
# H-1B AND PERMANENT VISA APPLICATION CASES ANALYSIS

Data Mining Report


## ABSTRACT

Using several years data to uncover the potential problems in the U.S. immigration policies and find out the improving method at the same time.



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CSE7331 Data Mining

# Contents

# I. Executive Summary

## 1. Business Understanding

The purpose of this project is to find out core factors that could affect the H-1B visa or permanent process for the government to improve the policy. According to the Immigration and Nationality Act, section 101(a)(15)(H), the H-1B is a visa in the U.S. which allows U.S. employers to employ foreign workers in specialty occupations for limit years.[1] For the permanent residence, which also known as the "Green Card", it is the immigration status authorize a person live and work in the U.S. permanently.

The process of getting a H-1B visa has three stages: the employer files for the employee as well as making relevant attestations; with an approved Labor Condition Application, the employer files a Form I-129; Once the Form I-129 is approved, the worker may begin working with the H-1B classification on or after the indicated start date.

As it is known, the H-1B visa was intended to serve employers who could not find the skilled workers they needed in the United States. [2] Thus, how to measure a person's professional talent, how many workers are needed, which area has the most emergent needing are the top questions that need to be solved first.

From the process of the H-1B visa, it is easily to find that the international students and workers, the U.S. citizens who are seeking for a job or already working in corresponding fields, the companies and organizations who want to hire international employees, and the responding agency of the U.S. government are involved in this issue. Obviously, they are focusing on totally different part of this process: for international workers, the relaxation of the policy will afford more chances for them to get a legal status to live and work in the U.S.; for the U.S. citizens, if the policy tightening, they may have far more job opportunities (for those who are seeking for job) or higher salaries (for those who are working now); for the companies and organizations, the relaxation of the policy means they could use lower cost to hire professionals; for the government, they are concerning about the unemployment rate and the GDP.

However, under the law, most employers are not required to prove to the Department of Labor that they tried to find an American to fill the job first. Over the years the program has become a government-assisted way for employers to bring in cheaper foreign labor. The National

Association of Software and Services Companies (NASSCOM), the Indian trade association, estimates that the US will face a shortage of just over a million IT engineers by 2018. The association also argues that nearly half of the students enrolled in STEM (Science, Technology, Engineering, and Mathematics) programs in US universities are foreign nationals. Bureau of Labor Statistics data shows that unemployment rates are lower for occupations that use many H-1B visas than the overall US. [3] Loopholes and lax enforcement of the H-1B visa program has resulted in exploitation of both visa holders and American workers.

> *Extra analysis:* ***H-1B and L-1 Visa Reform Act*** *(Sens.Grassley and Durbin): This act gives priority to educated students in assigning visas to U.S. agencies and advanced degree holders and prevents companies employing more than 50 employees from hiring extra of H-1B employees if H-1B and L-1 employees account for more than 50% of the company's U.S. workforce. It also reformed the L-1 visa program, including the bottom line for L-1 staff. The bill was first introduced in 2007 and re-launched in January 2017* [4].

Here are some statically data got from a survey from Goldman Sachs: 900k to 1mn individuals are working under H-1B visas in the US, and that about two-thirds of qualified H-1B visa holders eventually apply for a green card. While H-1B visa holders comprise only 0.6%-0.7% of total US jobs, they comprise about 12%-13% of tech-related jobs [5]. This data vividly performing that H-1B visa has connection with the Permanent Resident visa; also, H-1B workers play a key role in the U.S. society.

## 2. Data Set Description

To complete this project with an accurate result, we have uncovered several different data sets. The first one is a data set contains five years' worth of H-1B petition data, with approximately 3 million records overall. The columns in the dataset include case status, employer name, worksite coordinates, job title, prevailing wage, occupation code, and year filed. And this is also the main dataset where the major part of conclusion came out [6].

The next one is collected by the Department of Labor, where a permanent labor certification issued. This set contains data covers 2012-2017 and includes information on employer, position, wage offered, job posting history, employee education and past visa history, associated lawyers, and final decision [7].

**Because that there are too many columns in each raw data set, in this report will only list the selected part.*

*Table 1-1 The Description of Feature in the Raw Data (a. H-1B)*

| Feature | Data Set | Description |
|---|---|---|
| Case Status | Nominal | Result of application |
| SOC Name | Nominal | Job name in the Standard Occupational Classification System |
| Prevailing Wage | Ratio | Hourly wage established by the Department of Labor and Industries |
| Year | Nominal | |
| Worksite | Nominal | Location of the applying position |

*Table 1-2 The Description of Feature in the Raw Data (b. Permanent)*

| Feature | Data Set | Description |
|---|---|---|
| Case_status | Nominal | Result of the application |
| Class_of_admission | Nominal | Visa status of the applicant |
| Country_of_citizenship | Nominal | Nationality of the applicant |
| Job_info_work_state | Nominal | Location of the applying occupation |
| Pw_soc_title | Nominal | Job name in the Standard Occupational Classification System |

## 3. Verifying Data Quality

Because of the crucial influence it will lead to the result, verifying data quality is an indispensable step in data mining process. Within this kind of data preprocessing, mistakes such as duplicates, missing or outliers will be detected and processed before the analyzing start.

This project will focus on the H-1B visa applications submitted during 2011-2016 and the Permanent visa applications submitted during 2012-2017.

File selection is based on the analyzing target which discuss the potential problem beneath the progress of issuing H-1B and permanent.

Data quality and data cleaning is shown as following.

**Case Status:**

The data file contained some missed values (13 “NA” value) of this feature. However, cases with this missed feature have been removed because of statistical analysis, for a case without a status has no meaning. This feature does not have duplication.

**SOC Name:**

The data file contained a little missed value (17733 “NA” value) of this feature. However, cases with this missed feature have been removed because of statistical analysis, for a job title may not have its respond SOC name. This feature does not have any duplication.

