)$.

4.2 Value Functions

Workers

The value function for unemployed workers is:

$$\begin{aligned} rU_j(m) = b_j - h_j + f(\theta_j) \int_m^{\infty} \max\{W_j(w) - U_j(m), 0\}\, dG_j(w|y) \\ + \sum_{k \in \mathcal{J}_{-j}} s_{jk} f(\theta_k) \int_m^{\infty} \max\{W_k(w) - U_j(m) - c_{jk}, 0\}\, dG_k(w|y) \end{aligned} \quad (1)$$

the minimum wage, m, exogenously gives the lowest wage a worker can receive. Because workers are risk-neutral, the indirect instantaneous utility is linear in home production, b_j (if unemployed), or in wages, w (if employed). Both employed and unemployed workers have to entail some local living costs equal to h_j.
For unemployed workers, the third term in the right-hand-side of equation 1 reflects the potential outcome from a match in region j, which depends on the probability of finding a vacancy $f(\theta_j)$; by $G_j(w|y)$, the mapping from the distribution of productivities $F(y)$ into a regional distribution of wages according to the wage bargaining process, and what the worker would obtain if she accepted the offer: if she accepts a job in j with a wage of w, the value of being employed will be given by the recursive representation in 2; however, by changing her employment status,

the worker would lose the value of unemployment, U_j.
The fourth term in the sum on the right-hand-side of 1 follows a similar structure, it represents the potential outcome for an unemployed worker from j from a match in k, a different location. The difference is that now the probability for the unemployed worker of finding a vacancy is affected by $s_{jk} \in (0,1)$, such that job search from $j \in \mathcal{J}$ will be less efficient in receiving offers from abroad, $k \in \mathcal{J}_{-j}$, $k \neq j$. Also, by accepting an offer from another region, the worker in j will entail some moving costs $c_{jk} > 0$.

The value function for employed workers is:

$$rW_j(y) = w - h_j + \delta_j(U_j - W_j(y)) \tag{2}$$

where $w = m$ if the minimum wage is binding, $w = w_j(y)$ otherwise.
The value of employment, defined in 2 is given by the flow utility of w, the wage, the local living costs, h_j, and affected by δ_j, which represents the local exogenous probability of the match being destroyed.

Firms

The value functions for vacant firms is:

$$\begin{aligned} rV_j = -k + \frac{q(\theta_j)}{u_j L_j + \sum_{k \in \mathcal{J}_{-j}} s_{kj}(u_k L_k)} \Bigg[u_j L_j \int_{\frac{m}{A_j}}^{\infty} \max\left\{J_j(y) - V_j, 0\right\} dF(y) \\ + \sum_{k \in \mathcal{J}_{-j}} s_{kj} u_k L_k \int_{\frac{m}{A_j}}^{\infty} \max\left\{J_j(y) - V_j, 0\right\} dF(y) \Bigg] \end{aligned} \tag{3}$$

Similarly, a firm now would only accept to form a match if the match draws a productivity higher than $\frac{m}{A_j}$ in region j, this is because the total production of the match is $A_j y$. If the minimum wage is binding, any productivity draw smaller than $\frac{m}{A_j}$ will make the firm incur losses.
The value function of a filled vacancy is:

$$rJ_j(y) = A_j y - w + \delta_j(V_j - J_j) \tag{4}$$

where $w = m$ if the minimum wage is binding, $w = w_j(y)$ otherwise. If the profit from creating a vacancy is positive, firms will keep entering the market to create jobs. Firms will enter until the marginal profit of creating a vacancy equals the marginal cost. Thus, the free-entry condition states that the expected value of a vacancy will go to 0: $V_j = 0$

Match Surplus and Wages

The joint match surplus from a match with productivity y is defined by:

$$S_j(y) = W_j(y) - U_j + J_j(y) - V_j \tag{5}$$

As defined before, free-entry condition for firms will pin down the value of vacancies to 0, $V_j = 0$. The value of the wage with renegotiation at every instant will be given by the solution of the following maximization problem:

$$w_j(y) = \max_w (W_j(y) - U_j)^{\alpha}(J_j)^{(1-\alpha)} \tag{6}$$

where $\alpha \in [0, 1]$ is the relative negotiation power of the worker.
We can express the solution of the bargaining process as:

$$W_j(y) - U_j = \alpha S_j(y) \tag{7}$$

and

$$J_j(y) = (1 - \alpha)S_j(y) \tag{8}$$

Rewrite 2 to get the value of $W_j(y) - U_j$

$$W_j(y) - U_j = \frac{w_j(y) - h_j - rU_j}{r + \delta_j} \tag{9}$$

We can use 4 and 9 to get the value of the surplus 5 as:

$$S_j(y) = \frac{A_j y - h_j - rU_j}{r + \delta_j} \tag{10}$$

We can get the wage equation by combining 9 and 7 with 10:

