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The Demand for Green Cards

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Abstract

I estimate the demand curve for Legal Permanent Residence in the US, and the government revenues and migrant welfare gains that could be achieved by replacing all or parts of the current immigration system with a Uniform Price Auction. Willingness to pay and welfare are based on the net present value of the difference in income that people earn in the US compared to other countries. I obtain an equilibrium annual demand curve by modeling the dynamics of how pent-up demand for residence responds to the introduction of an auction for residence permits. I separately estimate the demand curves for each major source of demand for residence in the US, and combine them to find the total.

I find that there are currently large inefficiencies in border controls, the Diversity Visa Lottery, and Removals of Noncriminal Aliens. A revenue-maximixing auction of LPR to the the population of workers who have historically entered illegally would generate $10.2 billion in revenues and $8.5 billion in gains to the migrants. Changing the Diversity Visa Lottery to an auction, while keeping the number of visas the same, would give the government $5 billion in revenue annually, while increasing migrant welfare by $2.3 billion. Expanding the annual sales to the revenue-maximizing quantity generates $6.8 billion in revenue, and $8.5 billion in gains for the migrants. Giving non-criminal aliens the chance to purchase LPR for $30,000 before being deported would generate $2.8 billion in

revenues and $6.8 billion in gains for the migrants.

If the government auctioned all green cards, at the current level of one million naturalizations per year, the price would be $35,000 and revenues would be $33 billion after processing costs. Migrant welfare would increase by $10.6 billion. The profit-maximizing quantity would be 845,000, resulting in a price of $42,000 and revenues of $34 billion. This extra billion in revenue would be obtained at a cost of $6.7 billion in lost migrant welfare.

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Chapter 1

Immigration Overview, Literature, and Model

1.1 Introduction

Legal Permanent Residence in the United States is extremely valuable. People who live in the US enjoy higher salaries and a higher quality of life, on average, than people in many other countries. This means that there are many people who wish to leave their home countries and become residents of the US. Therefore, the US government must make decisions about how to handle these potential immigrants.

A Legal Permanent Resident is a person who has the right to live and work permanently anywhere in the United States, own property, attend public schools, colleges, and universities, and apply to become a U.S. citizen. People with Legal Permanent Residence (LPR) are issued 'green cards' signifying their status. Currently, green cards are allocated by the United States Citizenship and Immigration Services (USCIS) and Department of State consular offices in accordance

with immigration laws.

US law restricts immigration to a much smaller number than the amount of people who wish to immigrate. Decisions about who to let in are made by USCIS employees, based on a wide range of policies. Some visa categories give priority to refugees, some give priority to people with valuable skills, and others give priority to those who already have family in the country. There are fixed quotas for most of these categories, which generate large backlogs and wait times.

In this paper, I estimate the revenues that the United States Citizenship and Immigration Services could earn for the government by charging a price for Legal Permanent Residence, as well as the welfare gains that migrants would realize as a result of this system. Given that most benefits of LPR accrue to the holder, people would be willing to pay for it. There may be benefits to the current laws and problems with a price based allocation, and a full discussion of these issues is beyond the scope of this paper. My goal is to inform the debate by estimating the opportunity cost of allocation mechanisms other than the price system.

It is likely that many immigrants will not be able to afford to pay, up front, a price based on the full benefits they get from immigrating. This money would have to be collected over time, in the form of deductions from their future earnings. I assume that such a partnership between the USCIS and the Internal Revenue Service is feasible. The green card can be revoked if the immigrant does not pay the debt, and any application for full citizenship can be denied until the debt is paid.

Given that the USCIS is the monopoly provider of US LPR, it can set a price and/or quantity to maximize revenues. This requires estimating the demand curve for LPR. Given the fact that there is currently no legal market for the good, and there are few direct sources of price data, the methods of demand

curve estimation described in Berry (1994), Berry et al. (1995), Nevo (2000), and Rasmusen (2006) cannot be used. In this paper, I undertake the task of estimating this demand curve using currently available information, guided by the models and theories of the immigration literature.

The annual demand for US LPR is likely to be volatile. For that reason, I focus on generating a very conservative estimate for the demand curve. Whenever it is necessary to make an assumption or extrapolation, I choose the one that minimizes the estimated demand. This low estimate for demand, and therefore revenue and welfare, gives a minimum annual opportunity cost for continuing the current system.

Given this uncertainty, It will be almost impossible to accurately set a price-quantity pair that perfectly clears the market. If the USCIS sets prices, then it must allow quantities to fluctuate or continue to use non-price rationing mechanisms. If it sets quantities, then prices will fluctuate.

Given that LPR is a durable good, this situation matches the model of a durable goods monopolist described in Coase (1972) and Stokey (1981). If the monopolist cannot credibly commit to limiting quantities, then the price will immediately fall to marginal cost. I assume that the government is capable of credibly limiting the annual quantity of LPR to issue, by writing the limit into law, and that it chooses to do so.

One possibility for maximizing government revenue is perfect price discrimination. The USCIS has the authority to compel extensive disclosure of personal information, and this could, in theory, be used to find each person's willingness to pay and extract all consumer surplus from potential immigrants. A full analysis of such a plan is beyond the scope of this paper. I assume that this plan is impractical, because it would generate large transaction costs in the form of

migrants attempting to conceal information and the USCIS attempting to uncover it. If this assumption is incorrect, then the government could earn revenues equal to the total welfare numbers I report.

If the quantity is fixed, then the price must be set by some sort of auction in order for the market to clear. The Uniform Price Auction, an extension of the Second Price Auction, is an allocation mechanism with several attractive features. It is efficient, incentive-compatible, and easy to administer and participate in, especially when there is single-unit demand for a homogeneous good, as described in Milgrom (2004) and Krishna (2008). Under this system, the USCIS would set a quantity of green cards to auction, and then solicit bids from applicants. The top N bidders would be issued green cards, and they would all pay the price offered by bidder N+1. In this system, nobody can gain by hiding information or bidding anything other than their true value. It also results in the green cards being allocated to those with the highest willingness and ability to pay.

I am careful to differentiate between the current stock of people who demand US Legal Permanent Residence, and the flow of people who would demand LPR each year once an auction mechanism was operating. Currently, there is a large backlog of potential immigrants who have been unable to obtain entry. Many measures of current demand will include several years' worth of accumulated demand, and therefore must be adjusted downward to estimate a steady-state annual flow of demand. I present a model of pent-up demand that allows me to make this equilibrium prediction based on the current stock of demand and other known parameters.

The dissertation will proceed as follows: In Section 2 of this chapter, I will describe the existing literature on immigration auctions and estimations of the value of moving to the US. In Section 3, I present the model of immigration

choice and pent-up demand that I use in my estimations.

Each subsequent chapter will be an empirical estimate of the demand curve for LPR from a different group of demanders. I cover all major sources of demand that can be identified. There are three main categories of Legal Permanent Residence: employment visas, family-based visas, and refugees. There are people who successfully enter the country without proper documentation. There are two major groups of people who have revealed a desire to move to the US: applicants to the Diversity Visa program and people who are deported from the US.

In the final chapter, I combine all of the demand curves presented in the earlier chapters, as well as sources of demand too minor to be given their own chapter. This produces an estimate of the demand curve that would result from a complete replacement of the entire immigration system with a price-based mechanism. I will then summarize the combined results.

1.2 Literature

Van den Berg and Bodvarsson (2009) give a broad historical overview of US immigration trends and policy. They also highlight the need for reform, saying "The huge backlogs, confusing regulations, inconsistent treatment of applicants, lax enforcement of the immigration laws, widespread presence of unauthorized immigrants, and rapid expansion of the non-native population in the U.S. left few people satisfied." Further historical background is given in Williamson (1995) and Williamson (1996).

The idea of using an auction to allocate Legal Permanent residence is not new. It was discussed, and encouraged, in Simon (1999), at the end of Chapter 16, pages 357 to 364. He systematically counters several objections to auction-

ing immigration, and notes that the proposal was viewed favorably by many economists, including Milton Friedman[1]. The idea had earlier been suggested in Chiswick (1982) and by Gary Becker.

None of these authors attempt to estimate what the auction price would be. Selling citizenship for a fixed price was proposed in Freeman (2006). He spends a paragraph to produce an estimate of a price of $50,000. In the 2010 Annual Hayek Memorial Lecture, Becker (2010) also argues for setting a price, and uses the same figure of $50,000. In Muaddi (2006), the idea of Americans selling their residence rights to others is discussed, and $100,000 was given as a theoretical market price.

My estimates of the demand curves are based on the immigration choice model presented in Sjaastad (1962) and Borjas (1987), where immigration demand is based on wage differentials. People make migration decisions based on moving costs and their expected increase in wage after moving. If the wage increase is higher than their moving costs, they will migrate.

Grogger and Hanson (2011) run extensive empirical tests on observed migration flows and find "strong support for the income maximization hypothesis". Specifically, they find that migration responds to absolute differences in post-tax earnings. I use a simplified version of their model in my paper.

A recent and thorough overview of the immigration literature as it relates to my estimation problem is given in Clemens (2011). Clemens shows that much of the literature on immigration is devoted to examining its effects on the wages of natives in the receiving country, or the remittances immigrants send home, or the effects of 'brain drain' on the sending country. Relatively little research has been done on the increase in wages that an immigrant can expect when moving to

[1]In a letter to Simon, Friedman wrote, "I believe that this is one of those cases where when competent economists turn their attention to a particular problem, in this case immigration, they are likely to come up with the same solution."

the US. There are no known estimates of the demand curve for Legal Permanent Residence in the US.

In order to build a demand curve for LPR, it is necessary to estimate how much more money someone who wants to move to the US will make after moving. This is done in Clemens et al. (2008). They calculate, for 42 countries, the wage premium that the marginal immigrant would enjoy after moving to the US. I refer to these wage multipliers as the CMP wage multipliers, after the initials of the authors.

They first find the wage ratios of observably identical workers. They find people who are foreign-born and foreign-educated working in the United States and record their income. They then find people in the home countries with the same age and years of schooling and record their income. For example, people born and educated in the Philippines and working in the United States earn 3.8 times as much as people of the same age and educational level working in the Philippines.

This is only the first step. There are many reasons why the workers who moved to the US might be different than the workers who stayed in the home country. People select immigration because they know that it will benefit them, and moving a random person from one country to another will not have the same effect. If the people who already moved are better than average, then the new arrivals will enjoy less of a wage premium, and will be willing to pay less to move.