**Prevailing Wage:**

There were some missing data (85”NA” value) found. However, they have been removed for statistical purposes. On the other side, two outliers with value of “6,997,606,720” and “1,007,814,080” have been found either. Checking other features of the same employees uncovered that these values needed to be kept. There is none of other exception raised in these two applicants feature. However, for statistical calculation, it was needed to remove these outliers for better diagram analysis.

**Year:**

The data file contained some missed values (13 “NA” value) of this feature. However, cases with this missed feature have been kept as “NA” because of statistical analysis. And there is no deeper analysis. This feature does not have any duplication.

**Worksite:**

Fortunately, there were no missing data or duplication for Worksite.

**Case_status:**

Fortunately, there were no missing data or duplication for Case_status.

**Class_of_admission:**

The data file contained a little missed value (22845 null value) of this feature. However, cases with this missed feature have been kept because of statistical analysis, for an employee may not have any visa status before application. This feature does not have any duplication.

**Country_of_citizenship:**

The data file contained some missed values (59 null value) of this feature. However, cases with this missed feature have been kept because of statistical analysis, for an employee may a stateless person (eg.: people whose country is suffering a state succession). This feature does not have any duplication.

**Job_info_work_state:**

The data file contained some missed values (121 null value) of this feature. However, cases with this missed feature have been removed because of statistical analysis, for a U.S. company must have a worksite in one of the states. This feature does not have any duplication.

**Pw_soc_title:**

The data file contained a little missed value (2336 null value) of this feature. However, cases with this missed feature have been removed because of statistical analysis, for a job title may not have its respond SOC tilte. This feature does not have any duplication.

# II. Statistical Summary

The statistical summary of all feature of H-1B and Permanent application are described in Table 2-1 and Table 2-2, respectively. Among these features, most of them are nominal (such as *Case Status, Worksite, SOC Name*) while the rest are ratio (like *Prevailing Wage*). Therefore, for the majority of these data, Mean, Median, St. Dev, Variance, Min, Max, Range are mean less.

For the only ratio data, Prevailing Wage, there goes some deeper analysis, such as via calculating the variance and standard deviation to explore the income gap of applicants between rich and poor; by comparing the average and median, explore the extreme values of applicants' income. Prevailing Wage seems like a feature which will be affected by policies, especially for H-1B visa's cases. Because h1b is designed to recruit foreigners with high level of knowledge and skills. A high level means that the company will pay individuals higher wages. Thus, the federal law limits the minimum wage for those who apply for H1B. However, it is obviously that there are still some wage data equal to 0! To understanding these data better, this report will combine with specific policies and Case Status to analyze the impact of high or low wages on the application H-1B and the Green Card.

The Obama administration took office in 2009-2016, so the data this report covered are collected during Obama administration, which may have a positive impact on the application numbers due to the accommodative immigration policy. There is another feature, Case Status, which will follow both the domestic and international environment changings either.

The transformation of Worksite and Job-info-work-state into state data allows us to analyze the differences in the number of applicants across states, which may be better explained in the context of each state's economy.

Also, it is usefully to understand he who apply for H-1B and Permanent visa are what kind of job, why these occupations are more willing to apply for H1B and Permanent visa? Does the type of work

affect the Case Status? As we all known, illegal immigration is always come first when talk about immigration in the United States. Is this problem will be reflected by the data? For those who are applying for a Green Card, is their current visa status will affect the Case Status?

According to the tables, it is unexpected that most of the Permanent visa applicants are keeping their H-1B visa which means most Permanent visa applicants starting their applications because they work.

Finally, it is obviously that almost half of the Green Card applicants are came from India. Does this will have a negative influence on their applying? Is the nationality of applicants will be a factor of their Case Status?

Based on the stated analysis of the statistical summary several nominal data types including SOC Name (H-1B)/Pw_soc_title (Permanent), Worksite, Class_of_admission, Country_of_citizenship, Job_info_work_state and Pw_soc_title as well one ratio data, Prevailing Wage, are employed for further analysis in the next section.

*Table 2-1 The statistical summary of H-1B visa application feature*

| Variable | Data Type | Mean | Median | Mode | Frequency | St. Dev | Variance | Min | Max | Range |
|---|---|---|---|---|---|---|---|---|---|---|
| Case Status | Nominal | -------- | --------- | certified | 2,615,623 | -------- | ---------- | ----- | ------ | -------- |
| SOC Name | Nominal | -------- | --------- | Computer Systems Analysts | 523,949 | -------- | ---------- | ----- | ------ | -------- |
| Prevailing Wage | Ratio | 144,332 | 65,021 | 60,000 | 10,354 | 3,363,336 | 11,312,030,000,000 | 0 | 820,132,347 | 820,132,347 |
| Year | Nominal | -------- | --------- | 2016 | 647,803 | -------- | ---------- | ----- | ------ | -------- |
| Worksite (state) | Nominal | -------- | --------- | CALIF-ORNIA | 559,942 | -------- | ---------- | ----- | ------ | -------- |

*Table 2-2 The statistical summary of Permanent resident visa application feature*

| Variable | Data Type | Mean | Median | Mode | Frequency | St. Dev | Variance | Min | Max | Range |
|---|---|---|---|---|---|---|---|---|---|---|
| Case_status | Nominal | -------- | ---------- | Certified | 181,933 | ----- | ---------- | ----- | ------- | --------- |

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| Class_of_admission | Nominal | -------- | ---------- | H-1B | 283,019 | ----- | ---------- | ----- | ------- | --------- |
| Country_of_citizenship | Nominal | -------- | ---------- | INDIA | 205,158 | ----- | ---------- | ----- | ------- | --------- |
| Job_info_work_state | Nominal | -------- | ---------- | CALIFOR-NIA | 87,318 | ----- | ---------- | ----- | ------- | --------- |
| Foreign_worker_info_education | Nominal | -------- | ---------- | master's | 103,662 | ----- | ---------- | ----- | ------- | --------- |
| Pw_soc_title | Nominal | -------- | ---------- | Software Developers, Applications | 1,114,832 | ----- | ---------- | ----- | ------- | --------- |

## 1. Analysis and Visualization of Selected Data Types

As discussed above, three data sets are chosen for a deeper analysis in an attempt to uncover some more detailed message of the process of issuing H-1B and Permanent visa.