$$w_j(y) = \alpha A_j y + (1-\alpha)(rU_j + h_j) \tag{11}$$

Workers and Firms strategies

Define y_j^R to be the productivity value such that a worker in j would be indifferent between accepting a job offer from j with the corresponding wage and remaining unemployed:

$$W_j(y_j^R) = U_j$$

We can write y_j^R such that $W_j(y) - U_j = 0$ by using 11 and 9 as:

$$A_j y_j^R = rU_j + h_j \tag{12}$$

Similarly, following Schmutz and Sidibé (2019), we can define y_{jk}^M to be the value of productivity such that if an unemployed worker in j draws after matching with a vacancy from k, she will be indifferent between accepting such a job (and incur movement costs equal to c_{jk}) or remaining unemployed in j:

$$W_k(y_{jk}^M) = U_j + c_{jk}$$

$$y_{jk}^M = \frac{\left(1+\frac{\delta_k}{r}\right)(A_j y_j^R - A_k y_k^R - h_j + h_k) + (r+\delta_k)c + \alpha A_k y_k^R}{\alpha A_k} \tag{13}$$

Define $\hat{y}_j$ as the productivity value such that if $y = \hat{y}_j$, the bargained wage would equal the minimum wage $w(\hat{y}_j) = m$ according to the wage protocol defined in 11. Then, if the productivity draw is lower than $y = \hat{y}_j$ but high enough for the match to form, the minimum wage will be binding ($w = m$). If $y \geq \hat{y}_j$, the minimum wage will not be binding for that match, and the wage will be set according to 11.

$$\hat{y}_j = \frac{m - (1-\alpha)A_j y_j^R}{\alpha A_j} \tag{14}$$

Then, we can define now the value of employment W_j using 2 and 11 as:

$$W_j(y) = \begin{cases} \frac{m-h_j+\delta_j U_j}{r+\delta_j}, & y < \hat{y}_j \\ \frac{w_j(y)-h_j+\delta_j U_j}{r+\delta_j} = \frac{\alpha A_j(y-y_j^R)}{r+\delta_j} + U_j, & y \geq \hat{y}_j \end{cases} \tag{15}$$

We can redefine 1 to obtain an expression for y_j^R, an acceptance rule. Whenever a worker is matched with a vacancy, if she draws a productivity higher or equal to y_j^R she will accept the job, otherwise, she will continue searching for a job:

$$\begin{aligned} A_j y_j^R = b_j + \frac{f(\theta_j)}{r+\delta_j} \Bigg(\mathbb{1}\left(y_j^R < \frac{m}{A_j}\right)(m - A_j y_j^R)\left(F(\hat{y}_j) - F\left(\frac{m}{A_j}\right)\right) \\ + \alpha A_j \int_{\max\{\hat{y}_j, y_j^R\}} \left(y - y_j^R\right) dF(y) \Bigg) \\ + \sum_{k \in \mathcal{J}_{-j}} s_{jk} \frac{f(\theta_k)}{r+\delta_k} \Bigg(\mathbb{1}\left(y_{jk}^M < \hat{y}_k\right)(m - A_j y_j^R)\left(F(\hat{y}_k) - F\left(\frac{m}{A_k}\right)\right) \\ + \alpha A_k \int_{\max\{\hat{y}_k, y_{jk}^M\}} \left(y - y_k^R\right) dF(y) + \\ + \mathbb{1}\left(y_{jk}^M < \hat{y}_k\right)\left(\frac{\delta_k}{r}(A_k y_k^R - A_j y_j^R - h_k + h_j) - (h_k - h_j) - (r+\delta_k)c\right)\left(F(\hat{y}_k) - F\left(\frac{m}{A_k}\right)\right) \\ + \left(1 + \frac{\delta_k}{r}(A_k y_k^R - A_j y_j^R - h_k + h_j) - (r+\delta_k)c\right)(1 - F(\max\{\hat{y}_k, y_{jk}^M\}) \Bigg) \end{aligned} \tag{16}$$

By using 3, 4 and the Free-Entry condition, we can find the number of vacancies to be:

$$\mathcal{V}_j^{\eta} = (u_jL_j + \sum_{k\in\mathcal{J}_{-j}} s_{kj}(u_kL_k))^{(\eta-1)} \frac{1}{k(r+\delta_j)} \Bigg[u_jL_j \Bigg(\mathbb{1}\left(y_j^R < \hat{y}_j\right) \int_{\frac{m}{A_j}}^{\hat{y}_j} (A_jy - m)\, dF(y) + (1-\alpha)A_j \int_{\max\{\hat{y}_j, y_j^R\}} \left(y - y_j^R\right) dF(y) \Bigg) + \sum_{k\in\mathcal{J}_{-j}} s_{kj}u_kL_k \Bigg(\mathbb{1}\left(y_{kj}^M < \hat{y}_j\right) \int_{\frac{m}{A_j}}^{\hat{y}_j} (A_jy - m)\, dF(y) + (1-\alpha)A_j \int_{\max\{\hat{y}_j, y_{kj}^M\}} \left(y - y_j^R\right) dF(y) \Bigg) \Bigg] \tag{17}$$

Spatial Equilibrium

In order for a spatial equilibrium to hold it has to be that for all $j \in \mathcal{J}$, $j \neq k$:

$$U_j \geq U_k - c_{jk} \tag{18}$$

no unemployed worker has incentives to pay the moving costs to remain unemployed in another location. Assume the opposite was true for some pair $\{j,k\} \in \mathcal{J}$, as all unemployed individuals in j are identical all of them will have incentives to migrate into location k, making location j empty.