In order to test for selection bias, they use panel data of workers in the origin countries. They observe their characteristics, their salaries, and their migration decision. The panel does not follow the people after they move to a different country, but it does give information about the people who choose to leave. They

find some evidence that the people who leave have higher human capital than the ones who stay. For example, In the Philippines, the median mover comes from the 58th percentile of wages of non-movers. This means that the expected wage ratio that a new migrant would earn should be reduced from 3.8 to 3.5.

They use this and a wide variety of other evidence to conclude that migrants typically come from the 60th percentile of human capital among observably identical workers. This means that selection bias, while present, is not nearly large enough to explain the income differentials observed. Migrants benefit from the capital and institutions in the US, and moving them from their home countries to the US could generate a large gain in productivity and social welfare.

1.3 Model

1.3.1 Immigration Choice

I model each potential immigrant as maximizing the net present value of lifetime income:

$$Y = \sum_{t=0}^{t_R} \beta^t Y_t \tag{1.1}$$

where Y is lifetime income, t is a time period of one year, Y_t is income in year t, expressed in terms of real US dollars, β is the discount factor, and t_R is the number of years in the future that the immigrant will retire. This model ignores non-monetary gains from living in the US, and it ignores the income gain from the immigrant's descendants, but this is consistent with my goal of conservatively estimating the demand curve.

An increase in income is what motivates the immigration decision; moving

to the United States allows the immigrant to earn a higher wage. The amount that a potential immigrant would be willing to pay for American Legal Permanent Residence is then given by

$$D_i = \sum_{t=0}^{t_R} \beta^t \, \mathbf{E} \left[\mathrm{YA}_{ti} - \mathrm{YO}_{ti} \right] \tag{1.2}$$

where D_i is the individual's inverse demand, E is the expectation operator, YA is the real wages in the US, and YO is the real, Purchasing Power Parity-adjusted wages in the country of origin. Any moving costs, monetary and non-monetary, are amortized over the immigrant's lifetime and are subtracted from wages in the US.

To generate a conservative estimate, I assume that potential immigrants expect that real wages in the US will grow more slowly than real wages in the countries of origin. They believe that catch-up growth will eventually cause convergence in the economies and wages of the two countries, and expect that the difference in their wages will decrease by some percentage, g, each year as the economies converge. They forecast their lifetime wage difference based on their current wage difference:

$$D_i = \sum_{t=0}^{t_R} \beta^t \left(\frac{1}{1+g} \right)^t \left(\mathrm{YA}_i - \mathrm{YO}_i \right) \tag{1.3}$$

where g is the convergence rate that people expect when they make their migration decision. Equation 1.3 can be simplified to

$$D_i = \sum_{t=0}^{t_R} \left(\frac{1}{1+r+g+rg} \right)^t \left(\mathrm{YA}_i - \mathrm{YO}_i \right) \tag{1.4}$$

where r is the individual's discount rate.

1.3.2 Discount Rate

I can observe YA and YO, but I cannot observe an individual's r or g. Warner and Pleeter (2001) show that the discount rate that people use when evaluating future income streams can be high in conditions of uncertainty and involuntary movement, while John T. Warner (forthcoming) show that discount rates are much lower when conditions are more secure. While the past growth rates of GDP and wages in the countries of origin are known, and individual's g will depend on factors such as the sector they work in and their education.

Given this uncertainty, I report a range of values for $r + g + rg$, from 5% to 25%. For simplicity, I refer to the combined term as r in the remainder of the paper. When presenting my conclusions, I use a value of 20%. This number comes from the high estimates of average individual discount rates of about 11% reported in John T. Warner (forthcoming) and average convergence rates of about 8% observed for developing countries.

1.3.3 Pent-Up Demand

For some data sets, the future flow of expected immigrants will be similar to current annual flows. Other data sets give a stock of people who currently wish to immigrate, but have been prevented from doing so in the past. In these cases, I estimate the pent-up demand curve from data, and this demand curve must then be transformed into an equilibrium demand curve.

Each year, a new cohort of demanders enters the market for Legal Permanent Residence. Each potential immigrant has a demand for exactly one unit of LPR, as given by equation 1.4. The maximum working life, the t_R for the youngest worker, is ω. For ease of calculation, I assume that all people have the same ω, so

that there are currently ω cohorts in the market.

I assume that the number of potential immigrants in each cohort are the same, and that the distributions of their current salary differences, discount rates, and expected convergence rates are the same. I also assume that within a cohort, these numbers remain the same from year to year. This generates a conservative estimate; in reality, population is growing and younger generations have higher wages, as described in Hunt (2011), and this would generate a higher ratio of equilibrium demand to current demand.

In order to find an analytical solution, it is necessary to use a demand curve that can easily be summed horizontally and vertically, such as the unit-elastic demand curve. I am not assuming that the actual demand curve has this shape, but that the ratio of pent-up demand to equilibrium demand will be roughly equal to the ratio found from unit-elastic curves. I check this assumption at the end of this section.

Therefore, for the purposes of calculation, $(\mathrm{YA}_i - \mathrm{YO}_i)$ is distributed so that the inverse demand curve, in each cohort, for the benefits provided by one year of the good can be represented as

$$P = \frac{\alpha}{Q}. \tag{1.5}$$

The youngest cohort's inverse demand curve for LPR is

$$\begin{aligned} P_\omega &= \sum_{t=0}^{\omega-1} \beta^t \frac{\alpha}{Q} \\ &= \frac{1-\beta^\omega}{1-\beta}\frac{\alpha}{Q}. \end{aligned} \tag{1.6}$$

The second-youngest cohort has a demand summed over one less year, the third-youngest cohort has a demand summed over two less years, and so on until the oldest cohort, the one just about to leave the market, with a demand of $\frac{\alpha}{Q}$. At the starting year $T = 0$, the total pent-up market demand from the ω cohorts is

$$\begin{aligned} Q &= \sum_{c=1}^{\omega} \frac{1-\beta^c}{1-\beta} \frac{\alpha}{P} \\ &= \frac{1}{1-\beta} \left(\omega - \sum_{c=1}^{\omega} \beta^c \right) \frac{\alpha}{P} \\ &= \frac{1}{1-\beta} \left(\omega - \frac{\beta - \beta^{\omega+1}}{1-\beta} \right) \frac{\alpha}{P}. \end{aligned} \tag{1.7}$$

$$\tag{1.8}$$

Let

$$\frac{(1-\beta^{\omega})\,\alpha}{1-\beta} \equiv L \tag{1.9}$$

so the lifetime demand curve of the youngest cohort is $Q = \frac{L}{P}$.

Let

$$\frac{\alpha}{1-\beta} \left(\omega - \frac{\beta - \beta^{\omega+1}}{1-\beta} \right) \equiv M \tag{1.10}$$

so the short-term pent-up market demand curve is $Q = \frac{M}{P}$.

Given historical limitations on many categories of immigration, the current demand curve for those categories is the one described in equation 1.7, with all cohorts still in the market. The equilibrium demand curve will be the one described in equation 1.6, with only the youngest cohort in the market. For any positive price, the ratio of people who will demand LPR in equilibrium to the people who demand it now is $\frac{L}{M}$.

Therefore, I will multiply all stock demand numbers by $\frac{L}{M}$, to get the equi-

librium flow of quantity demanded. When r is 20% and ω is 45, $\frac{L}{M} \approx 0.025$. This is the value I use in my calculations. At any price, the currently observed quantity demanded is divided by about 40.

As a check on this value, I look at the age distribution of Diversity Visa Lottery winners provided by the Office of Immigration Statistics and assume that it is a random sampling of the stock of people who would purchase LPR for a positive price. Of the 50,000 winners, about 7,500 were in the 20-24 age bracket, so approximately 1,500 of them would be in the youngest cohort of demanders. $\frac{50}{1.5} \approx 33.3$, so the observed demand would be divided by 33.3 to get the demand from the youngest cohort.

This suggests that the pent-up demand method produces a slight overestimate of the equilibrium demand quantity with high discount rates, consistent with my goal of conservatively estimating the demand curve. With an ω of 45 and an r of 8%, $\frac{M}{L} \approx 33.9$.

Chapter 2

Diversity Visa Estimation

2.1 Introduction

Currently, 50,000 green cards are issued annually through the Diversity Visa Lottery. Residents of countries that have not historically sent many immigrants to the US are allowed to enter the lottery. The Diversity Immigrant Visa program (DV) is, from the applicant's point of view, entering a lottery to obtain an option to purchase American Legal Permanent Residence. If a person wins the lottery, that person can obtain legal permanent residence by paying $1,730 and producing some documents. The application costs and requirements are minimal, only requiring time filling out an online form and a properly formatted digital photograph.

The Diversity Visa Lottery has been criticized, and members of Congress have repeatedly sponsored bills to eliminate it, as discussed in Wasem (2011). I inform this debate by estimating the opportunity cost of the DV lottery in terms of lost government revenues.

The process of bidding in an auction for US Legal Permanent Residence

would be similar to the process of applying for the Diversity Visa lottery, and the qualification and document requirements would also be similar. This means that the DV lottery does a good job of identifying the number of people who are willing and able to enter an online bidding system for US LPR, with the expectation that they will be subject to a certain amount of scrutiny and face non-monetary moving costs from dealing with the immigration bureaucracy. Note that everyone who applied to the DV Lottery effectively entered a bid of $1,730.

In this chapter, I estimate the revenue the government of the US could earn each year if the Diversity Visa Lottery were replaced with a Uniform Price Auction that sold Legal Permanent Residence to 50,000 people each year. I also estimate the maximum revenue that could be earned if the government chose a different quantity to auction. This requires an estimate of the demand curve of green cards.

2.2 Data and Estimation

2.2.1 Wage Increases

I use data from Clemens et al. (2008), who calculate expected wage differences using panel data on incomes of immigrants before and after moving to the United States. They report their results as ratios. For example, the marginal immigrant from Mexico expects to multiply his or her wage by 2.53. I refer to these as the CMP wage multipliers. For countries they do not cover, I estimate multipliers from GDP data. See Section 2.3 for details. I generate the maximum possible wage difference by multiplying current wages in each country by these CMP multipliers, minus one.