*A. SOC Name(Nominal)*

The five **hottest SOC Name** among applications go down from the top are ***Computer System Analysts*** **(523949),** ***Software Developers, Applications*** **(414716),** ***Computer Programmers*** **(398546),** ***Computer Occupations, All Other*** **(203498),** ***Software Developers, Systems Software*** **(83856)**. Obviously, each of those top SOC Name is related to the Information Technology Industry. There are some assumptions about the reason that lead to this phenomenon, which are shown as followings:

- During 2011 to 2016, the Information Technology Industry has experienced a rapid developing term, which supports far more occupations.
- Because of the responsible policy, there even far more 20,000 positions for employees who has a higher education in a STEM major.
- For international students, those who study in a major included in the STEM (Science, Technology, Engineering, Mathematic) will have 2 years longer valid time of their OPT than those who study in majors beyond the STEM, which means more opportunities to submit their H-1B application.

*B. Prevailing Wage(Ratio)*

From the data set, for the prevailing wage of each H-1B visa application, 2018 applicant are given more than 1,000,000 US dollars per year; 1704 employees are given more than 10,000,000 dollars per year; 1276 people will own more than $100,000,000 per year; and there are even 2 people who can earn 1,000,000,000 per year! These data have a big influence on the average of the total, which is almost 2 times of the median. These data seem unbelievable and fake in the first glance, but since a research has been found out, it became acceptable. It is said that more than half of the privately held tech companies with $1 billion valuations have at least one immigrant founder, according to the National Foundation for American Policy [8]. Thus, it is reasonable that why some applicants could earn such amazing wage.

The distribution of the wage from each application of H-1B visa is visualized in Fig. 1.

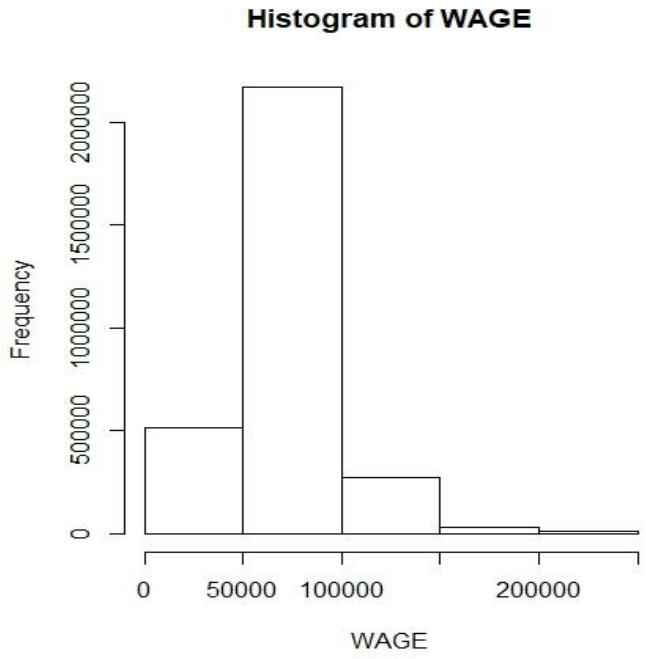



Fig.1 The distribution of prevailing wage from all applications

It is shown clearly in the diagram above that about 2/3 employees are given a great prevailing wage between 50,000 and 100,000 U.S. dollars. As the gross Domestic Product per capita in the United States was recorded at $48783.5 in 2011, $49976.6 in 2013, $52194.9 in 2016 [9], it is obviously that the majority of applicants has an ideal prevailing wage. Because of the purpose of purchasing higher profit as well as lower cost, in some extent, these kinds of high prevailing wage represents that those employees are surely high quality.

However, just as the saying, “A coin has two sides”, high prevailing wage may also cause problems like more international employees are attracted, which means intense competition for good occupation; more international students are attracted, which means fierce competition for education opportunity, and so on.

*C. Worksite(Nominal)*

The state information of worksite from each application of H-1B visa, which is a nominal data type, are visualized in Fig. 2. As the presented data is nominal, the code for each state is presented in Table 2-3 to have a better understanding of the given Figures as percentage since they cannot be properly aggregated.

*Table 2-3 The description of codes provided for each state*

| **Code** | 45 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 |
|---|---|---|---|---|---|---|---|---|---|---|
| **Description** | No Data Reported | CALIFO-RNIA | TEXAS | NEW YORK | NEW JERSEY | ILLINOIS | MASSACH-USETTS | PENNSYL-VANIA | FLORIDA | GEORGIA |
| **Code** | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 | 18 | 19 |
| **Description** | WASHIN-GTON | VIRGI-NIA | MICHI-GAN | NORTH CAROLI-NA | OHIO | MARY-LAND | CONNECTI-CUT | MINNESO-TA | ARIZONA | MISSOURI |
| **Code** | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 |
| **Description** | WISCON-SIN | COLOR-ADO | INDIA-NA | TENNE-SSEE | OREG-ON | DISTRICT OF COLUMBIA | DELAW-ARE | IOWA | ARKAN-SAS | KANSAS |
| **Code** | 30 | 31 | 32 | 33 | 34 | 35 | 36 | 37 | 38 | 39 |
| **Description** | UTAH | SOUTH CAROLI-NA | KENT-UCKY | RHODE ISLAND | LOUISI-ANA | OKLAHO-MA | ALABAMA | NEW HAMPSHI-RE | NEBRAS-KA | NEVADA |
| **Code** | 40 | 41 | 42 | 43 | 44 | 46 | 47 | 48 | 49 | 50 |
| **Description** | NEW MEXICO | MISSISS-IPPI | IDAHO | MAINE | HAWAII | WEST VIRGINIA | NORTH DAKOTA | VERM-ONT | SOUTH DAKOTA | PUERTO RICO |
| **Code** | 51 | 52 | 53 | | | | | | | |
| **Description** | ALASKA | MONTA-NA | WYO-MING | | | | | | | |