4.3 Equilibrium

The stationary distribution of unemployment is given by:

$$u_j = \frac{\delta_j}{\delta_j + f(\theta_j)\left(1 - F\left(\max\{y_j^R, \frac{m}{A_j}\}\right)\right) + \sum_{k\in\mathcal{J}_{-j}} s_{jk} f(\theta_k)\left(1 - F\left(\max\{\mathbb{1}(y_{jk}^M > \hat{y}_k) y_{jk}^M, \frac{m}{A_k}\}\right)\right)} \tag{19}$$

Similarly, the number of people at each region should remain constant. The amount of unemployed workers who leaves region j should be compensated by the amount of people who arrives from k, such that:

$$u_j L_j \sum_{k \in \mathcal{J}_{-j}} s_{jk} f(\theta_k) \left(1 - F\left(\max\{\mathbb{1}(y_{jk}^M > \hat{y}_k) y_{jk}^M, \frac{m}{A_k}\}\right)\right) =$$

$$\sum_{k \in \mathcal{J}_{-j}} u_k L_k s_{kj} f(\theta_j) \left(1 - F\left(\max\{\mathbb{1}(y_{kj}^M > \hat{y}_j) y_{kj}^M, \frac{m}{A_j}\}\right)\right) \quad (20)$$

A stationary equilibrium in this economy is characterized by:

1. An acceptance strategy of local jobs given by y_j^R as described in 16
2. A mobility strategy given by the acceptance strategy of distant jobs given by y_{jk}^M as described in 13
3. The number of vacancies in each region is given by 17
4. Unemployment rates are given by 19
5. Populations are given by 20
6. The spatial equilibrium condition given by 18 holds

5 Identification

As the model builds on Schmutz and Sidibé (2019), some parts of their identification strategy can be followed. The parameters to be estimated can be grouped in 3 sets: the national parameters $\{m, r, k, \alpha, \eta, F\}$; the location specific parameters $\{A_j, b_j, \delta_j, h_j\}_{j \in \mathcal{J}}$, and a third set consisting of $\{c_{jk}, s_{jk}\}_{\mathcal{J}x\mathcal{J}_{-j}}$. $\mathcal{J}$ is set to the 94 *départements* in continental France.
Some of the parameters are set directly to the data. I start by estimating some measure of location specific productivity. As firms are homogeneous I don't consider any firm fixed effects, but the analysis could be extended to allow for this. Thus, I estimate a function of wages on individual characteristics with time and location fixed effects as described in 1:

$$w_{it} = x_{it}\beta + \gamma_t + \psi_j + \epsilon_{it}, \quad (1)$$

where x_{it} controls for individual characteristics as age and experience. γ_t controls for time fixed effects and ψ_j, regional fixed effects.
Thus, I consider A_j to be estimated by the region fixed effects parameters from 1.

The rest of parameters are estimated sequentially such that:

Given A_j, y_j^R, the productivity value threshold, is set to match the empirical value of the average wage following a transition from unemployment into employment in the same location j, $\mathbb{E}[w_j|\mathcal{U}_j\mathcal{E}_j]$, y_j^R is estimated by:

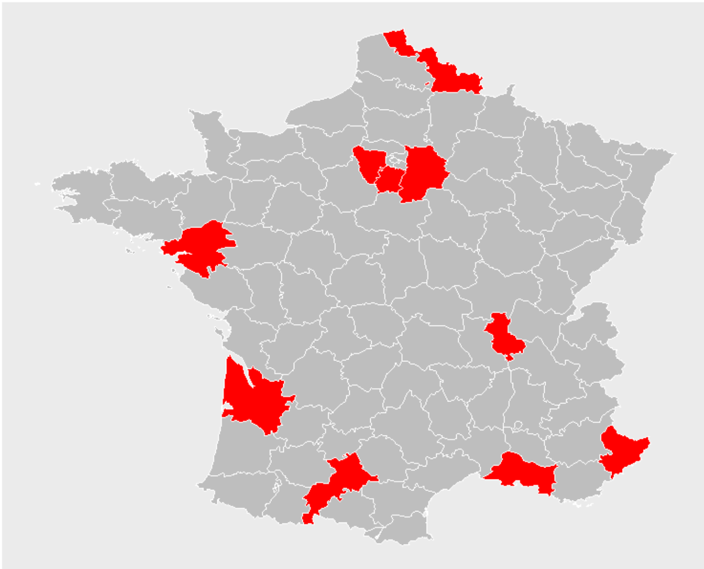
$$\mathbb{E}[w_j|\mathcal{U}_j\mathcal{E}_j] = A_j\left(\alpha\mathbb{E}[y|y \geq y_j^R] + (1-\alpha)y_j^R\right) \tag{2}$$

