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Global Migration and Labor Markets

Course of
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INTRODUCTION

Labour Market and Migration

According to economic theory, migration may simply be viewed as an investment: employees hunt for higher-paying opportunities in foreign labour markets, and if the long-term return is high enough to compensate for the various costs of relocating overseas, they decide to shift countries. There are numerous elements that increase the likelihood of migration. The wage differential is the most obvious and obvious, but others, such as worker age and skill set, may be important as well: young and highly educated people are more likely to move away from their own country because, on the one hand, they have their entire lives ahead of them, so they have a longer time span to benefit from the investment; on the other hand, highly skilled workers face a broader job market, so when they look for a job, their geographical research is more extensive. Furthermore, highly trained professionals may elect to relocate for the advancement of their careers: an experience abroad can be quite beneficial in obtaining a promotion or returning to a comparable post in the home country if they are not totally content with the foreign way of life. Persons with basic skills may decide to relocate in order to improve their condition, whereas people with average skill levels may be worried of not finding a comparable job environment in terms of the value given to their talents overseas and being compelled to accept a worse one. To support this notion, it is important noting that the basic levels of knowledge required are likely to be similar across countries, however hurdles, such as language, may exist for the middle level. Competences are more uniform in the highly skilled job market, and communicative obstacles are less likely to exist.

It is also vital to include facts that reduce the likelihood of migration that we have simply referred to as "costs," which in empirical studies are primarily proxied by the distance between the country of origin and destination. To deconstruct this category, it is necessary to distinguish between material and psychological ones. Material costs, such as plane tickets or the higher cost of living, are more obvious, but psychological costs, such as leaving a known environment, friends, family, and the house where you grew up, are likely to be more significant: leaving a known environment, friends, family, and the house where you grew up, are what really prevent people from moving as soon as they learn they can increase their salary somewhere else. Given that the latter types of costs are more difficult to forecast, the phenomena of "instant return" is extremely common, as the projected return on investment may be substantially changed once the worker is effectively in the new environment. When analyzing employees' family costs, we must consider the issue of "tied movers" and "tied stayers," which are persons who migrate because their partner can earn a greater pay. Their decision to relocate can be formalized as if the couple behaves as distinct individuals, and so they will choose to relocate overseas based on the sum of salaries in the native and foreign states.

Immigrants’ Effect on the Local Job Market

Once in the new country, migrants will interact with native workers in the labor market, and various layers of interaction may occur. The most basic scenario suggested by economic theory is that natives and immigrants are perfect replacements in the production process if they

have the same skills, therefore they would fight for the same open positions in the job market with a negative effect on pay for a fixed demand. However, interactions between different job markets within a country should be mentioned as well: each immigrant, regardless of his skills, is unlikely to have an impact solely on the sub-market of workers with comparable skills, but the externalities of the migration process will spread throughout the entire job market. The specialization of local workers when foreign workers arrive is a simple illustration of this trend, which is formalized by economic theory by identifying these two groups as complements. In the absence of foreign migration, some middle-skilled locals may choose to seek for and secure occupations requiring only lesser abilities in order to avoid being unemployed. Given the presence of non-native immigrants with poor skills, the previously mentioned local category can specialize and develop their knowledge in order to be more competitive for middle-level positions and, as a result, raise their wage. To summarize, they may not compete for the same occupations as new immigrants, but the presence of foreign employees may allow natives to do better. Conversely, middle-skilled immigrants may choose low-level occupations due to discrimination or because their abilities are not acknowledged in the new country, competing with low-skilled natives. A more complicated network of interactions among job markets can be a positive externality of high-skilled immigration, which is typically aimed towards industrialized and developed countries, particularly but not only in high-tech sectors. One such mechanism is as follows: this type of immigration can increase the salary of lower skilled natives (and possibly attract lower skilled immigrants as a result) through their demand for services because those "special immigrants" are likely to have a salary above the average, and thus they will demand premium services from the economic environment in which they live. They may demand high-quality public services, employ a babysitter, and eat at local restaurants. All these actions are likely to stimulate an increase in job demand in the region and spur its economic growth.

NETLOGO SIMULATION

In our simulation, we'll look at an economy with three countries and three types of workers: highly skilled, middle-skilled, and low-skilled. Workers are randomly assigned to countries at the start of the simulation; each patch will be distinguished by a wage for each of these categories as well as some basic economic fundamentals such as the number of available jobs per category, GDP, indicators of job market flexibility, and initial average unemployment. Each type of worker will almost certainly confront three different pay in different countries. This is exactly what happens in reality, because jobs that demand the same qualities are paid differently depending on the country. In our simulation, we will assume that workers are fully aware of the pay in each of the three states. They can elect to relocate their family to the country with the best profitability after observing how much their employment is paid in the two countries where they do not live.