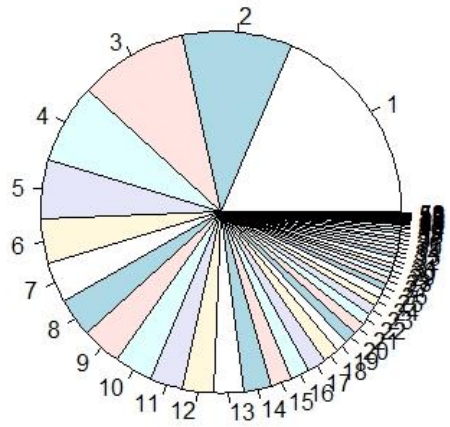



Fig.2 The fraction of application that state owns

As it is known, California owns the majority of the applications. During 2011~2016, about 18.67% H-1B application applied for occupation in California. This may lead by job position offered here which are mostly included in the hottest SOC names, such as Computer Systems Analysts, Computer Programmers, Software Developers, Applications. It is nearly equal to the fraction Texas owns plus New York's, which are the top 2 and top 3 of all. On the opposite, the minority of the applications are owned by Wyoming, with about 0.03% of all. According to the analysis, it is easy to find out that **the majority of states (38 states)** are owning **application numbers lower than the average**. It is obviously that **there is a huge gap in application numbers between states**.

> *Extra Analysis: According to **the Annual Estimates of the Resident Population for the United states, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2016*** [10]*, the application numbers of each state has a positive correlation with the resident population of each state. However, there are **some exceptional** which may **be caused by the different economic structures of different state** (eg.: Florida owns larger population than New Jersey. But due to its industry structure which dominated by the tertiary industry* [11] *and "Government is largest employer in most Florida"* [12]*, Florida has less applications than New Jersey) and **the various locations of different state** (eg.: New Jersey owns smaller population than Florida. But due to its perfect location (bordered by the state of New York, the Atlantic Ocean, the Delaware River and Pennsylvania, the Delaware Bay and Delaware)*[13]*, it has the 4$^{th}$ application number of all).*

*D. Class_of_admission(Nominal)*

The top 5 classes among those 374362 Permanent applicants are ***H-1B*** **(283018), null (22845),** ***L-1*** **(19938),** ***F-1*** **(14946) and** ***Not in USA*** **(8588)**. Almost 75.6% applicants are having their H-1B visa when

they start to apply a Permanent visa. That may be translate as people who owns a stable work is more likely to purchasing permanent stay in the USA. This could also be proved by the number of applicants who owns his/her L-1 visa before applying for a Permanent Resident visa.

For the null value, we have two supposes: one is missing value, the other is a special case that the applicant applying for a Permanent visa without any valid U.S. visa. Here is an example for this case: a person who was immigration legally and married with a resident, once identity expired, may be allowed to stay in the United States and apply for a Permanent visa without any valid visa.

*E. Country_of_citizenship(Nominal)*

The hottest country whose residents are more likely to apply for H-1B are **India (205158), China (28861), South Korea (24761), Canada (14804) and Mexico (8961)**. Here come two questions: Why Indians became the top immigration country? China has a great population as India which is several times larger than Korea, why the immigration is close to Korea?

For the first question, there are several reasons that India became the top talent exporting country:

- Due to the higher level of the development of its IT industry, Indian residents are more competitive than other countries' residents.
- For some historical background, Indians are specialist in English, which means there will be less communication problems.
- Because of the domestic environment, Indians are more likely to go abroad.

To answer the second one, here goes a reason: because for the Chinese, they need to schedule before applying for a "Green Card"; on the opposed, there is no such limitation for the Korean. And there even goes some policies encourage the Korean to immigrate to the United States.

*Extra Analysis: There is another assumption about the considerable number of Indian immigration. Outsourcing firms, many based in India, are major users of H-1B visas. The out-sourcing firm contracts with an employer, such as Disney, to perform technical services. Disney then closes down its in-house department and lays off its employees. The outsourcing firm then performs the works* [14].

*F. Pw_soc_title(Nominal)*

The **hottest SOC Title among Permanent Resident visa applications** could be listed from top to bottom as ***Software Developers, Applications* (114832), *Computer Systems Analysts* (36700), *Software Developers, Systems Software* (21354), *Electronics Engineers, Except Computer* (13191), *Computer and Information Systems Managers* (9631).** Same as the H-1B visa application cases, the top choices are

also related to the IT industry. When looking into the summary of data of Class_of_admission, the reason of this case is coming out immediately: **75.6% applicants of Permanent Resident visa are already keeping their H-1B visas**, among which the hottest choices of SOC Name is related to the IT industry.

## 2. Exploring the Relationships among Various Data Types

As often happens when analyzing selected data types, many explanations relate to other aspects of the data set given in other data types. Considering such an example: it is supposed that applications submitted by employees earning a higher prevailing wage are more likely be certified. There are other types of relationships in the dataset provided, which is discussed in more detail in this section. Here are the relationships that are discussed in this report.

*A. Prevailing wage Vs. Case status (H-1B visa)*

Fig 3.1 and Fig 3.2 show the relationship between success rate of H-1B application and the applicants' prevailing wage (<200,000).