In a similar manner, the value of y_{jk}^M, the lowest productivity match that a worker from j would accept in order to move to k is set to match the empirical value of the average wage following a transition from j to k, $\mathbb{E}[w_j|\mathcal{U}_k\mathcal{E}_j]$:

$$\mathbb{E}[w_j|\mathcal{U}_k\mathcal{E}_j] = A_j\left(\alpha\mathbb{E}[y|y \geq y_k^M] + (1-\alpha)y_j^R\right) \tag{3}$$

Because for a large number of couple of regions, the number of observations (transitions) is too low, we can´t assume that the average wage following a transition from j to k converges to the true expected wage value following a transition. Thus, I will select a subset of regions $\mathcal{J}_1 \subset \mathcal{J}$ for which the matrix of transitions between any two locations $\{j,k\} \in \mathcal{J}_1$ is large enough. The selected locations are showed in Figure 3

FIGURE 3 – Subset of locations $\mathcal{J}_1$



There are 10 locations which constitute $\mathcal{J}_1$ are selected such that the *départements* are distributed all along France and according to population. The Paris and the Hautes-de-Seine departments are not selected as they wage is much larger than the rest of locations. [1]

The moving costs are identified from the difference in wages between locals and migrants, from which I obtain the values for y_j^R and y_{jk}^M as described before. Once this values are obtained, c_{jk} was defined to solve:

$$U_j = W_k(y_{jk}^M) - c_{jk} \tag{4}$$

As I only have the matrix of moving costs for the subset $\mathcal{J}_1$, I need to estimate the values of c_{jk} for the whole set of locations $\mathcal{J}$.

Following Kennan and Walker (2011) and Schmutz and Sidibé (2019) I estimate the moving costs on distance, population differences and location specific productivity differences:

[1] The departments chosen rank 1st, 3rd, 4th, 6th, 9th, 10th, 12th, 14th and 20th in population. The *départements* are: Alpes-Maritimes, Bouches-du-Rhône, Haute-Garonne, Gironde, Loire-Atlantique, Nord, Rhône, Seine-et-Marne, Yvelines, Essonne.

$$c_{jk} = \beta_0 + \beta_1 dist_{jk} + \beta_2 \left(\frac{L_j}{L_k}\right) + \beta_3 \left(\frac{A_j}{A_k}\right)$$

Given that I dispose now of the full $\mathcal{J}x(\mathcal{J}-1)$ matrix of moving costs, I compute the estimated values of y^M_{jk} for all couple of locations by solving 4.

The value of the spatial search friction is taken from the transitions out of unemployment observed in the data.

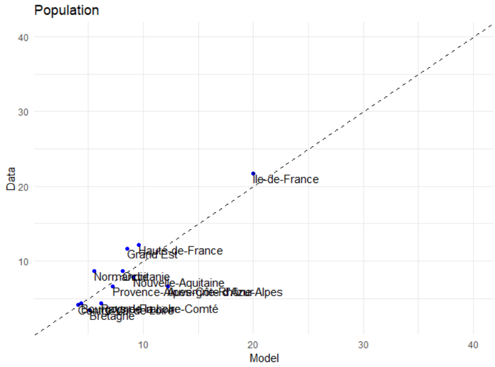
$$\frac{\mathcal{U}_j \mathcal{E}_j}{\mathcal{U}_k \mathcal{E}_j} = \frac{u_j L_j f(\theta_j) \left(1 - F\left(y^R_j\right)\right)}{s_k u_k L_k f(\theta_j) \left(1 - F\left(y^M_k\right)\right)} \tag{5}$$

Given the characterization of y^R_j described in 16, b_j is set to match the value of 2. The value of k is set to match the empirical levels of unemployment.

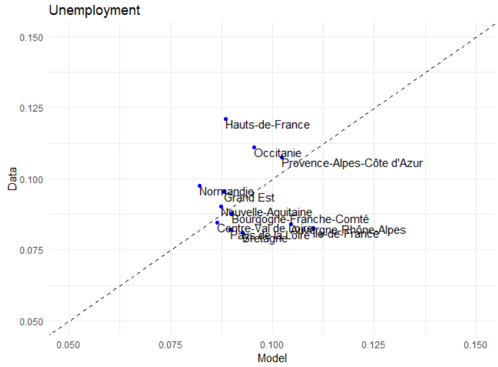
5.1 Results

Some of the parameters are set to match their counterpart in the yearly frequency french data: r is set to 0.04 to match annual interest rate. m is set to match 2016 national minimum wage, which was 9.67. δ_j is set to match yearly location specific separation rates.