Survey data shows that most people expect wage differences that are less than this. According to a Gallup poll conducted from 2007 to 2009, 16 percent of the world's adults would like to move to another country if they had the chance. This implies that at least 84% of adults worldwide would not purchase residence in any other country at a price of zero. They expect that their wage difference is too small to compensate them for their costs of moving.

Of the people who wanted to move, 24% listed the US as their desired destination. Of the people who chose another country, is is not clear if that country was the best of many possible options or the only place they wanted to go to. Under the latter assumption, 96% of the world's population would not be willing to purchase American Legal Permanent Residence at a price of zero. This seems extreme; some of the people who listed another country as their top choice would probably purchase American residence if the process was efficient and convenient.

The poll implies that, for some percentage of the world's population between 84% and 96%, their expected lifetime net present value of increased wages from moving to the US is less than the moving costs they expect to face. This matches the numbers from Diversity Visa applicants. There was only one country[1] where more than 4% of the population applied for a Diversity Visa.

2.2.2 Wages

The current incomes of Diversity Visa applicants are not known, so I must use national averages. The skewed nature of income distributions means that demand curves based on income multipliers will be convex to the origin. In order to account for this, I split the applicants from each country equally among the

[1] Sierra Leone

income quintiles in that country. In each quintile, the maximum willingness to pay is based on the average income of that quintile. This reduces the risk of overestimating demand and makes my numbers conservative.

To ensure consistency with my wage multiplier data, I use 2008 GDP data to determine the average annual salary boost that immigrants can expect. The salary boost is the CMP multiplier, times 2008 PPP-adjusted average income for each quintile. I use Purchasing Power parity incomes under the assumption that all money is spent in the US. If immigrants are sending money home to support family, or plan to retire in their home country, then the PPP adjustment will underestimate their willingness to pay to work in the US.

2.2.3 Quantities

In 2010, there were 14.8 million applicants for the DV lottery[2]. See Figure 2.1 for a visualization of the percentage of each county that applied. Citizens of countries totaling about 50% of the world's population[3] are excluded from this program. Given that the excluded countries are ones that already send many immigrants to the US, there are likely to be systemic differences between excluded and non-excluded countries: the excluded ones are likely to have many more people willing to immigrate. Assuming the excluded countries are similar would generate a lower bound on applicants.

As a lower bound, there would be 29.6 million applicants if the program were open to the whole world, or about 0.67% of the world's adult population.

[2]People applied in November 2010 for DV-2012, the chance at a visa in 2012.

[3]The excluded countries are Brazil, Canada, China (mainland-born), Colombia, the Dominican Republic, Ecuador, El Salvador, Guatemala, Haiti, India, Jamaica, Mexico, Pakistan, Peru, Philippines, Poland, South Korea, the United Kingdom, and Vietnam.

This implies that at least 0.67% of the world's adult population[4] would be willing to pay at least $1,730 for American Legal Permanent Residence.

I use the country-level data from this program as a measurement of the willingness of that country's citizens to pay a small positive price for green cards. It generates a conservative estimate of where each country's demand curve intersects the quantity axis.

Grogger and Hanson (2011) show that more educated people are more likely to migrate. This means that people from higher income quintiles are more likely to be willing to move. The exact effect is not quantified, however. In order to generate a conservative estimate, I distribute the applicants equally among the quintiles, when in reality they are more likely to come from the upper income quintiles.

2.2.4 Demand Curve Generation

For each of the five quintiles in each country, I construct the equilibrium demand curve as a straight line between two points. The price-intercept is the discounted Net Present Value of a lifetime of converging higher wages. I use a working life, ω, of 45 years; the immigrant with the highest willingness to pay is one that comes at age 20 and works until age 65. The quantity-intercept is the number of DV applications recorded in the year 2008[5], multiplied by $\frac{L}{M}$ and divided by five.

For example, Indonesia's GDP was $3,690 in 2008. The top income quintile earned 45.5% of Indonesian national income, so their average income is $3690 \times$

[4]This number excludes people already living in the US. For the rest of the paper, 'world' should be read as 'world outside the US'.

[5]2009 GDP data for many countries was not available, I wanted the data set to be as complete as possible while minimizing the number of estimations used.

$\frac{45.5}{20} = 8395$. The expected wage multiplier for an immigrant from Indonesia is 6.2, so the maximum annual salary boost is $8395 \times 5.2 = 43652$. At r=20%, the NPV of 45 years of this salary boost is about $262,000.

There were 44,739 Diversity Visa applicants from Indonesia in 2008, so I assign 8,948 of them to the top quintile. This number is divided by about 40 to produce an annual quantity of 224. The demand curve segment for the top Indonesian income quintile is a straight line from (0,$262,000) to (224,$0). The demand curve for Indonesia is the horizontal sum of the curves for the five quintiles, which will be convex to the origin.

I construct the world demand curve by horizontally summing all of the country-quintile demand curves. The result is Figure 2.4. This is a conservative estimate of the steady-state demand curve that we can expect in equilibrium, once the initial backlog is cleared away, if there are no major changes in the current demand for US LPR. See the Code Appendix for the Stata code.

2.2.5 Price, Revenue, and Welfare

Once the demand curve is generated, I estimate the expected price of US LPR if the USCIS sells 50,000 annually. I also calculate the expected revenues, above and beyond the $1,730 currently charged for processing Diversity Visas. In addition to government revenues, I calculate the total gain in social welfare that would come from the auction mechanism. This welfare gain includes government revenues; the consumer surplus that immigrants would gain is welfare minus revenues.

The welfare calculation assumes no positive or negative externalities from the immigration; it is simply the area under the demand curve and above the

cost of processing. This approximation is accurate if immigration numbers are unchanged. Any externalities generated by the immigrants under this system should not be much different than externalities generated by current immigrants.

I also calculate the quantity of residence permits that maximizes government revenues. This quantity is several times larger than 50,000. I show the price, revenues, and total welfare gains at this quantity. For larger quantities of immigration, the welfare analysis is less certain, but the literature surveyed in Clemens (2011) shows that immigrants do not have any major negative effects on the countries they move to, and that the overall effect is a small positive externality.

Table 2.1 gives data on all discount rates from 5% to 25%. Under my preferred specification, at a discount rate of 20%, the equilibrium price at a quantity of 50,000 would be $101,000, which would generate $4.98 billion in revenues and 8.98 billion in total welfare. The revenue-maximizing quantity is 194,000, and at that quantity, the price would be $37,000, generating $6.79 billion in revenues and $17 billion in welfare.

Table 2.2 focuses on the welfare calculation. The current DV lottery gives LPR to one random person in the demand curve. The resulting welfare gain is the area under the demand curve, times a fraction equal to 50,000 divided by the equilibrium number of applicants. An auction system would select the 50,000 people who value LPR the highest. This would increase welfare from $1.71 billion to $8.98 billion. After subtracting the revenues taken by the government, migrants as a group would be better off by $2.29 billion if the lottery was replaced by an auction.

2.3 Alternative Methods of Estimating Demand

The results of my paper depend on the wage multipliers presented in Clemens et al. (2008). To make sure that these multipliers are reasonable, I calculate the demand curve using other sources of productivity information. In addition, they do not report data for all countries and it is necessary to use other data to fill in the gaps.

To fill in the missing data, I use the following model: In each country, output is produced with labor and other factors with a Cobb-Douglas production function:

$$Y = L^{\alpha} * K^{(1-\alpha)} \tag{2.1}$$

where L is the labor and human capital that immigrants take with them when they move, and K is the capital, land, and institutions of a country. Differences in total factor productivity between countries are a part of K. All countries have the same α.

Capital is freely mobile, so all countries have the same marginal product of capital and the ratio of capital to labor is constant worldwide. 'Labor' is actually human capital: the skills of the workers. When workers move to a different country, they keep their level of human capital, but their wages are based on the capital on their new country.

The ratio of two countries' capital will be the same as their per-capita GDP ratio. Workers are paid equal to their marginal product of labor. Therefore, any

workers who move will expect a wage multiplier of

$$k_i = \left(\frac{\text{YA}}{\text{YO}}\right)^{(1-\alpha)} \tag{2.2}$$

I use an α of 0.5 and Purchasing Power Parity-adjusted GDP data to generate missing values. This α is the median labor share reported in The Conference Board's Total Economy Database, and it also is a good match for the CMP multipliers. See Figure 2.3 for a comparison between the CMP multipliers and multipliers generated by this method. While there are many outliers, they are equally distributed around the 45% line. Other values of α generate data that are clearly on one side of the line.

As a robustness check, I also estimate the demand curves in two different ways that do not use CMP data. The first uses labor productivity measures from The Conference Board's Total Economy Database. This is a measure of the income per hour worked in each country, or if the hours data is not available, annual income per worker in those countries. I use the ratios between these values and the values in the US. Differences in income per hour worked eliminate GDP differences due labor force participation rates and desire for leisure, and are a more direct measure of differences in capital and human capital between countries. See Figure 2.6 and Tables 2.3 and 2.4 for the results. This method generates a demand curve that is somewhat lower: it predicts a price of $80,000 at a quantity of 50,000. The lower demand curve results in welfare gains are also slightly lower.

The second alternative method uses a simple ratio of Purchasing Power Parity-adjusted GDP between the two countries to generate the multipliers. See Figure 2.7 and Tables 2.5 and 2.6 for the results. This demand curve predicts a price of $69,000 at a quantity of 50,000.

With these alternative methods of estimation, the demand curves for several countries are quite different than the demand curves generated using the CMP multipliers. Figure 2.3 compares the CMP multipliers to the ones generated by the GDP method. Clemens et al. (2008) show that migrants from some countries, such as Yemen and Egypt, realize much larger income increases than GDP differences would suggest. Migrants from other countries, such as Ethiopia and Bangladesh, realize smaller wage multipliers than GDP would suggest. When the worldwide demand curve is generated, these differences average out.

2.4 Results and Conclusion

In this paper, I generate conservative estimates of the opportunity cost of issuing 50,000 US Legal Permanent Residence permits via the Diversity Visa lottery rather than an auction. With a combined discount and convergence rate of 20%, and using income multipliers based on previous research, the equilibrium price would be about $101,000 and additional revenues would be about $4.98 billion. Other methods of generating wage differences generate equilibrium prices of $80,000 and $69,000.