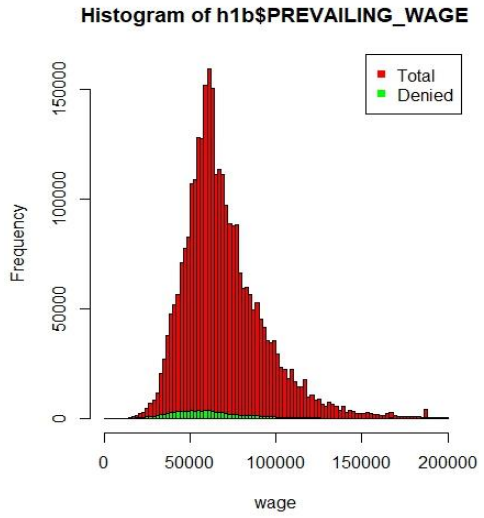



Fig. 3.1 The distribution of denied rate between different Prevailing Wage

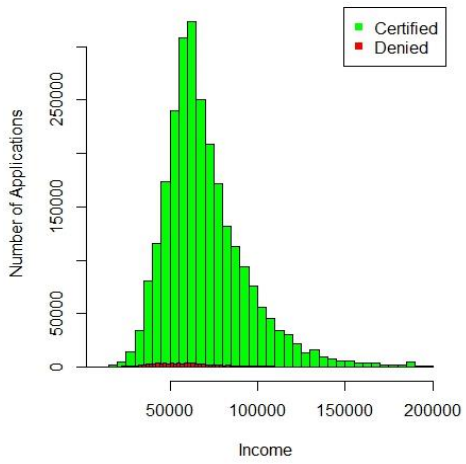



Fig. 3.2 The distribution of success rate between different wage

It is clearly that the denied rate is following the application numbers, and applicants who got a denied usually has a wage that is lower than the average of all applicants. Detailed fail rates are listed as followings:

- Total: 94346/3002445=3.14%
- >200,000: 3029/10584=28.6%

- >1,000,000: 1779/2018=88.2%
- >10,000,000: 1507/1704=88.44%
- >100,000,000: 1147/1276=89.89%
- >1,000,000,000: 2/2=100%
- <15,000: 72/109=66.06%
- >15,000 and <25,000: 1691/9483=17.83%

It seems that an applicant who has a definitely higher wage may possibly have a negative influence on their application of H-1B visa. On the other hand, because there is a limitation that the prevailing wage must be at, or above the federal or state or local minimum wage, whichever is higher. So those who earns a wage that lower than 15,000 (247.5 work days a year, 8 hours per day, the federal minimum wage is $7.25/hr effective July 24, 2009 [15]. Thus, 1980*7.25=14355) are more likely to be denied.

At the same time, from Fig 3.2, it is easily to find that with the increasing of wage between 30,000 and 50,000 US dollars, while the application number growing, the success rate going up. As it is shown in Fig 3.3, it is visually that an employee with a prevailing wage between 55,000 and 65,000 has the highest success rate. In other words, a making sense prevailing wage is a factor which will be helpful for pursuing a certified case.

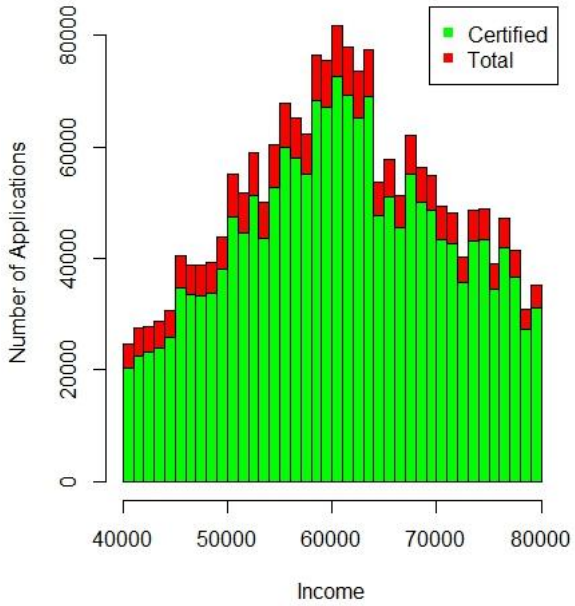



Fig. 3.3 The distribution of success rate of 40,000< Prevailing Wage <80,000

*B. Prevailing wage Vs. Full-time job (H-1B visa)*

The following hysterogram Fig 3.4 describes the relationship between prevailing wage and the work type (full-time or not).

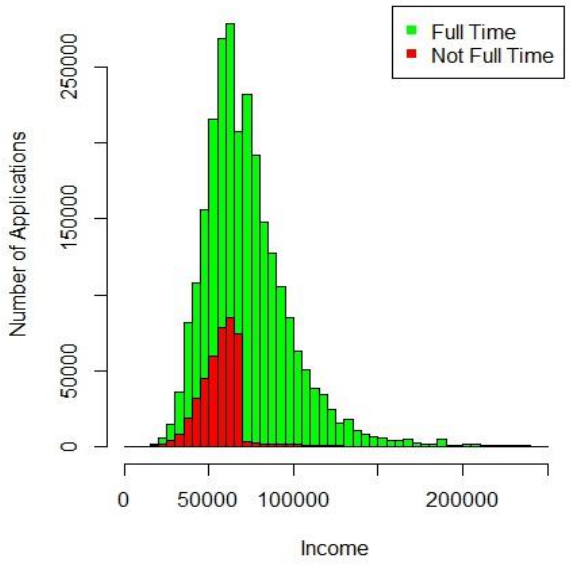



Fig. 3.4 The distribution of wage between different work types

There is a definitely differential between full-time employees' and other work types employees' prevailing wage. Employees who choose to work as not full-time worker commonly earn lower than 70,000 US dollars per year.

There also an interesting finding raised from not full-time workers' prevailing wage, described clearly in Fig 3.4.1.