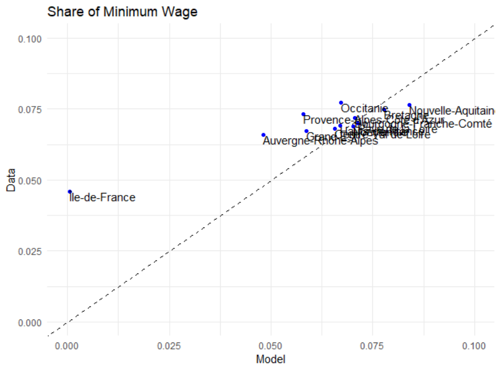
Parameter	Name	Moment
r	Interest Rate	0.04
k	Cost of a vacancy	Average unemployment
α	Workers bargaining power	0.5
η	Matching elasticity	Hosios condition
m	Minimum wage	2011 minimum wage
δ_j	Job destruction rate in j	Match job separations
A_j	Location specific productivity	Match regression estimates
b_j	Home production	Average wage of locals
h_j	Living Costs	INSEE-Filosofi
c_{jk}	Moving costs	Average wage of movers $j \to k$
s_{jk}	Spatial search friction	Transitions $j \to k$



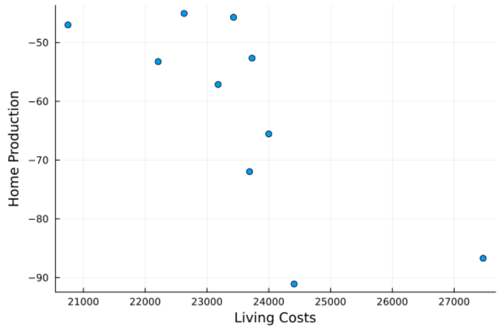
(a) Population



(b) Unemployment Rates



(c) Share of Minimum Wage workers



(d) Housing Costs vs Home production

FIGURE 4 – Main caption describing all the subgraphs.

TABLE 7 – Estimated levels of home production, job creation rate and job destruction rate

Parameter	b_j	f_j	δ_j
Minimum	-91.09	0.895	0.0907
Mean	-61.61	1.016	0.110
Median	-55.19	0.977	0.108
Maximum	-45.05	1.207	0.171
Sd	16.77	0.108	0.0122

Figure 4d the relationship between the estimated value of b_j and an estimation of the annual living costs by INSEE. Even though the sample is small, the home production value might be capturing the location specific living cost.

6 The effects of the minimum wage

The effects of different levels of minimum wage in unemployment will be non-linear as described in Figure 5.

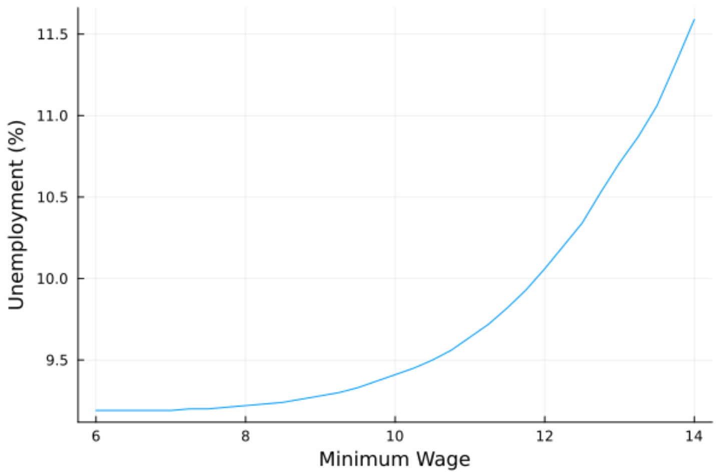


FIGURE 5 – Minimum Wage to Unemployment Rate

As the graph describes, increasing the minimum wage level is not always associated with an increase in overall unemployment. The stationary level of unemployment was described by:

$$u_j = \frac{\delta_j}{\delta_j + f(\theta_j)\left(1 - F\left(\max\{y_j^R, \frac{m}{A_j}\}\right)\right) + \sum_{k \in \mathcal{J}_{-j}} s_{jk} f(\theta_k)\left(1 - F\left(\max\{\mathbb{1}(y_{jk}^M > \hat{y}_k) y_{jk}^M, \frac{m}{A_k}\}\right)\right)} \quad (1)$$

A change in the minimum wage will affect unemployment through different channels. In a partial equilibrium, increasing the minimum wage will have no effects on unemployment if it is not binding. However, when the minimum wage is binding ($\frac{m}{A_j} > y_j^R$), the minimum wage will increase unemployment by reducing the set of productivity draws that will result in a match. More specifically, any productivity draw between $y \in \left[y_j^R, \frac{m}{A_j}\right]$ which would have been realized absent the minimum wage, is now not possible.