Changing the allocation from a lottery to an auction would result in $2.29 billion in welfare gains for the migrants. Alternative methods result in smaller migrant welfare gains of $0.96 and $0.4 billion.

The revenue-maximizing number of permits to issue annually is 194,000. At those quantities, the equilibrium price would be $37,000 and equilibrium revenues would be $6.79 billion. Assuming low or no external costs from increasing migrant flows, increasing immigration via an auction system allows the government to raise revenue while increasing total welfare. The migrant welfare gains

from increasing immigration to the revenue-maximizing amount are $8.53 billion.

2.5 Tables

Table 2.1: Demand, DV, Main Specification

r	Current Capacity: 50000			Revenue Maximization			
	Price (USD)	Revenue (USD Billions)	Welfare	Quantity	Price (USD)	Revenue (USD Billions)	Welfare
.05	374000	18.6	30.46	258000	112000	28.53	69.68
.06	321000	15.99	26.22	248000	98000	24.03	58.82
.07	277000	13.78	23.21	240000	87000	20.59	50.51
.08	244000	12.14	20.8	233000	79000	17.91	44.05
.09	222000	11	18.38	226000	71000	15.8	38.89
.1	198000	9.8	16.75	221000	65000	14.1	34.78
.11	179000	8.88	15.47	216000	61000	12.72	31.37
.12	166000	8.23	14.11	212000	56000	11.57	28.62
.13	155000	7.67	12.97	209000	53000	10.62	26.29
.14	141000	6.99	12.13	206000	49000	9.81	24.34
.15	133000	6.56	11.37	203000	47000	9.12	22.67
.16	124000	6.13	10.72	201000	44000	8.52	21.23
.17	118000	5.8	10.14	198000	42000	8	19.93
.18	111000	5.48	9.61	197000	40000	7.55	18.84
.19	106000	5.2	9.43	195000	38000	7.15	17.87
.2	101000	4.98	8.98	194000	37000	6.79	17
.21	97000	4.78	8.57	193000	35000	6.47	16.23
.22	94000	4.6	8.2	192000	34000	6.18	15.54
.23	90000	4.43	7.87	190000	33000	5.92	14.88
.24	87000	4.28	7.57	189000	32000	5.68	14.32
.25	85000	4.14	7.3	188000	31000	5.47	13.8

Table 2.2: Welfare, DV, Main Specification

		Current Capacity: 50000			Revenue Maximization		
r	Current Welfare	Auction Welfare	Auction Revenue	Migrant Gain	Welfare	Revenue	Migrant Gain
.05	5.32	30.54	18.6	6.62	69.79	28.59	35.88
.06	4.67	26.23	15.99	5.57	58.92	24.08	30.16
.07	4.15	23.22	13.78	5.29	50.6	20.64	25.81
.08	3.73	20.81	12.12	4.96	44.12	17.95	22.44
.09	3.38	18.39	10.98	4.03	39	15.83	19.78
.1	3.1	16.7	9.8	3.81	34.84	14.13	17.62
.11	2.85	15.47	8.88	3.74	31.49	12.74	15.89
.12	2.65	14.11	8.23	3.24	28.67	11.6	14.42
.13	2.47	12.98	7.67	2.83	26.36	10.64	13.25
.14	2.32	12.13	6.99	2.83	24.38	9.83	12.23
.15	2.18	11.37	6.56	2.63	22.71	9.14	11.39
.16	2.07	10.7	6.14	2.5	21.26	8.54	10.65
.17	1.96	10.15	5.8	2.39	20.01	8.02	10.03
.18	1.87	9.62	5.48	2.26	18.87	7.57	9.43
.19	1.79	9.43	5.2	2.44	17.9	7.16	8.95
.2	1.71	8.98	4.98	2.29	17.04	6.81	8.53
.21	1.64	8.57	4.78	2.15	16.26	6.48	8.13
.22	1.58	8.21	4.6	2.03	15.56	6.2	7.79
.23	1.53	7.88	4.43	1.92	14.94	5.93	7.48
.24	1.47	7.58	4.28	1.82	14.34	5.7	7.17
.25	1.43	7.3	4.14	1.74	13.82	5.48	6.91

2.5.1 Alternate Methods

Table 2.3: Demand, DV, Conference Board Labor Productivity

r	Current Capacity: 50000			Revenue Maximization			
	Price (USD)	Revenue (USD Billions)	Welfare	Quantity	Price (USD)	Revenue (USD Billions)	Welfare
.05	280000	13.93	21.53	304000	83000	24.76	58.15
.06	243000	12.08	18.58	292000	73000	20.84	49.05
.07	213000	10.58	16.16	282000	65000	17.84	42.1
.08	189000	9.34	14.61	273000	58000	15.51	36.7
.09	171000	8.46	12.92	266000	53000	13.67	32.45
.1	153000	7.55	11.75	259000	49000	12.19	28.97
.11	140000	6.92	10.8	254000	45000	10.98	26.18
.12	128000	6.33	9.92	250000	42000	9.99	23.89
.13	119000	5.87	9.21	246000	39000	9.15	21.96
.14	111000	5.45	8.6	241000	37000	8.45	20.26
.15	104000	5.1	8.06	238000	35000	7.85	18.87
.16	97000	4.78	7.64	236000	33000	7.33	17.68
.17	92000	4.54	7.19	234000	31000	6.88	16.64
.18	87000	4.29	6.86	231000	30000	6.48	15.7
.19	84000	4.09	6.51	229000	28000	6.13	14.9
.2	80000	3.89	6.24	227000	27000	5.82	14.16
.21	76000	3.73	5.96	212000	28000	5.54	13.16
.22	73000	3.56	5.79	211000	27000	5.29	12.58
.23	70000	3.43	5.56	210000	26000	5.07	12.08
.24	68000	3.31	5.34	208000	25000	4.86	11.6
.25	66000	3.2	5.15	207000	24000	4.68	11.18

Table 2.4: Welfare, DV, Conference Board Labor Productivity

		Current Capacity: 50000			Revenue Maximization		
r	Current Welfare	Auction Welfare	Auction Revenue	Migrant Gain	Welfare	Revenue	Migrant Gain
.05	4.36	21.5	13.93	3.21	58.31	24.83	29.12
.06	3.83	18.61	12.08	2.7	49.22	20.9	24.49
.07	3.4	16.18	10.58	2.21	42.24	17.89	20.94
.08	3.05	14.63	9.34	2.24	36.81	15.56	18.2
.09	2.77	12.94	8.46	1.7	32.53	13.71	16.05
.1	2.53	11.77	7.55	1.68	29.05	12.22	14.29
.11	2.34	10.81	6.92	1.56	26.25	11.01	12.9
.12	2.17	9.93	6.33	1.44	23.95	10.02	11.77
.13	2.02	9.22	5.87	1.33	22.02	9.18	10.82
.14	1.9	8.62	5.45	1.27	20.31	8.48	9.94
.15	1.79	8.07	5.1	1.18	18.92	7.87	9.26
.16	1.69	7.59	4.79	1.11	17.73	7.35	8.68
.17	1.61	7.2	4.54	1.06	16.68	6.9	8.18
.18	1.53	6.87	4.29	1.05	15.74	6.5	7.71
.19	1.46	6.52	4.09	.96	14.94	6.15	7.32
.2	1.4	6.25	3.89	.96	14.22	5.84	6.98
.21	1.35	5.97	3.73	.89	13.19	5.56	6.29
.22	1.29	5.73	3.57	.86	12.62	5.31	6.01
.23	1.25	5.57	3.43	.89	12.11	5.08	5.78
.24	1.21	5.35	3.31	.84	11.63	4.88	5.55
.25	1.17	5.16	3.2	.79	11.21	4.69	5.35

Table 2.5: Demand, DV, GDP Difference

r	Current Capacity: 50000			Revenue Maximization			
	Price (USD)	Revenue (USD Billions)	Welfare	Quantity	Price (USD)	Revenue (USD Billions)	Welfare
.05	246000	12.21	17.37	346000	69000	23.17	52.53
.06	216000	10.71	14.66	332000	60000	19.49	44.35
.07	186000	9.19	12.91	321000	54000	16.67	38.09
.08	162000	8.03	11.49	312000	48000	14.49	33.21
.09	145000	7.16	10.35	301000	44000	12.76	29.21
.1	131000	6.48	9.31	293000	40000	11.37	26.1
.11	120000	5.91	8.53	286000	37000	10.24	23.54
.12	110000	5.42	7.9	267000	37000	9.3	20.95
.13	102000	5.02	7.35	263000	34000	8.52	19.26
.14	95000	4.67	6.85	259000	32000	7.87	17.84
.15	89000	4.38	6.42	256000	30000	7.3	16.62
.16	84000	4.1	6.06	252000	29000	6.82	15.51
.17	79000	3.88	5.75	250000	27000	6.39	14.6
.18	75000	3.67	5.45	248000	26000	6.02	13.8
.19	72000	3.5	5.22	246000	25000	5.7	13.09
.2	69000	3.35	4.97	244000	24000	5.4	12.46
.21	65000	3.19	4.78	240000	23000	5.14	11.84
.22	63000	3.05	4.59	239000	22000	4.91	11.33
.23	60000	2.93	4.42	238000	21000	4.7	10.88
.24	58000	2.82	4.26	237000	21000	4.5	10.46
.25	56000	2.73	4.11	236000	20000	4.33	10.08

Table 2.6: Welfare, DV, GDP Difference

		Current Capacity: 50000			Revenue Maximization		
r	Current Welfare	Auction Welfare	Auction Revenue	Migrant Gain	Welfare	Revenue	Migrant Gain
.05	3.84	17.41	12.21	1.36	52.7	23.24	25.62
.06	3.37	14.7	10.71	.62	44.48	19.55	21.57
.07	2.99	12.94	9.19	.76	38.2	16.73	18.48
.08	2.69	11.52	8.03	.81	33.31	14.53	16.09
.09	2.44	10.26	7.2	.62	29.3	12.8	14.07
.1	2.23	9.34	6.48	.63	26.18	11.4	12.55
.11	2.05	8.55	5.91	.59	23.62	10.27	11.29
.12	1.91	7.88	5.44	.54	21.01	9.33	9.77
.13	1.78	7.37	5.02	.57	19.32	8.55	8.99
.14	1.67	6.86	4.67	.52	17.89	7.89	8.33
.15	1.57	6.44	4.38	.48	16.67	7.33	7.77
.16	1.49	6.06	4.11	.46	15.56	6.84	7.23
.17	1.41	5.74	3.88	.44	14.64	6.42	6.82
.18	1.35	5.45	3.69	.42	13.84	6.04	6.45
.19	1.29	5.23	3.49	.45	13.13	5.71	6.13
.2	1.23	4.98	3.34	.4	12.5	5.42	5.85
.21	1.18	4.77	3.19	.39	11.87	5.16	5.53
.22	1.14	4.59	3.06	.39	11.37	4.92	5.3
.23	1.1	4.41	2.94	.38	10.91	4.71	5.1
.24	1.06	4.26	2.83	.37	10.49	4.52	4.91
.25	1.03	4.12	2.73	.36	10.11	4.34	4.74