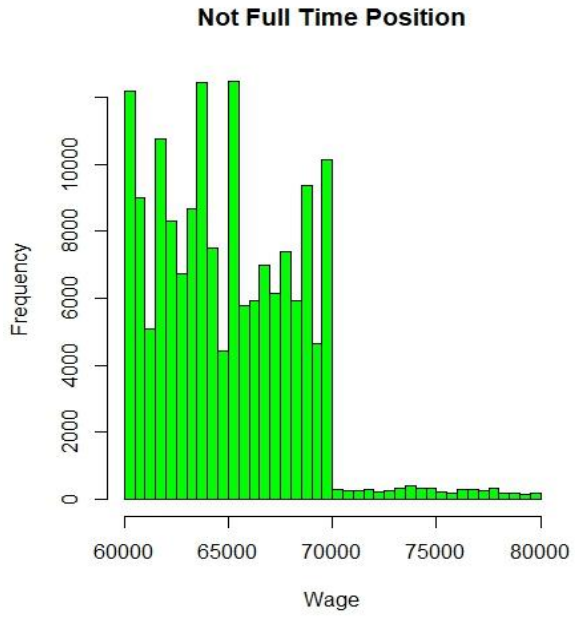



Fig. 3.4.1 The distribution of wage of not full-time job applicants

First, there came an assumption that because the denied rate is significantly higher when a not full-time job employee earns prevailing wage more than 70,000 dollars per year. However, after calculated (1684/18484=9.11%), this assumption has been proved not reasonable. There are still goes some other supposes, such as 70,000 per year for one not full-time worker may be a not acceptable cost for the employer, but those assumption cannot explain the suddenly drop in the diagram.

*C. Case status Vs. Class of admission (Permanent visa)*

The relationship of different current visa status of the applicants and the denied rate can be detailed by the Table 2-4 below.

*Table 2-4 The denied rate of different visa status applications*

| **visa** | **H-2A** | **C-3** | **D-1** | **K-1** | **V-2** | **A-3** | **EWI** | **VWT** | **B-1** | **H-2B** | **P-4** | **C-1** | **G-1** |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **total** | 157 | 7 | 6 | 2 | 2 | 29 | 1,955 | 58 | 620 | 412 | 6 | 40 | 11 |
| **denied** | 100 | 4 | 3 | 1 | 1 | 14 | 814 | 24 | 246 | 147 | 2 | 13 | 3 |
| **denied rate (%)** | 63.69 | 57.14 | 50 | 50 | 50 | 48.28 | 41.64 | 41.38 | 39.68 | 35.68 | 33.33 | 32.5 | 27.27 |
| **visa** | **B-2** | **G-5** | **N** | **T-1** | **M-1** | **A1/A2** | **O-2** | **Q** | **VWB** | | **P-3** | **P-1** | **H-1B1** |
| **total** | 3,333 | 64 | 4 | 4 | 26 | 155 | 20 | 5 | 10 | 22,845 | 40 | 178 | 551 |

| | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **denied** | 899 | 16 | 1 | 1 | 6 | 31 | 4 | 1 | 2 | 4,451 | 7 | 31 | 90 |
| **denied rate (%)** | 26.97 | 25 | 25 | 25 | 23.1 | 20 | 20 | 20 | 20 | 19.48 | 17.5 | 17.42 | 16.33 |
| **visa** | **TPS** | **E-1** | **R-2** | **I** | **E-2** | **H-1C** | **F-2** | **J-1** | **Not in USA** | **H-3** | **R-1** | **F-1** | **O-3** |
| **total** | 187 | 549 | 7 | 82 | 4,237 | 8 | 960 | 963 | 8,588 | 37 | 112 | 14946 | 12 |
| **denied** | 30 | 83 | 1 | 11 | 534 | 1 | 116 | 106 | 941 | 4 | 12 | 1,440 | 1 |
| **denied rate (%)** | 16.04 | 15.12 | 14.29 | 13.41 | 12.6 | 12.5 | 12.08 | 11.01 | 10.96 | 10.81 | 10.71 | 9.63 | 8.33 |
| **visa** | **H-4** | **O-1** | **J-2** | **TD** | **Parole** | **E-3** | **L-2** | **H-1B** | **H-1A** | **TN** | **G-4** | **L-1** | **AOS** |
| **total** | 739 | 805 | 101 | 15 | 2,684 | 878 | 531 | 283,019 | 41 | 4,265 | 108 | 19938 | 1 |
| **denied** | 61 | 64 | 7 | 1 | 177 | 48 | 29 | 14,313 | 2 | 192 | 4 | 599 | 0 |
| **denied rate (%)** | 8.25 | 7.95 | 6.93 | 6.67 | 6.59 | 5.47 | 5.46 | 5.06 | 4.88 | 4.5 | 3.7 | 3 | 0 |

| | | | | | |
|---|---|---|---|---|---|
| **visa** | **AOS/ H-1B** | **M-2** | **J-2** | **P-2** | **U-1** |
| **total** | 2 | 3 | 101 | 15 | 2 |
| **denied** | 0 | 0 | 7 | 0 | 0 |
| **denied rate (%)** | 0 | 0 | 6.93 | 0 | 0 |

- Total denied rate: 25649/374362=6.86%

From the table it is easy to see that the applicant who has already kept a H-1B visa may less likely to be denied, since the denied rate of H-1B keepers (5.06%) is lower than the average. This may lead by the vast number of H-1B keepers belong all applicants (about 75%).

It is reasonable that without a valid visa status (null value) will more likely to be denied (19.48%). There are also some kinds of visa status keepers, which is the minority in the applicants, are not has a significantly high probability to be denied. This situation may be caused by the visa type (such as H-2A is issued to farmers who works seasonally; C-3 is issued to other countries' civil servants, their spouses and

children who transit through the United States; A-3 is issued to ambassadors, ministers, foreign officials, government officials or staff and their families or attached).

*D. Case status Vs. Country*

Here listed some countries' application denied rate.