The unemployment rate will also be affected by the migration rate. When the value of $y_{jk}^M > \hat{y}_k$, the minimum wage will not affect the migration decision. As y_{jk}^M was defined to be the productivity draw that pays a wage large enough to compensate the worker for the migration costs and $\hat{y}_k$ was the productivity draw in k that was paying exactly the minimum wage, this condition establishes that the wage a worker would accept to migrate from j to k is larger than the minimum wage. However, when $\frac{m}{A_k} < y_{jk}^M < \hat{y}_k$, the minimum wage is enough to compensate a move from j to k. This means that whenever this condition is met, there is a new set of jobs that the worker will be willing to accept, $y \in \left[\frac{m}{A_k}, \hat{y}_k\right]$, as all these jobs will pay the worker enough to compensate for the moving costs. [2] Lastly, if $\frac{m}{A_k} > y_{jk}^M$, the unemployment rate will be larger as the set of jobs following a productivity draw $y \in \left[y_{jk}^M, \frac{m}{A_k}\right]$ would have been realized absent the minimum wage.

Lastly, the unemployment rate in j will be affected by the market tightness in every market $j \in \mathcal{J}$. The value of θ_j is given by the number of unemployed workers in each location and the number of vacancies in location j, which was given by:

$$
\begin{aligned}
\mathcal{V}_j^\eta = (u_j L_j + \sum_{k \in \mathcal{J}_{-j}} s_{kj}(u_k L_k))^{(\eta-1)} \frac{1}{k(r+\delta_j)} \Bigg[u_j L_j \Bigg(\mathbb{1}\left(y_j^R < \hat{y}_j\right) \int_{\frac{m}{A_j}}^{\hat{y}_j} (A_j y - m)\, dF(y) \\
+ (1-\alpha) A_j \int_{\max\{\hat{y}_j, y_j^R\}} \left(y - y_j^R\right) dF(y) \Bigg) \\
+ \sum_{k \in \mathcal{J}_{-j}} s_{kj} u_k L_k \Bigg(\mathbb{1}\left(y_{kj}^M < \hat{y}_j\right) \int_{\frac{m}{A_j}}^{\hat{y}_j} (A_j y - m)\, dF(y) \\
+ (1-\alpha) A_j \int_{\max\{\hat{y}_j, y_{kj}^M\}} \left(y - y_j^R\right) dF(y) \Bigg) \Bigg] \quad (2)
\end{aligned}
$$

As described in 2, when the minimum wage is binding, the worker will appropri-

[2] The lowest possible productivity draw that will lead to a match is given by $\frac{m}{A_k}$. This is because the total production of the match will be $A_k y$. If the minimum wage is binding, any productivity draw smaller than $\frac{m}{A_k}$ will make the firm incur losses.

ate less surplus from the match, reducing the value of the job. On the other hand, a higher value of m will induce migration from k to j, making it more profitable for a firm to hold a vacancy in j. Given the free-entry condition, the dominating effect will bring the number of vacancies up or down.

Define the number of migrants from location k to location j to be:

$$\mathcal{M}_{kj} = s_{kj} f(\theta_j) u_k L_k \left(1 - F\left(\max\left\{\mathbb{1}(y_{kj}^M > \hat{y}_j) y_{kj}^M, \frac{m}{A_j}\right\}\right)\right)$$

which is affected by the spatial search friction s_{kj}, assumed to be a constant; the job finding probability, which is affected by the minimum wage through θ_j; the number of unemployed people in k, and the probability of finding an acceptable match, which increases when m is binding.

The welfare of region j looks like this:

$$\Omega_j = \bar{W}_{jj}((1-u_j)L_j - \sum_{k \in \mathcal{J}_{-j}} \mathcal{M}_{kj}) + U_j u_j L_j + \sum_{k \in \mathcal{J}_{-j}} \mathcal{M}_{kj}(\bar{W}_{kj} - c_{kj})$$
$$+ \bar{J}_{jj}((1-u_j)L_j - \sum_{k \in \mathcal{J}_{-j}} \mathcal{M}_{kj}) + \sum_{k \in \mathcal{J}_{-j}} \mathcal{M}_{kj} \bar{J}_{kj}$$

The total welfare will be given by $\Omega = \sum_{j \in \mathcal{J}} \Omega_j$.