2.6 Figures

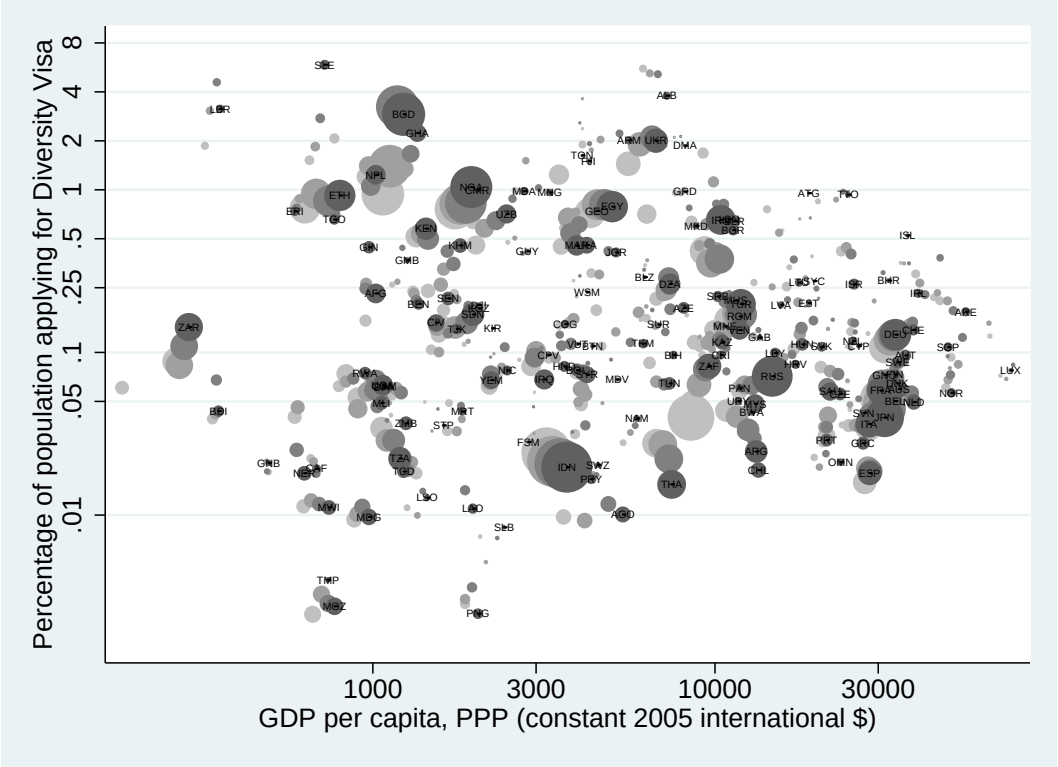

Figure 2.1: Diversity Visa Applicants and GDP, Population-Weighted 2005-2008. Lighter circles are earlier years.