- India: 9518/205158=4.64%
- China:1600/28861=5.54%
- South Korea:2585/24761=10.44%
- Canada:890/14804=6.01%
- Mexico:2022/8961=22.56%
- Japan: 297/2970=10%
- Philippines:1575/8631=18.25%
- Total denied rate: 25649/374362=6.86%

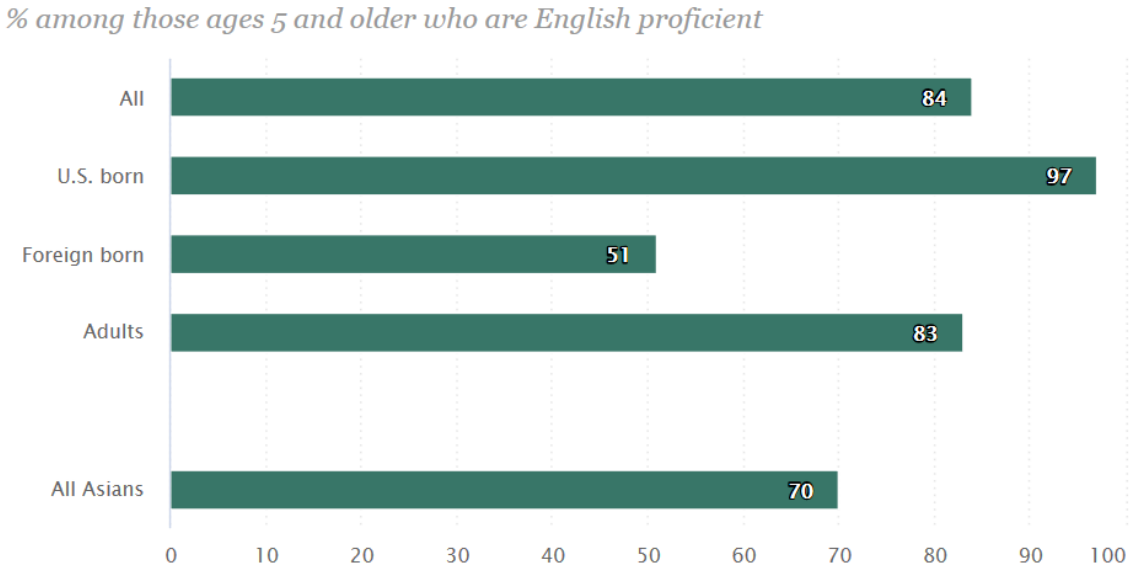
Mexican are more likely be denied while applying for the US Permanent Resident visa. This may because of the historical problem (illegal immigrant. In 2012, 52% illegal immigrants in the USA were from Mexico [16].) which make the USCIS became more carefully when checking eligibility. Among the applicants whose visa status is EWI, 57.24% are Mexican. And the assumption has also been proved by the Mexican applicants without a valid visa status has a denied rate 804/1622=49.57%.

For Filipinos, the high denied rate may be caused by the occupation they taken is not the one which is needing many talents.

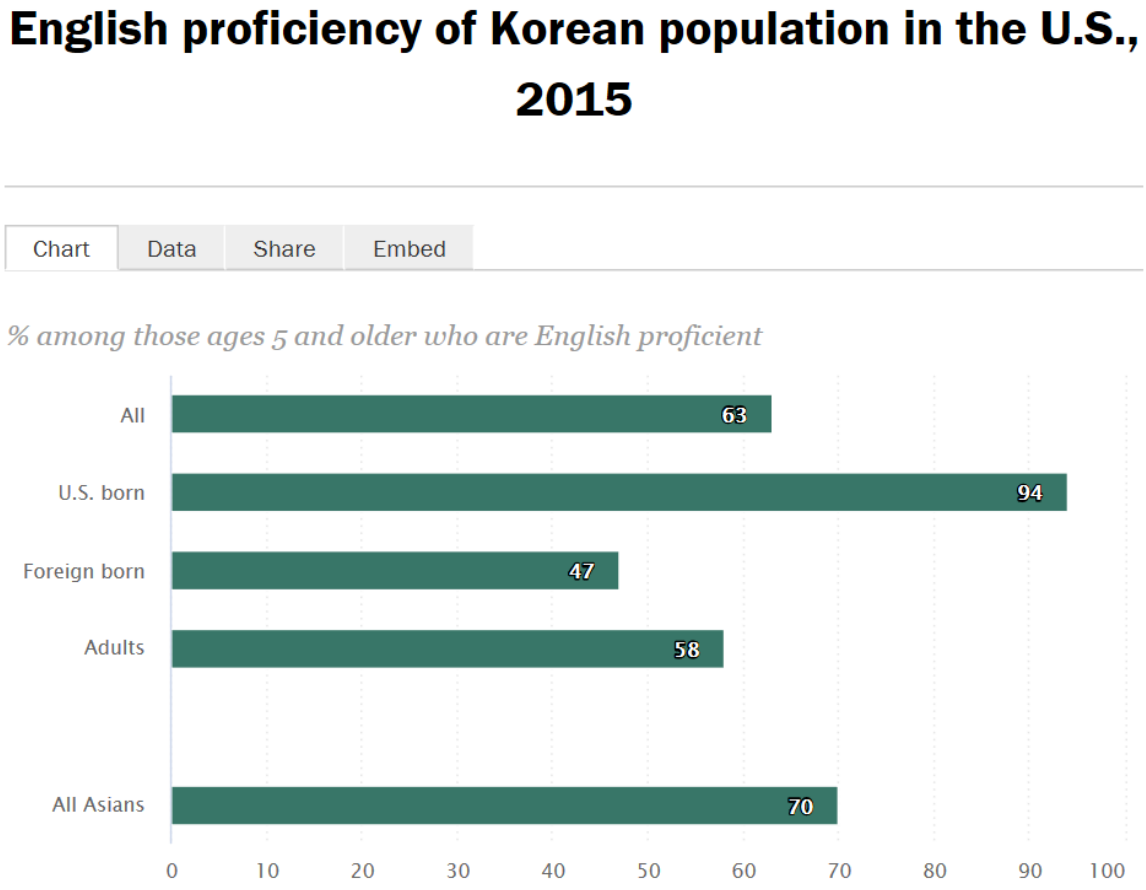
For Japanese and Koreans, except the same reason as Filipinos, English proficiency may be another factor (see as graph g 3-1 and g 3-2 showing [17][18]).