This function states that the number of local workers, those who transition from unemployment into a job in the same location j, will have an average welfare level of $\bar{W}_{jj}$. The size of this set is given by $(1-u_j)L_j$, the number of employed people in j, minus $\sum_{k \in \mathcal{J}_{-j}} \mathcal{M}_{kj}$, the sum of workers who migrated from $k \neq j$. U_j describes the welfare level of an unemployed worker in j, which is the same for all unemployed workers. The last term of the first line describes the average welfare level of migrants workers from k to j, moving costs are also taking into consideration in the welfare function. The second line describes the average welfare level associated with a filled vacancy from a local worker ($\bar{J}_{jj}$) or from a migrant ($\bar{J}_{kj}$). The welfare value of a worker employed in j is given by $W_j(y) = \frac{w_j(y) - h_j + \delta_j U_j}{r + \delta_j}$ and the value of the wage is directly affected by A_j, the location specific productivity, why don't workers migrate to the most productive location? There are two spatial frictions that affect migration decisions, one is the spatial search friction, which reduces the probability of matching with a vacancy from some other location, the other one is the moving cost, which reduces the amount of acceptable matches. In the absence of spatial frictions the value of being unemployed would equalize across locations. Because of the barriers to movement, this is not true in this model.

The total welfare value is given by Figure 6:

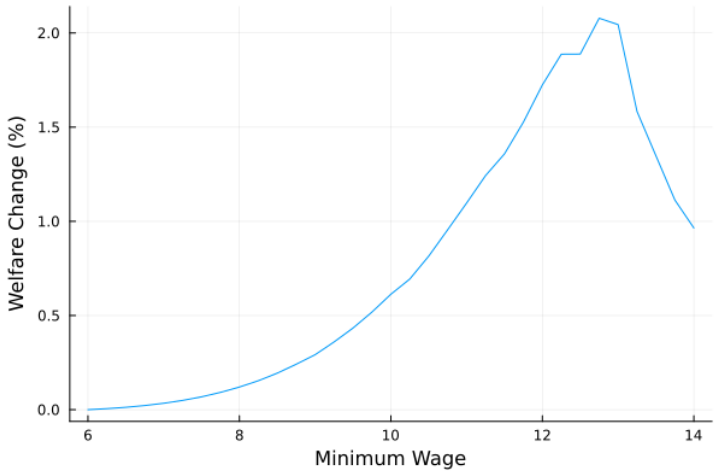


FIGURE 6 – Minimum Wage to Welfare per capita

The maximum level of welfare is attained when $m = 10.5$. The value of $\bar{W}_{jj}$ is a positive function of wages which itself is a positive value on

6.1 Heterogeneous effects of the minimum wage

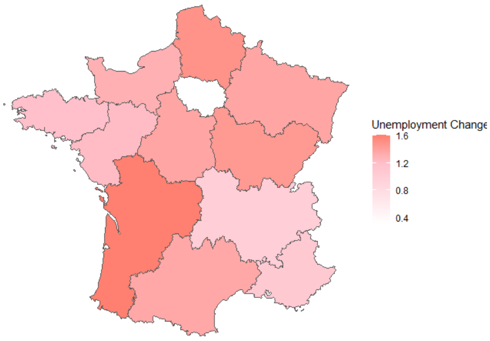
Recall that the initial value of the minimum wage was set to 9.67€. I find that the value of m that maximizes Ω is given by $m = 10.50$€.
In figure 7b we can observe the change on wages associated with an increase from the initial to he optimal value of m:

The change of welfare is unevenly distributed. Those locations with a larger location specific productivity experience a positive increase in welfare, while those in regions with a lower A_j are worse off after the increase in m. The change in welfare levels occurs as a consequence of a change in migration response from location

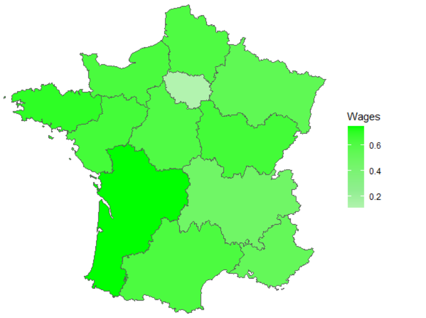
j to k. As the minimum wage increases it becomes large enough to compensates workers for the moving costs, making it easier for workers to find acceptable job offers from abroad. Once the minimum wage is binding for migrants $\bar{W}_{jj} = \bar{W}_{kj}$.

From figure 7d we can observe how the change of population occurs towards the most productive areas. As mobility will occurs as a response to higher job accepting probability, the change in welfare will be associated to a larger welfare gains from moving workers towards the most productive areas.

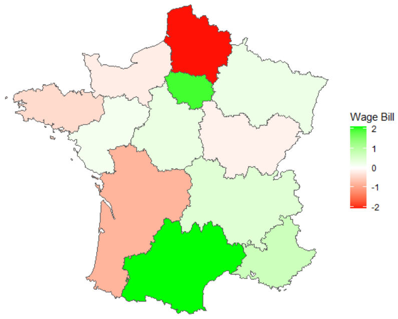
As we can see, the minimum wage that maximizes welfare does so by reallocating employees towards more productive areas.
On the other hand, changes in welfare will be also explained by the unemployment rates, as can be observed in figure 7a, most of the locations will increase their unemployment levels as a consequence of the change in minimum wage. The results were showing how the home production values b_j were substantial and negative , making the difference between the welfare values of employed and unemployed workers large.