It would be unreasonable and uninteresting to enforce a set wage over time, therefore we will allow it to change over time: a rise in GDP over the previous cycle will create new employment, and salary variation will be a function of the gap between demand and supply. We will assume implicitly that in a country, all employers of a certain type of workers pay the same salary, which we believe is reasonable. If a country's wage for a particular type of workers, say low skilled workers, is relatively high, low skilled workers in the other two

countries will begin migrating there after weighing the economic convenience versus the expenses of transferring. However, we do not know in advance if all low skilled workers will move there since the wage fluctuates over time and families may be composed by workers with different skills, hence different ”best destinations”.

The goal of this work is to look for agent reactions to the simulated economic environment in terms of migration of families with more than one component versus singles, return in the native nation after being abroad, and skill composition of migration.

SETUP THE WORLD

The first procedure that is run as the simulation starts is the setup of the world. In this passage we create the three countries of equal size and square shape, identifying them with different colors and we attribute to the patches the values of their own economic fundamentals as the *initial average unemployment rate* and the *salary base*.

Then the world is populated: we create a *number of workers* that are sent to one of the countries with equal probability: if the user decides to keep in off-mode the *AsymmetricSkills* switcher, in each country the will be the same distribution of skills, while if the switcher is on the simulation will try to reproduce the situation of a world with a developed country, a developing one and one in the middle of them as far as skills distribution is concerned.

Once workers own skills, they are grouped into families: each worker will be attached a ”surname” and will be linked with its relatives behaving as a unique individual

(i.e. maximizing the familiar income rather than the individual one)

```
ask workers [
  if pcolor = gray [ set familyN random(count(workers with [pcolor = gray])) + 1000]
  if pcolor = yellow [ set familyN random(count(workers with [pcolor = yellow])) + 2000]
    if pcolor = sky [ set familyN random(count(workers with [pcolor = sky])) + 3000] ]
```

Notice that in this step we made the important assumption that families are formed only among individuals in the same country thanks to the per-country constant, but on the other hand the procedure allows to have families with only one member, for a better fit of reality. In that case the procedure below will recognize only one worker as member of its family.

```
ask workers [set myFamily workers with [familyN = [familyN] of myself ]]
```

Obviously workers will have to take into account costs of migration in taking their decision. As previously mentioned, we can divide costs of migration into material and psychological: the first type of costs is set equal for all workers who live in the same country since they include the cost of travel and comparables and are proxied by the *distance between the country* of origin and destination. Psychological costs differ among people since they depend on the network of relationships built with family and friends, moreover we cannot assume them constant over time since the underlying relationships are not, hence we let them be different

for each worker and we set the psychological costs of the family as the sum of the costs of each member. The only assumption we have made about these costs is that they are lower when the worker is abroad, assuming an emotional tie with the native country, and if the workers is highly skilled, since it is likely to have a bigger ability of finding new opportunities, hence it is more prone to leave.

Since we have assumed that workers have perfect knowledge about job markets in foreign countries, they will collect information about what they could earn moving (in the collect info procedure), then compute the total familiar income and the total familiar costs.

Now the job market is created. Since the GDP can be seen as the sum of salaries paid by firms, we fix the GDP of the period before the simulation starts as if each worker in the country earned the *base salaries* divided by 2: this will create a GDP positive shock as the simulation starts, changing salaries and letting migrations happen. The current GDP is simply calculated as sum of the salaries of workers in the country of interest, while we set the initial condition of the job market according to the *initial average unemployment rates* as shown below.

```
ask patches [let x count workers with [skills = 1 and pcolor = [pcolor] of myself] set jobL
round(x - x * initial_unempl_rate) ]
```

Each country will be characterized by a single average unemployment level and not by a per-category one because it would have been probably confusing for the user: according to our simplification, the user will have to select only 3 values, while in the other case they would have been 9.

Initially, salaries in countries are set as the *base salary* decreased by a simple function of the number of workers per category.