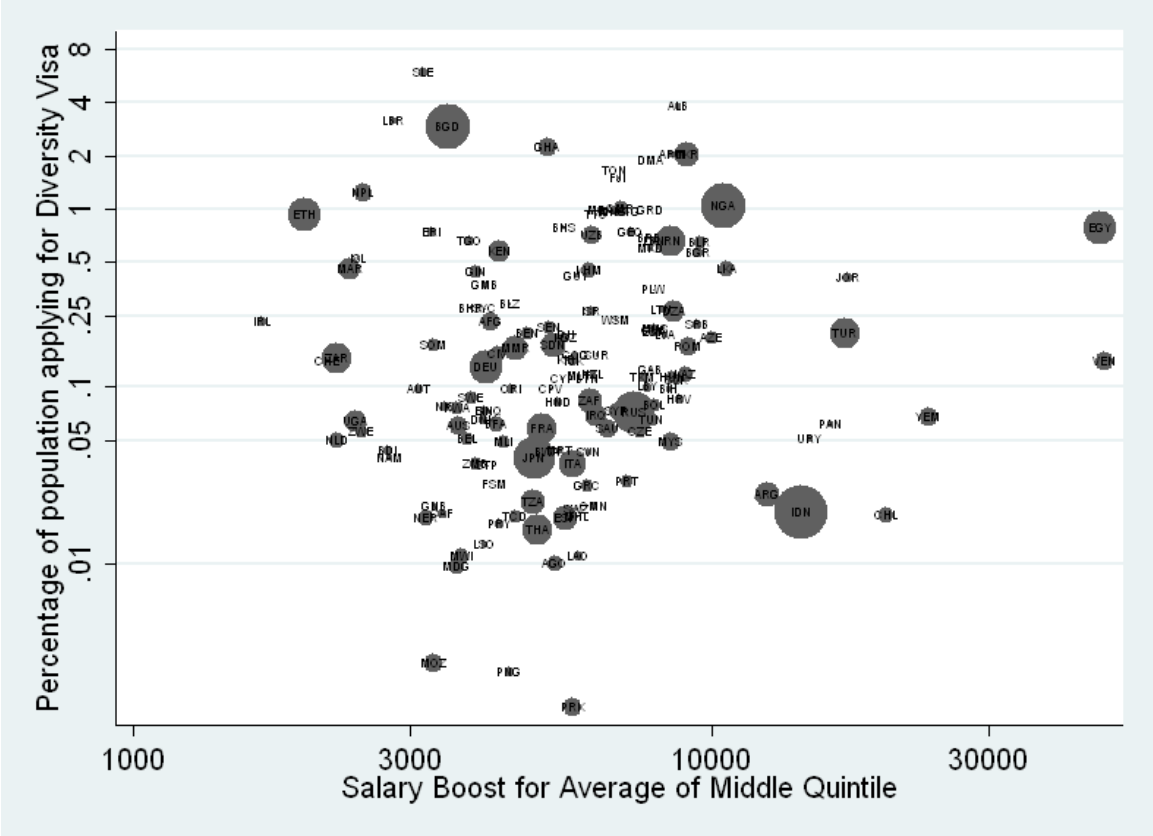

Figure 2.2: Diversity Visa Applications and Salary Boost, 2008

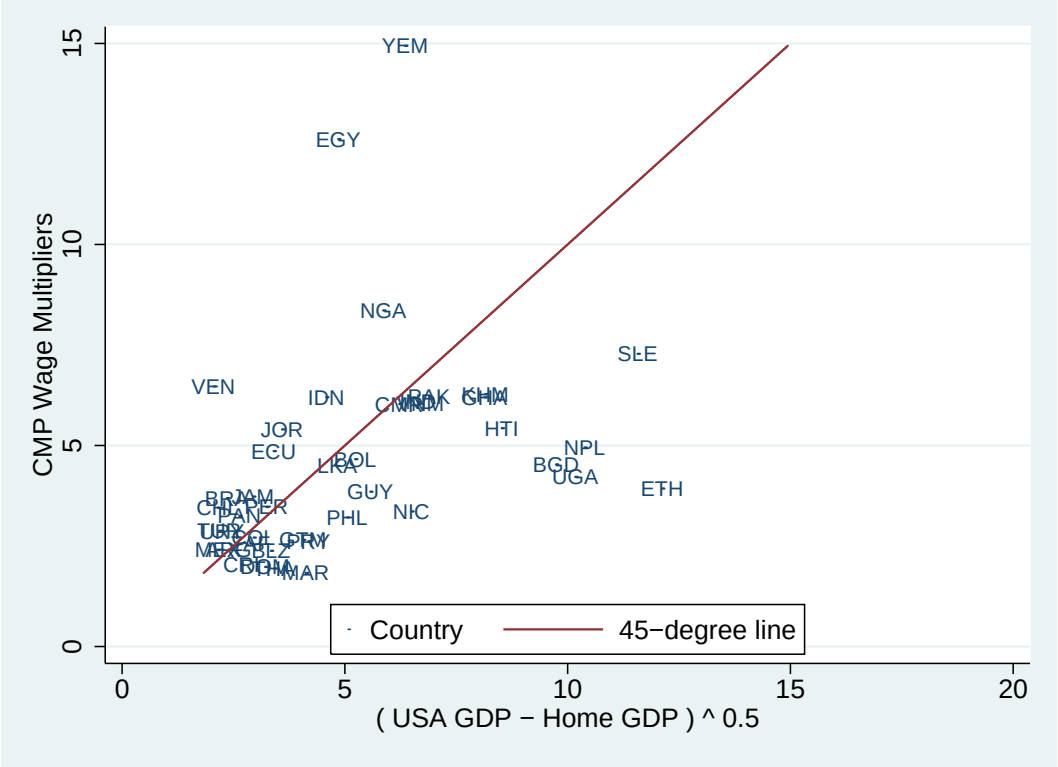

Figure 2.3: Wage Multiplier Comparison

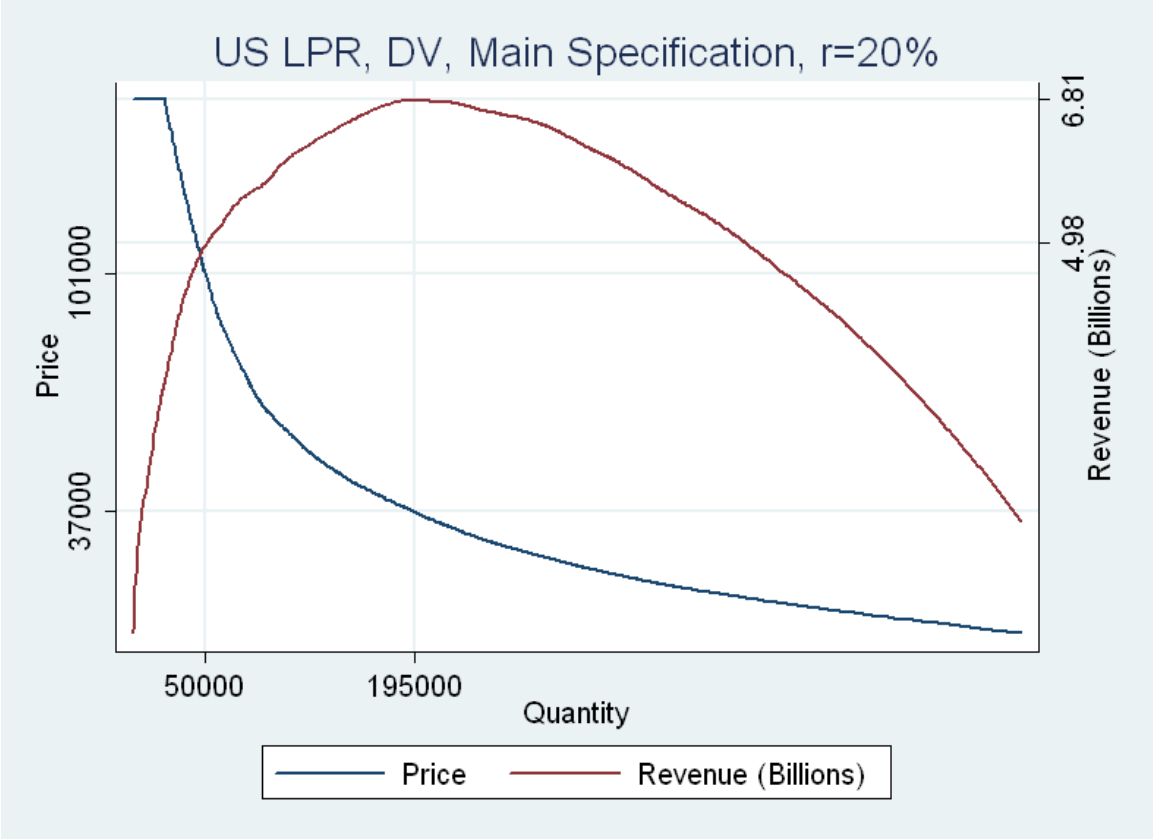

Figure 2.4: Demand and Revenue, DV, Main Specification

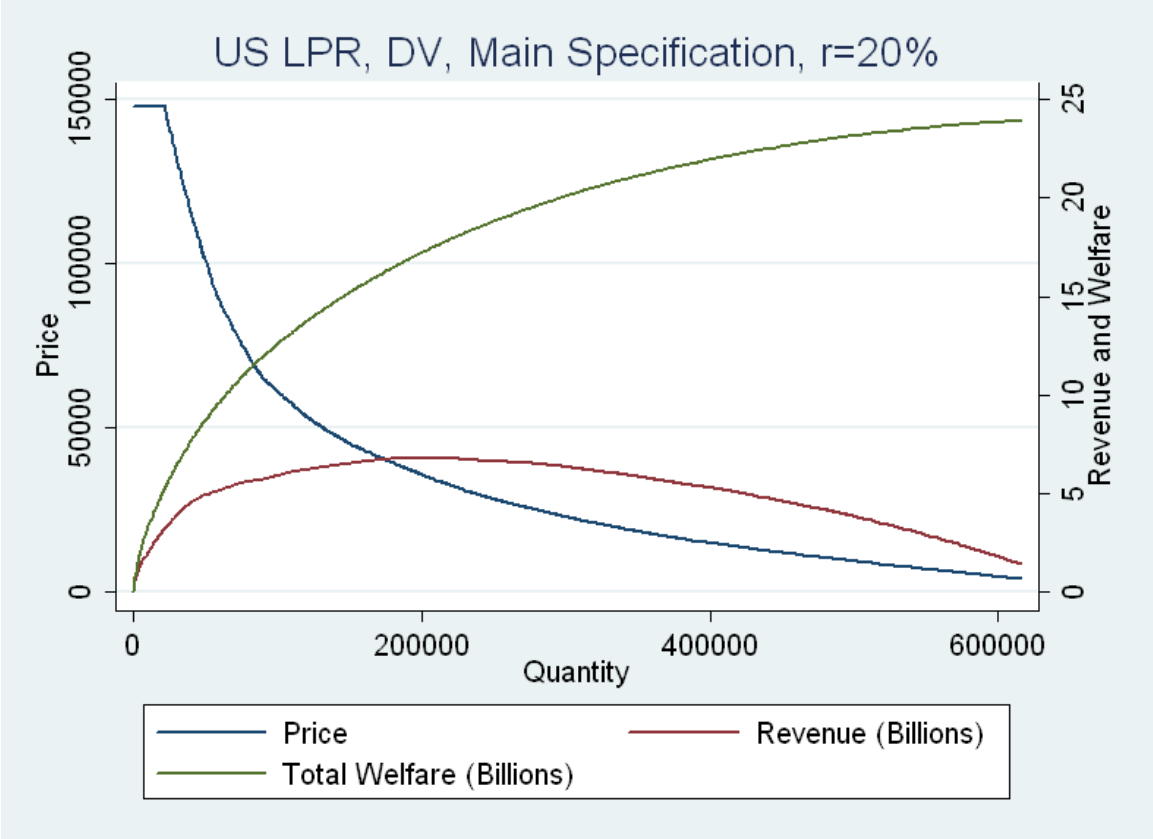

Figure 2.5: Welfare, DV, Main Specification

2.6.1 Alternate Methods

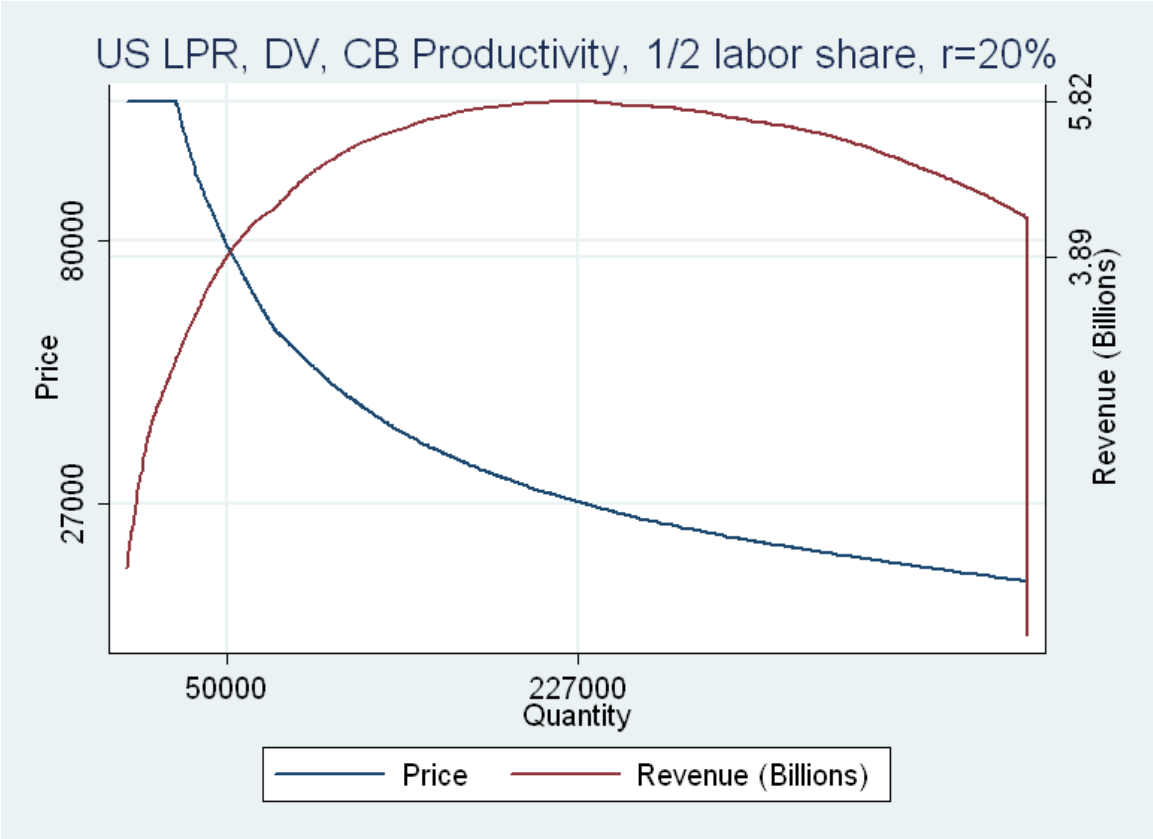

Figure 2.6: Demand and Revenue, CB Productivity

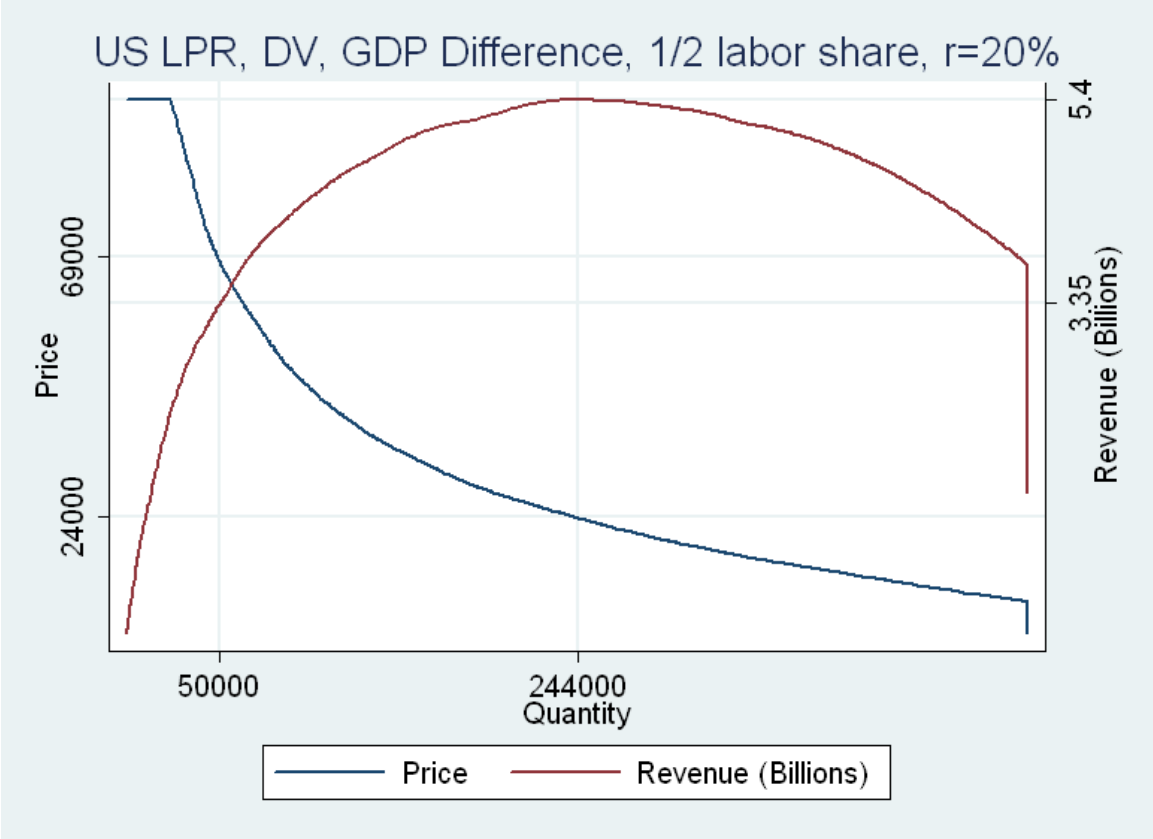

Figure 2.7: Demand and Revenue, GDP Difference

Chapter 3

High Skilled Employment Visa Estimation

3.1 Introduction

Obtaining employment-based LPR is typically a two-step process. First, workers obtain a dual-intent temporary work visa. The visa gives them the right to work in the US for a period of up to six years, and petition for a change of status from temporary worker to Legal Permanent Resident. The most well-known example of a dual-intent work visa is the H-1B visa for high-skilled workers, and other categories are the L-1 and O-1 visas. The L-1 visa is for intracompany transfers of employees, and the O-1 visa is for "individuals with extraordinary ability or achievement". According to the most recent Yearbook of Immigration Statistics, over 90% of employment-based LPR's were 'adjustments of status' rather than 'new arrivals'.

The adjustment of status required to obtain an employment-based (EB) LPR is a difficult and expensive process. Legal fees, filing fees, and the cost of

complying with regulations and requirements typically add up to around $10,000, according to quotes from immigration law offices. This is in addition to the money and effort of obtaining a temporary work visa. Even at these prices, the number of people who want LPR is greater than the quotas, and workers from many countries have long backlogs and waiting periods.

The current number of about 135,000 employment-based LPR awards given to people already in the US includes spouses and children in addition to workers. About half of the LPR's are awarded to the workers themselves. I will produce estimates under the assumption that the process for visa awards for spouses and children is unchanged, and that only the worker enters the auction. I also assume that the USCIS would want to keep the numbers of immigrants constant, so it would sell 65,000 green cards per year to dual-intent workers while issuing the remaining green cards to their spouses and children.

In this chapter, I estimate the revenue that the USCIS could earn each year by replacing the current EB LPR paperwork with a Uniform Price Auction that sold Legal Permanent Residence to 65,000 dual-intent workers each year. Around 200,000 workers each year are awarded a dual-intent visa annually. This means that a worker who comes in on an employment-based dual-intent visa has a roughly one in three chance of eventually getting a green card. The observed auction price will be the willingness to pay of the 66th percentile of temporary workers.

This chapter will proceed as follows: In Section 2, I will describe the existing literature on the salaries of skilled temporary workers. In Section 3, I describe the various data inputs that I use. In Section 4, I present the results and conclude.

3.2 Literature

The salaries of skilled temporary workers in the US, especially H-1B visa holders, have been extensively studied, most recently in Clemens (2010), Lofstrom and Hayes (2012), Hunt (2011), and Mithas and Lucas (2010). I use the data presented in these papers in my estimates.

Clemens (2010) uses confidential personnel data from a large Indian IT company to track the salaries of 14,799 unique individuals who applied for H-1B visas in 2007 and 2008. In those years, the annual caps on H-1B visas were reached on the first few days of applications, and the USCIS used a lottery to decide which ones to process. This natural experiment removes selection bias and allows him to test the effect of a work permit on an individual's income. The company personnel records recorded the location and salary in 2009 for each worker. The average PPP-adjusted annual salary difference that workers enjoyed from leaving India was about $39,000, or 2.4 times their salary in India.

Clemens (2010) also found that the salaries of people who had been in the US temporarily, and then returned to India, were not significantly higher than the salaries of people who never left India. He concluded that "very little of the vast increase in earnings caused by working abroad accompanies the worker to India upon his or her return." However, he also found that many people who were denied H-1B visas were able to find work in other countries. Because of this, the effect of randomly issuing an applicant an H-1B visa was an annual salary increase of about $8,400 in PPP dollars, or 12% of the salaries they were earning in the US. This suggests that the demand curve for US LPR may be determined more by the availability of substitutes than by conditions in the home countries of workers.

Clemens (2010) also reports that it is common for workers on H-1B visas to leave the US before the visa expires, once they are finished with the project they were sent to do. This shows that, for some workers in some situations, the value of remaining in the US is close to zero.

Lofstrom and Hayes (2012) present the mean and median annual earnings of H-1B visa holders in various occupations, using individual data on over 200,000 visa holders obtained from the USCIS through a FOIA request. They then compare these workers to native workers using data from the 2009 American Community Survey. They find that, among individuals between the ages of 22 and 64 with at least a Bachelor's degree, H-1B workers earn less than natives and naturalized citizens earn more. After controlling for age, education, occupation, and industry, however, the H-1B visa holders earn 10% more but the naturalized immigrants only earn 3% more.