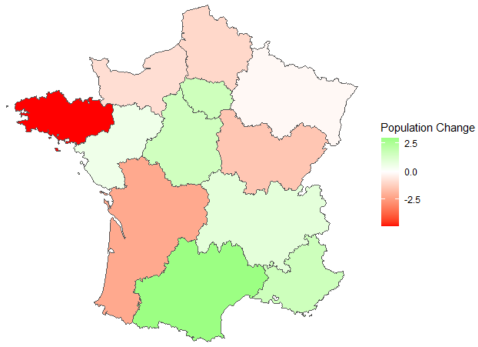
(a) Subgraph 1



(b) Subgraph 2



(c) Subgraph 3



(d) Subgraph 4

FIGURE 7 – Main caption describing all the subgraphs.

6.2 Decomposition

Unemployment rate: $u = \sum_j L_j u_j$

$$\Delta u = \sum_j \underbrace{\left(\frac{L_j + L'_j}{2}\right)(u'_j - u_j)}_{\text{within-region employment effect}} + \sum_j \underbrace{\left(\frac{u_j + u'_j}{2}\right)(L'_j - L_j)}_{\text{reallocation effect}}$$

Wage Bill : $WB = \sum_j \mathcal{E}_j \cdot \mathbb{E}(w_j)$

$$\Delta WB = \sum_j \underbrace{\left(\frac{\mathcal{E}_j + \mathcal{E}'_j}{2}\right)(\mathbb{E}(w_j)' - \mathbb{E}(w_j))}_{\text{wage effect}} + \sum_j \underbrace{\left(\frac{\mathbb{E}(w_j) + \mathbb{E}(w_j)'}{2}\right)(\mathcal{E}'_j - \mathcal{E}_j)}_{\text{reallocation effect}}$$

7 Conclusions

In this paper, I propose a spatial general equilibrium model with migration dynamics and job market frictions to quantify the optimal minimum wage level. Two results arise from this exercise: first, the unemployment rate can be reduced as a response to higher minimum wages; second, the optimal value of the minimum wage is non-zero and equal to 10.50€. The two arise from the interaction between migration frictions and minimum wages. As workers would need to be compensated for the moving costs if they were to accept a job abroad, their job acceptance probability of distant jobs is reduced. When the minimum wage value becomes large enough, the set of jobs they would be willing to accept increases and becomes the same as that of a local worker. By increasing job acceptance probability, the optimal minimum wage will induce migration towards the more productive areas. Thus, the optimal minimum wage reallocates employees towards more productive locations.

References

Allegretto, S. A., A. Dube, and M. Reich (2011). Do minimum wages really reduce teen employment? accounting for heterogeneity and selectivity in state panel data. *Industrial Relations: A Journal of Economy and Society 50*(2), 205–240.

Bilal, A. (2021). The geography of unemployment. Technical report, National Bureau of Economic Research.

Card, D. and A. B. Krueger (2000). Minimum wages and employment: a case study of the fast-food industry in new jersey and pennsylvania: reply. *American Economic Review 90*(5), 1397–1420.

Card, D., J. Rothstein, and M. Yi (2023, August). Location, location, location. Working Paper 31587, National Bureau of Economic Research.

Diamond, P. A. (1982). Wage determination and efficiency in search equilibrium. *The Review of Economic Studies 49*(2), 217–227.

Dube, A., T. W. Lester, and M. Reich (2016). Minimum wage shocks, employment flows, and labor market frictions. *Journal of Labor Economics 34*(3), 663–704.

Flinn, C. J. (2006). Minimum wage effects on labor market outcomes under search, matching, and endogenous contact rates. *Econometrica 74*(4), 1013–1062.

Heise, S. and T. Porzio (2022, July). Labor misallocation across firms and regions. Working Paper 30298, National Bureau of Economic Research.

Kennan, J. and J. R. Walker (2011). The effect of expected income on individual migration decisions. *Econometrica 79*(1), 211–251.

Kuhn, M., I. Manovskii, and X. Qiu (2021). The geography of job creation and job destruction. Technical report, National Bureau of Economic Research.

Monras, J. (2019). Minimum wages and spatial equilibrium: Theory and evidence. *Journal of Labor Economics 37*(3), 853–904.

Mortensen, D. T. (1998). Equilibrium unemployment with wage posting: Burdett-mortensen meet pissarides. *University of Aarhus CLS Working Paper* (98-014).

Pissarides, C. A. (1985). Short-run equilibrium dynamics of unemployment, vacancies, and real wages. *The American Economic Review 75*(4), 676–690.

Schmutz, B. and M. Sidibé (2019). Frictional labour mobility. *The Review of Economic Studies 86*(4), 1779–1826.

Todd, P. E. and W. Zhang (2022, November). Distributional effects of local minimum wages: A spatial job search approach. Working Paper 30668, National Bureau of Economic Research.