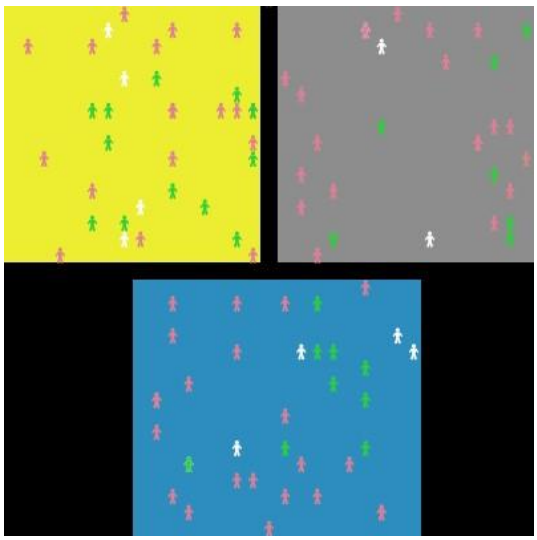


Figure 1:

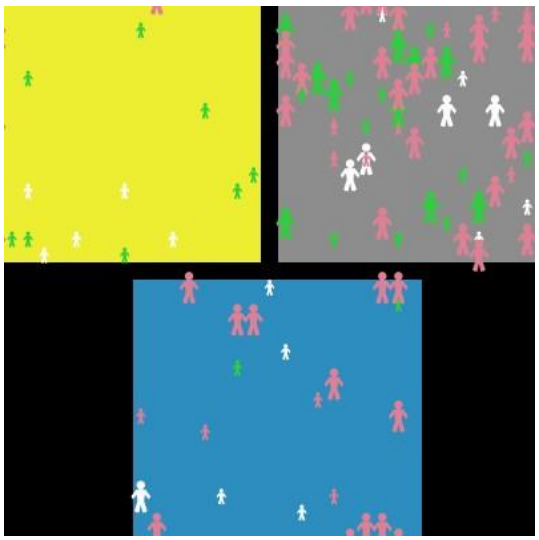


Figure 2:

Figure 1: The visual output of the setup procedure with three countries and three types of workers mainly in one country

Figure 2: Typical output of a go procedure dure. Migrants are bigger than natives and three types of workers and

salary differential among countries. In order to keep into account the possibility of being unemployed, the workers consider the expected salary, multiplying it by the probability of being employed. As shown in the code below we will consider the probability of being employed as the ratio between the overall number of jobs and the actual workforce: the expectation is applied to the current familiar income. If the number of available jobs is higher than the number of workers, clearly the probability of employment will be 1.

```
ask workers [let x count workers with [pcolor = [pcolor] of myself]
                                        let tot_jobs [jobL] of patch-here + [jobM] of patch-here +
                                [jobH] of patch-here let
                            prob_employement tot_jobs / x
                        set actual-familyIncome actual-familyIncome * min (list 1 prob_employement) ]
```

Notice that in the model there is no way for a worker to improve his skills and change its category, hence the comparison among levels salaries of different skills makes no sense since the model is based on per-category wage differentials: it only matters that salaries of the same category has the same order of magnitude.

THE OUTPUT

The simulation's output consists of both a visual representation of the agents in the states and many charts that are generated. The charts that indicate how salaries vary over time in the three countries are probably the most essential because any interpretation of the others must be related to their behaviour. Other charts illustrate how many migrants return to their home country each cycle in relation to the overall number of migrants in the world at the time, as well as the number of migrants who are part of a family with more than one person against how many are singles. The last graphs visualize the migration flows through the number of immigrants in each country, while we keep also track of the changes due to the migration process as far as each country's workforce composition is concerned.

SIMULATIONS

Preliminary Test

First of all we have performed some simulations with the only aim to test whether our simulation was able to recreate obvious pattern in the job market. As shown in the following figures the creation of families allowed the tied movers and tied stayers effect to take place,

in fact those workers are not in the country that maximizes their own wealth, but they accept a lower salary because the family can benefit from migrating (or not migrating).

Figure 3: A middle skilled tied stayer

Figure 4: Detail of its internal variables

The example in the figure above shows how the actual salary of the worker is 229 and he could easily move to the country sky to obtain 237. However his familiar situation prevents him to do so: the family would be worse off moving.

Another test for the goodness of our simulation was to check if, when salaries skyrocket in a country, all workers will converge there, and that's the case. As shown in the image below, wages in country Sky are significantly higher than the others for each one of the categories of interest: as a consequence, once the differential is sufficient, each family will move to such place.