Hunt (2011) uses the National Survey of College Graduates to study a large pool of immigrants and compare their salaries to natives. She finds that immigrants who entered on a student or work visa earn significantly higher salaries than natives, but that immigrants who entered with Legal Permanent Residence do not. Controlling for field of study, education, age, age at arrival, and foreign and U.S. experience, immigrants who came in on a work visa enjoy a 36 log point salary advantage over natives. This suggests strong positive sorting on unobservables, and that any estimate based on average salaries in various countries will underestimate the willingness to pay of self-selected potential immigrants.

Mithas and Lucas (2010) study the salaries of a large sample of IT professionals from 1998 to 2006 and also find that foreign workers earn significantly more than natives. The IT workers with an H-1B visa earned 6 log points more than natives, while workers with LPR earned 12 log points more, controlling for

education, several experience variables, and firm type. They study how changes in visa caps affect the salary premium, and find that in the three years when the visa cap was reached, the salary premium was higher than in the years when it was not.

The 6% salary advantage of workers with Legal Permanent Residence, after controlling for other factors, is interesting. It could represent selection bias, or it could imply that the salaries of H-1B visa holders are artificially low because they cannot switch forms and therefore have less bargaining power. If this is true, it means that current holders of work visas could expect a large earnings increase after obtaining LPR, therefore increasing their willingness to pay.

In a working paper, Mukhopadhyay and Oxborrow (2012) find that workers who enter the US with employment based LPR earn over $11,000 a year more than workers who enter on a temporary work visa. They attribute the difference to labor market frictions caused by the fact that holders of H-1B and L-1 visas cannot change employers.

However, it is also possible that current immigration policy means that people coming to the US on temporary work visas are different than the relatively few people who are awarded green cards immediately. I have not been able to find any studies that track the salaries of workers as they transition from a work visa to LPR. Given this uncertainty, I assume that obtaining LPR will simply allow a worker to maintain his or her current salary.

3.3 Data and Estimation

The best current source of information on the salaries of high-skilled work visa holders in the US is Lofstrom and Hayes (2012). They report the 2009 mean

and median annual salaries for H-1B visa holders overall, and in the five major occupational categories of H-1B visa holders: Information Technology, Engineering, Math and Sciences, Health, and Post-Secondary Education. Over 72% of H-1B visa holders work in these occupations.

Future workers will all have different salaries, but it is reasonable to assume that these salaries will be drawn from the same distribution. The standard labor economics assumption is a lognormal distribution of salaries, and the kernel density function for the salaries of immigrants presented on Hunt (2011) gives no reason to reject this assumption. Therefore, I derive the location and scale parameters of six lognormal distributions from the mean and median salary data in Lofstrom and Hayes (2012), and combine that with the percentages of workers in each occupation to simulate future cohorts of work visa holders.

I create 100 groups of 2,000 people each, with a number of groups of each occupation equal to the percentage of the worker population in that occupation. For the 28% in other occupations, I use the overall distribution of salaries. Each group is assigned a salary drawn from the appropriate distribution.

Then I use the data on visa holders in Clemens (2010) to calculate how much of their salary would be lost if they were forced to leave. Some workers will have the potential of a permanent job in the US and no other options outside their home country. If forced to leave the US, they will lose most of their earnings, so they would pay the most for a green card. Others will have the opportunity to go to other high-income countries to work, and will pay a smaller amount to remain in the US. Some workers are on temporary assignments and will have no good prospects in the US, and so will pay almost nothing to remain.

I use the Local Average Treatment Effect of obtaining a US work visa, 12% of US salaries, as the percentage of salaries that the median worker in each group

would lose if forced to leave the US. I then assume that the salary loss within each salary group is a uniform distribution, from zero to 24%. This is probably an underestimate, as it claims that the most anyone would lose from being forced to return to their native country is 24% of PPP salaries, but this is consistent with my goal of finding a floor for the demand curve.

The average age of H-1B workers, reported in Lofstrom and Hayes (2012), is 32 years. This means that they will expect to work for 35 years before retiring.

The expected convergence rates of US salaries and salaries in the developing countries that the workers come from are high, as high as 10%. However, the relevant salary comparison for the workers also depends on the growth rate of salaries in the countries that they could move to if they were not in the US. Many of these countries are developed countries with salaries that are expected to grow no faster than salaries in the US. This means that demand will be based on lower expected wage convergence. I report results based on a value of 5%.

A pessimistic assumption of the discount rate, or the cost of capital, that workers face is between 10% to 15%. Therefore, in the conclusion of this section, I report the range from relatively pessimistic assumption of 15% to a more pessimistic assumption of 20%. I also calculate wider range of values for the discount rate plus expected convergence rate, from 5% to 25%.