# English proficiency of Japanese population in the U.S., 2015

Chart | Data | Share | Embed




*g 1-1 English proficiency of Japanese in USA, 2015*[17]




*g 1-2 English proficiency of Koreans in USA, 2015*[18]

*E. Case status Vs. Job*

The denied rate of different jobs:

- Software Developers, Applications: 3730/114832=3.25%
- Electronics Engineers, Except Computer: 586/13191=4.44%
- Accountants and Auditors: 390/6122=6.3%
- Meat, Poultry, and Fish Cutters and Trimmers: 1317/5330=24.71%
- Cooks, Restaurant: 552/2310=23.9%
- Secondary School Teachers, Except Special and Career/Technical Education 222/1118=19.86%
- Chefs and Head Cooks 18.1%

It is obviously that in recent years, the US. employers are hunger to find IT talents. On the oppose, an applicant whose work is not related to science, engineering, or financial (such as occupations related to grocery, service industry and catering) may have more probability to receive a “Denied”.

## 3. Exploring the Temporal Components in -- Years of Data

The case of the H-1B and Permanent visa applying have experienced some changes during years.

From states aspect, we have Fig 3.1 and Fig 3.2 showing as follows.

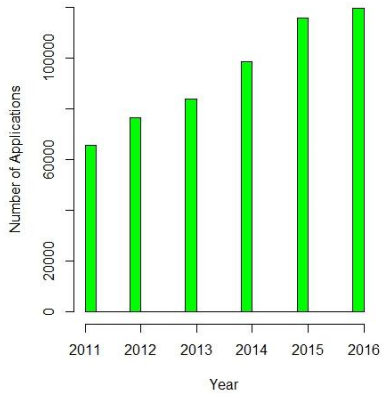



Fig. 3.1 The distribution of CA application during 2011~2016

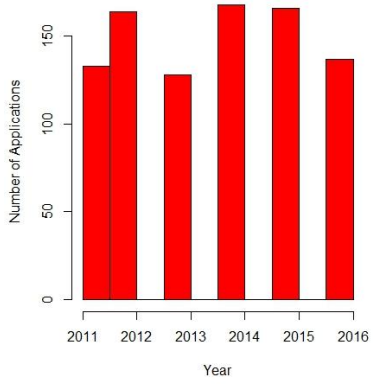



Fig. 3.2 The distribution of WY application during 2011~2016

It is vividly performed that the number of application of H-1B visa is increased in California while Wyoming has a stable number about 150. Thus, though the whole number of applications is trending to be increased, for different states, may not all of states has an obviously increasing looking of the application number of the H-1B visa.

According to H-1B and Permanent visa application numbers, there are Fig 3.3 and Fig 3.4.

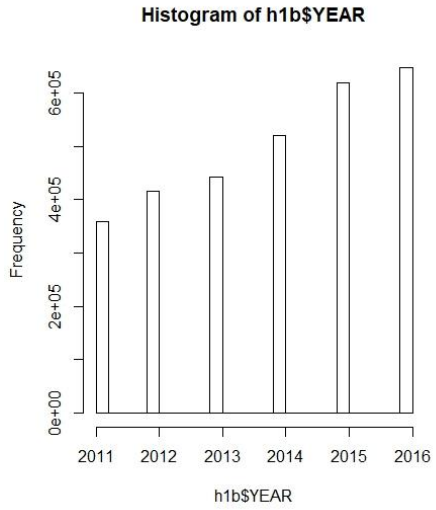



Fig. 3.3 The distribution of H-1B application during 2011~2016

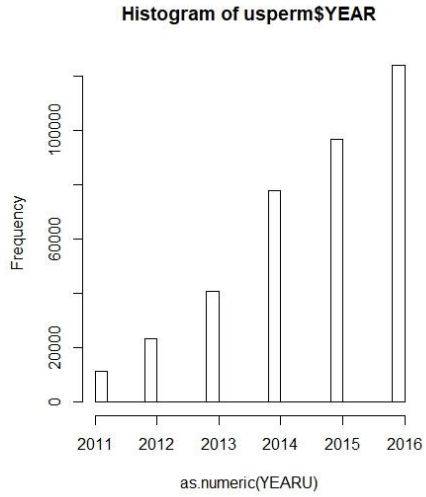



Fig. 3.4 The distribution of Permanent application during 2011~2016

The figures above performing that both kinds of visa application numbers are increasing over years.

For H-1B, it has an increasing trending which is not as stable as Permanent visa's. This may be resulted by the changing policies for H-1B these years. On the other hand, for Permanent visa applicants, their enjoying a more stable living state which makes their decision of applying for Permanent visa is harder to be affected by the international environment changing.

Thus, a bold guess could be made that in the nearest future, not only the application number of H-1B but also the Permanent Resident visa applications will keep increasing. Owe to Trump administration's immigration tightening policy, the increasing speed of the application number of H-1B will be slowed down, which may have an influence on the Permanent visa application numbers either.

There are also some interesting things occurred in the job market can be found while time flying.

- Jobs related to the IT industry always the hottest choice for both international employees and the U.S. employers.
- There are also some top positions which are not affiliated to the IT industry, such as ***Financial Analysts, Management Analysts, Accountants and Auditors***.
- The occupation belongs to ***Accountants and Auditors*** has **increasing by times** during 2011 (**4438**) to 2012 (**9093**).
- There are also some SOC increasing slowly, like ***Electrical Engineers, Physicians and Surgeons***, which means this kind of fields are developed.

# III. Conclusions

The data of the H-1B and Permanent visa applications are a potential indictor for the potential problems of each related U.S immigration policy. In the report, an extensive analysis is performed over various feature of each U.S immigration policy during Obama administrations. The following conclusions are made from mining the data in this project.

- During 2011 to 2016, the Information Technology Industry has experienced a rapid developing term, which supports far more occupations.
- There are surely some high-quality employees stay in the USA owe to these two policies.
- Due to different environment (economic, geographic), each state performs different situations.
- Applicants' nationality will have an impact on their application.
- Applicants' Prevailing Wage plays a crucial role in their application. Higher or lower than common value will lead to a "Denied".
- Applicants' currently visa status will affect their application.
- Applicants' job will have an influence on their application.

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