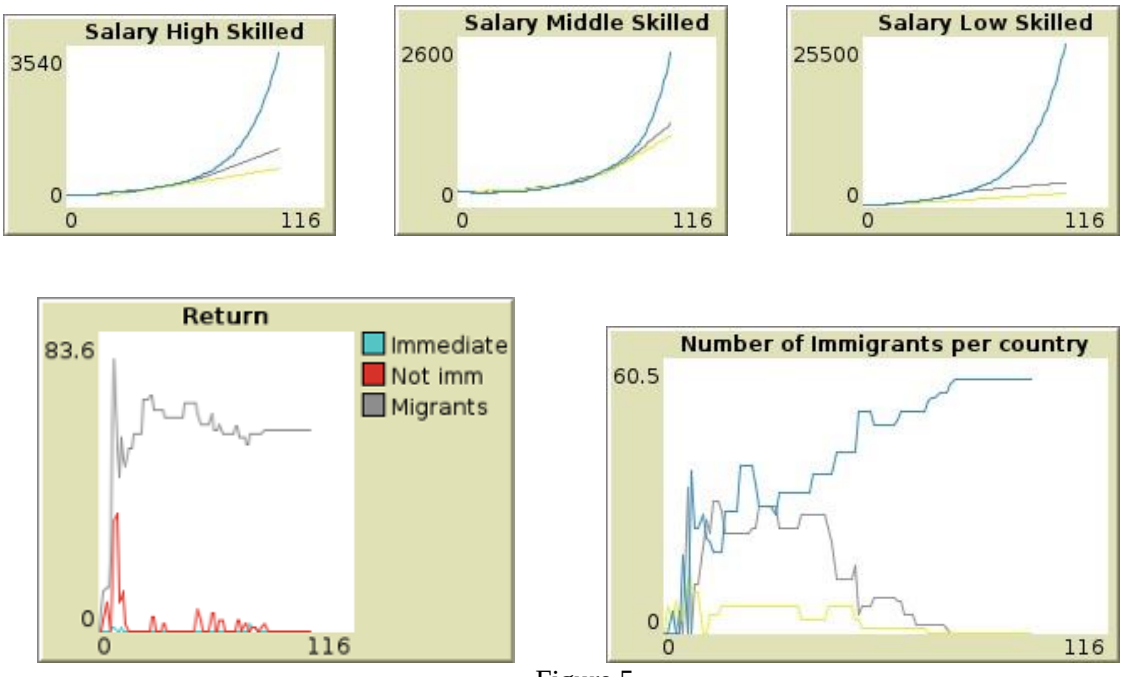


Figure 5

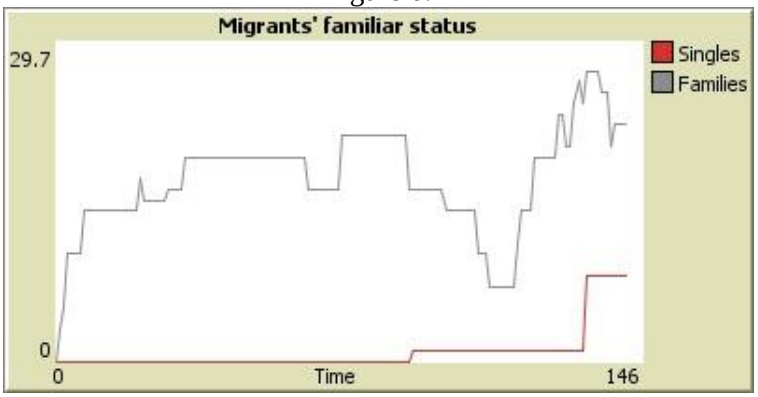
We can notice that, given the above salary distribution, the number of immigrants that returned in their native country is stable and equal to 0 in the last cycles of the simulation, while the number of migrants is below its peak: each worker form country Sky that migrated in the past

came back and each foreign worker moved to Sky, as shown in the chart on the right, from where we can notice that no immigrants are present in Yellow or Gray.

EXPERIMENTAL RESULTS

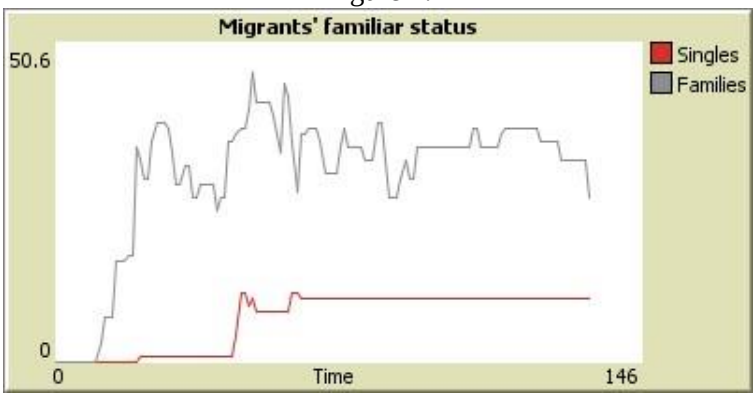
A very interesting result arises if the distances among the three different countries are pretty high, while other values are neither too high nor too low and similar among the countries, while the asymmetric skills switcher is off. Indeed, as we can notice from the figure 6, at the beginning of the simulation and for many cycles, singles are not able to migrate. On the other hand, there are families made up of more than one component that migrate immediately. This is due to the fact that the income of the family is greater than the income of a single, and this surplus in the income can be used to cover the material cost of the migration that is represented by the distance between the country where workers are and the one where they could earn more. Indeed a worker decides to migrate if the actual family income is lower than the income the family would have in another country subtracting material and psychological costs of the family, which do not play an important role when there are very high material costs. After some time, also singles start migrating since wages are likely to increase and to become high enough to cover the material costs of migration.

Figure 6:



On the other hand, if distances among the countries are not too big, keeping constant the other values, we notice that singles start migrating after few ticks.

Figure 7:



It is also interesting to see what happens if a country (e.g. the Sky country) has a more flexible job market with respect to the other two nations as shown in figure 8.

Figure 8:

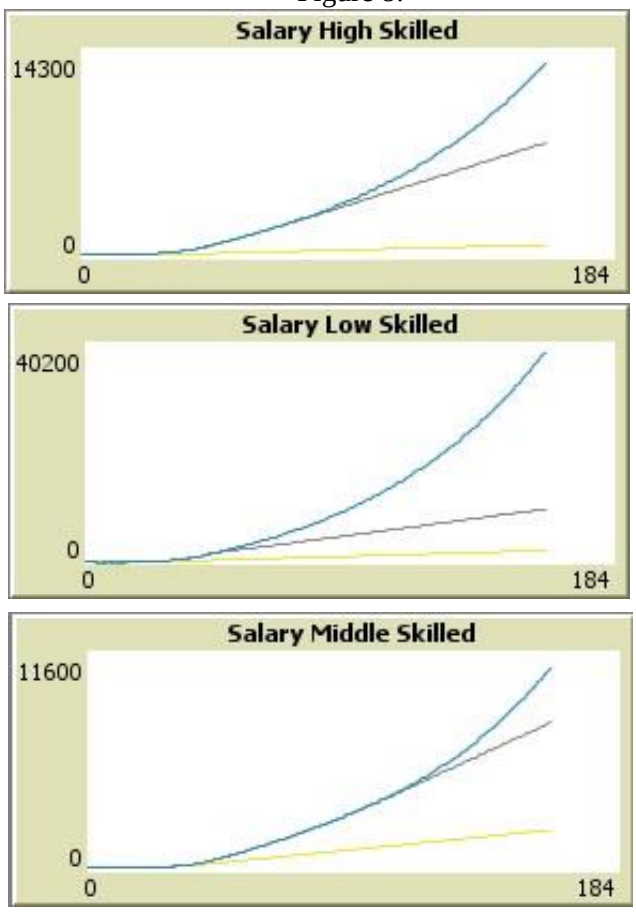
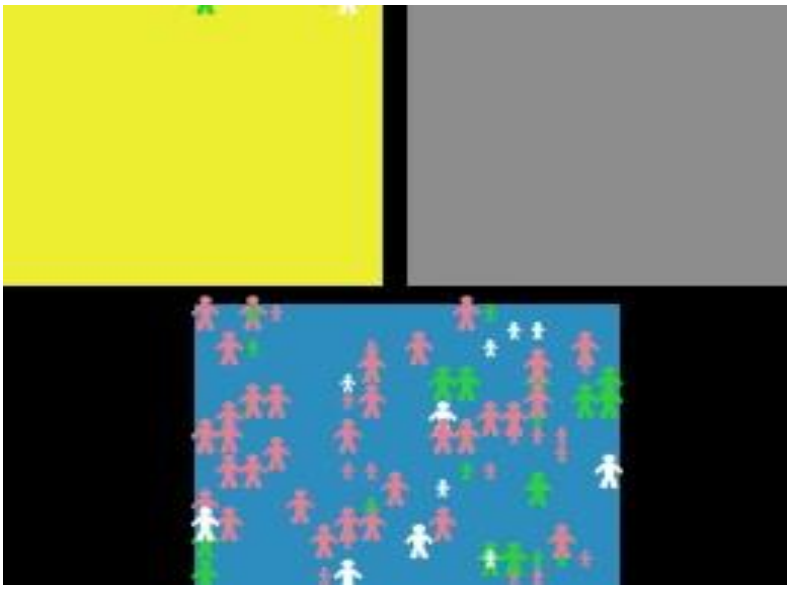


Figure 9

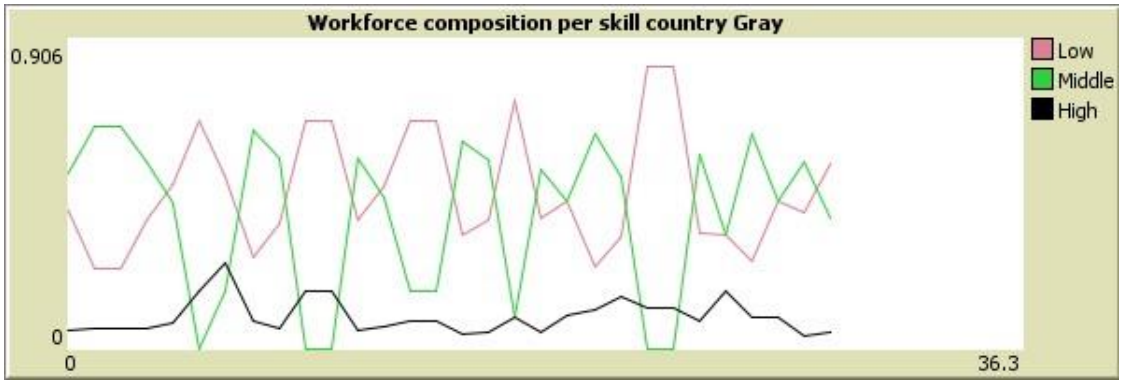


A higher salary with respect to the other countries is due to a high job market flexibility in that country since in this way the salary reacts very much to a difference between the number of jobs and the number of workers.

From the three charts about salaries, we can see that the salary in the Sky country is the highest for all the three categories of workers. As a result, after some time the economy reaches a steady state equilibrium: almost all the workers are in the country with the highest salary, as we can see in figure 9. We can see that if the wage differential among different countries is really high, both material and psychological costs become irrelevant, therefore workers decide to migrate. A higher salary with respect to other countries is due to a high job market flexibility in that country since in this way the salary reacts very much to a difference between the number of jobs and the number of workers.

From the three charts about salaries, we can see that the salary in the Sky country is the highest for all the three categories of workers. As a result, after some time the economy reaches a steady state equilibrium: almost all the workers are in the country with the highest salary, as we can see in figure 9. We can see that if the wage differential among different countries is really high, both material and psychological costs become irrelevant, therefore workers decide to migrate. In some simulations, from the charts about the workforce composition per skill we can directly see the effect that an increase in high-skilled workers has on low-skilled immigration. Indeed a high number of pretty qualified workers can stimulate the migration of low-skilled workers by increasing the demand for services that they provide. Taking a chart about the Gray country as an example, especially at the beginning we notice that an increase in the black line representing highly skilled workers corresponds to an upward trend in the pink line representing a low skilled category. Obviously, this is not always the case since there are other factors that influence the salary and the migration of low-skilled.

Figure 10:



CONCLUSION

After conducting numerous trials, we can confirm that our model accurately reflects some aspects of real-world job markets. First and foremost, we have discussed how employees are tied by family when they make the decision to migrate. There are those who would not migrate if they were single, but do so since the entire family will be better off after the migration (tied movers), and others who cannot migrate even if their wage is higher because the family is better off in the actual country (tied stayer). Second, if the wage differential in our model is

particularly large, employees are more inclined to migrate since the rise in income is greater than the costs of migrating. Furthermore, we were able to study how being a member of a family aids in migration when there are high material expenses to contend with, as well as how the job market's flexibility attracts international employees. Finally, we examined the impact of high skilled workers on low skilled workers using charts that depict workforce skills.

Clearly, this model could be improved. It may be more practical, for example, to build more complex functions to define worker supply and demand and to allow people to improve their skill level or take positions below their skills. Furthermore, as stated in the introduction, migration is affected by age, which is a variable that could be included.

EXTENDING THE MODEL

To better reflect reality, it may be able to incorporate an age dimension for workers or the possibility of a change in skill level during the simulation. Furthermore, more accurate modeling of labor demand and supply could be undertaken.