For each of the hundred income groups, I create a straight-line demand curve between two points: a price of 24% of the net present value of 35 years of a salary in the US, and a price of zero. I construct the total demand curve by horizontally summing the demand curves for each income group. See the Code Appendix for details.

3.3.1 Price, Revenue, and Welfare

Once the demand curve is generated, I estimate the expected price of US LPR if the USCIS sells 65,000 annually to high-skilled workers currently in the country. I also calculate the expected revenues, above and beyond the $1,730 currently charged for processing Diversity Visas. In addition to government revenues, I calculate the total gain in social welfare that would come from the auction mechanism, compared to no immigration, and ignoring externalities. Current policy sacrifices some, but not all, of these welfare gains by forcing H1B workers to leave after six years, and by not necessarily allocating the visas to those who get the most benefit from them.

I also calculate the quantity of residence permits that maximizes government revenues. This quantity is always 88,000, because the quantity calculations do not depend on the discount rate. I show the price, revenues, and total welfare gains at this quantity. The difference in welfare between 88,000 H1B workers and current policy is a floor of the welfare gains that could be realized by expanding the quota. To the extent that highly skilled immigrants generate positive externalities on average, and current policy is an inefficient allocation, welfare gains from expanding the quota would be higher than this difference.

See Figures 3.1 and 3.2 for the demand curves at discount rates of 15% and 20%, and table 3.1 for data on all discount rates from 5% to 25%. Figure 3.3 shows the welfare gains that could be realized by further expansion of the quota.

Under my preferred specification, at a discount rate of 15%, the equilibrium price at a quantity of 65,000 would be $83,000, which would generate $5.31 billion in revenues and 8.98 billion in total welfare. At the revenue-maximizing quantity of 88,000, the price would be $65,000, generating $5.6 billion in revenues.

Welfare gains would be at least $1.3 billion more than current policy at that quantity.

3.4 Results and Conclusion

In this chapter, I estimate the lower bound of the opportunity cost of the current system for awarding a change of status from high-skilled temporary worker to Legal Permanent Resident. I calculate the expected price and revenues of issuing 65,000 employment-based green cards with a Uniform Price Auction with bidding limited to high-skilled temporary workers. Under baseline assumptions, the USCIS could raise an additional $5.31 billion each year at an expected price is $83,000. Under more pessimistic assumptions of discount rates and/or wage convergence, the price would be $66,000 and revenues would be $4.51 billion.

If holders of temporary work visas would enjoy higher salaries as a result of getting a green card and being allowed to work for any employer, then the willingness to pay and price will be higher. If moving costs are a concern, the price will be higher. If the visa processing effect underestimates the salary that a worker will lose when forced to leave, the price will be higher.

Given that current immigration policy is widely criticized, replacing one aspect of the naturalization process with an auction should be feasible. The USCIS already has the systems and expertise in place to handle a computerized application process, which could be modified to run an auction. There is no reason to believe that the average quality of permanent residents under an auction system would be lower than under the current lottery system, or that they would impose larger costs on society than the people who are currently awarded green cards.

The bidding, just like the current application system, would be limited to people who have already passed one round of screening and who have a documented history of law-abiding life and work in the US.

3.5 Tables

Table 3.1: Demand, DV, H1B Workers

r	Current Capacity: 65000			Revenue Maximization			
	Price (USD)	Revenue (USD Billions)	Welfare	Quantity	Price (USD)	Revenue (USD Billions)	Welfare
.05	188000	12.13	19.5	88000	147000	12.85	22.48
.06	168000	10.83	17.43	88000	132000	11.47	20.09
.07	152000	9.75	15.71	88000	119000	10.33	18.11
.08	138000	8.85	14.27	88000	108000	9.37	16.46
.09	126000	8.09	13.06	88000	99000	8.56	15.06
.1	116000	7.44	12.03	88000	91000	7.87	13.87
.11	108000	6.89	11.15	88000	84000	7.28	12.85
.12	100000	6.41	10.38	88000	78000	6.77	11.97
.13	94000	5.99	9.72	88000	73000	6.33	11.21
.14	88000	5.63	9.14	88000	69000	5.94	10.54
.15	83000	5.31	8.63	88000	65000	5.6	9.95
.16	79000	5.02	8.18	88000	62000	5.3	9.43
.17	75000	4.77	7.77	88000	59000	5.03	8.96
.18	72000	4.54	7.41	88000	56000	4.79	8.55
.19	68000	4.34	7.09	88000	54000	4.57	8.17
.2	66000	4.15	6.79	88000	51000	4.38	7.83
.21	63000	3.99	6.53	88000	49000	4.2	7.52
.22	61000	3.83	6.28	88000	47000	4.04	7.24
.23	59000	3.69	6.06	88000	46000	3.89	6.99
.24	57000	3.57	5.86	88000	44000	3.75	6.75
.25	55000	3.45	5.67	88000	43000	3.63	6.54

3.6 Figures

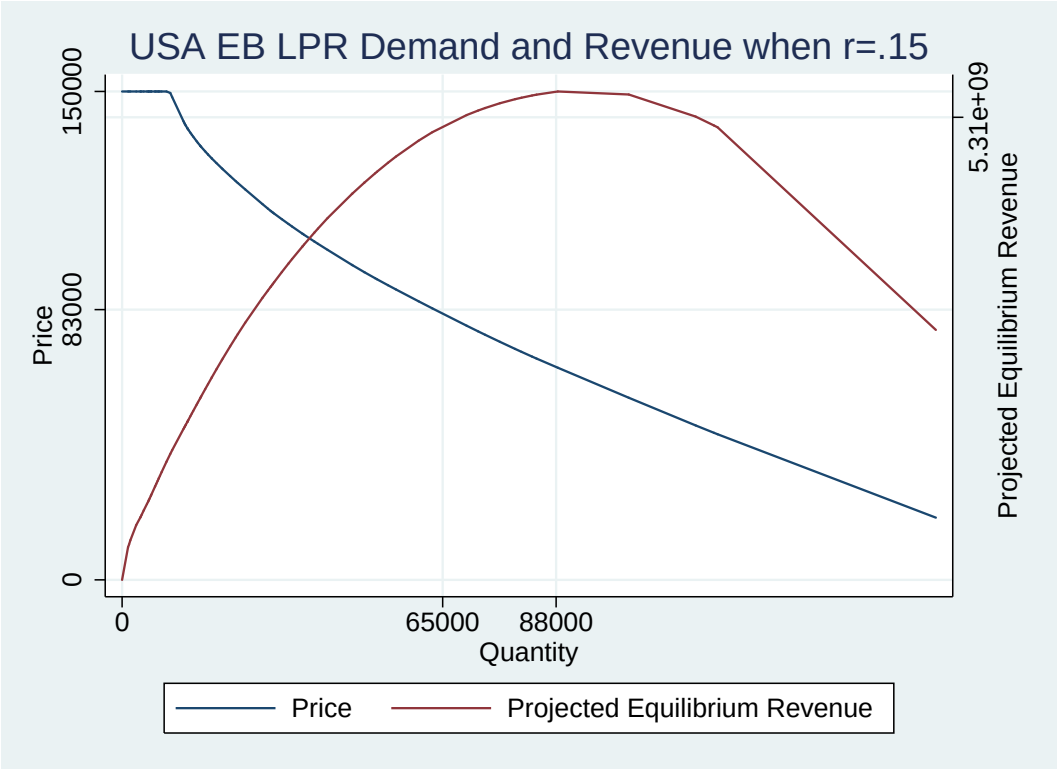

Figure 3.1: Demand and Revenue, H1B Workers, r=.15

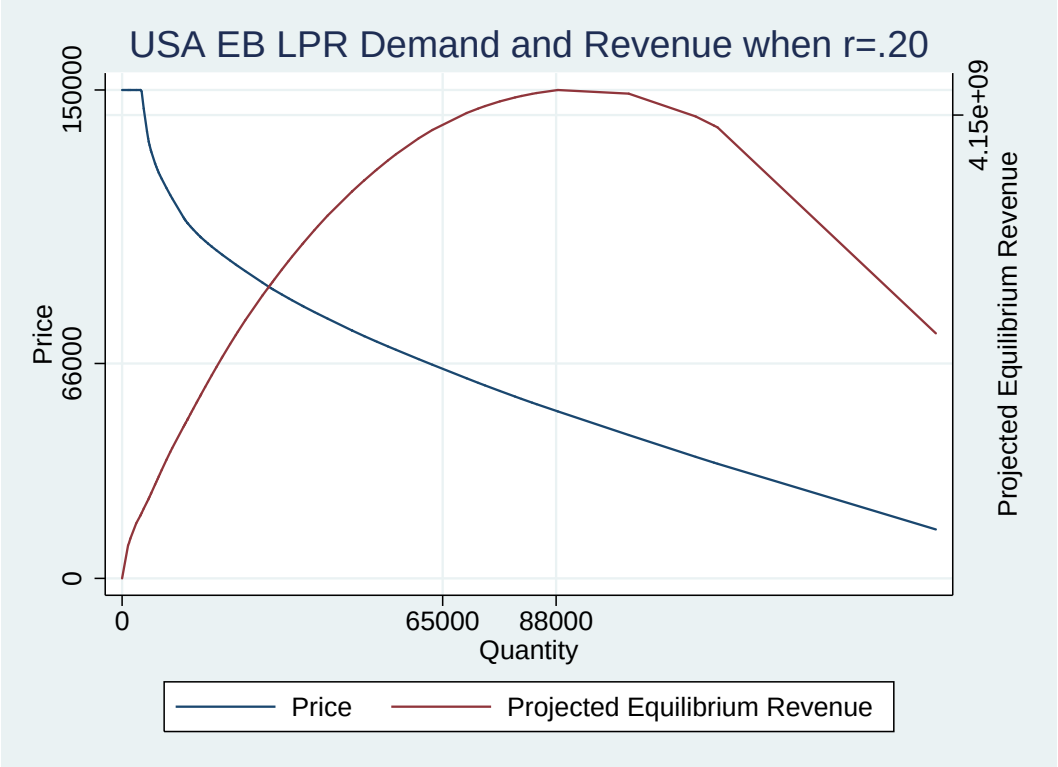

Figure 3.2: Demand and Revenue, H1B Workers, r=.2

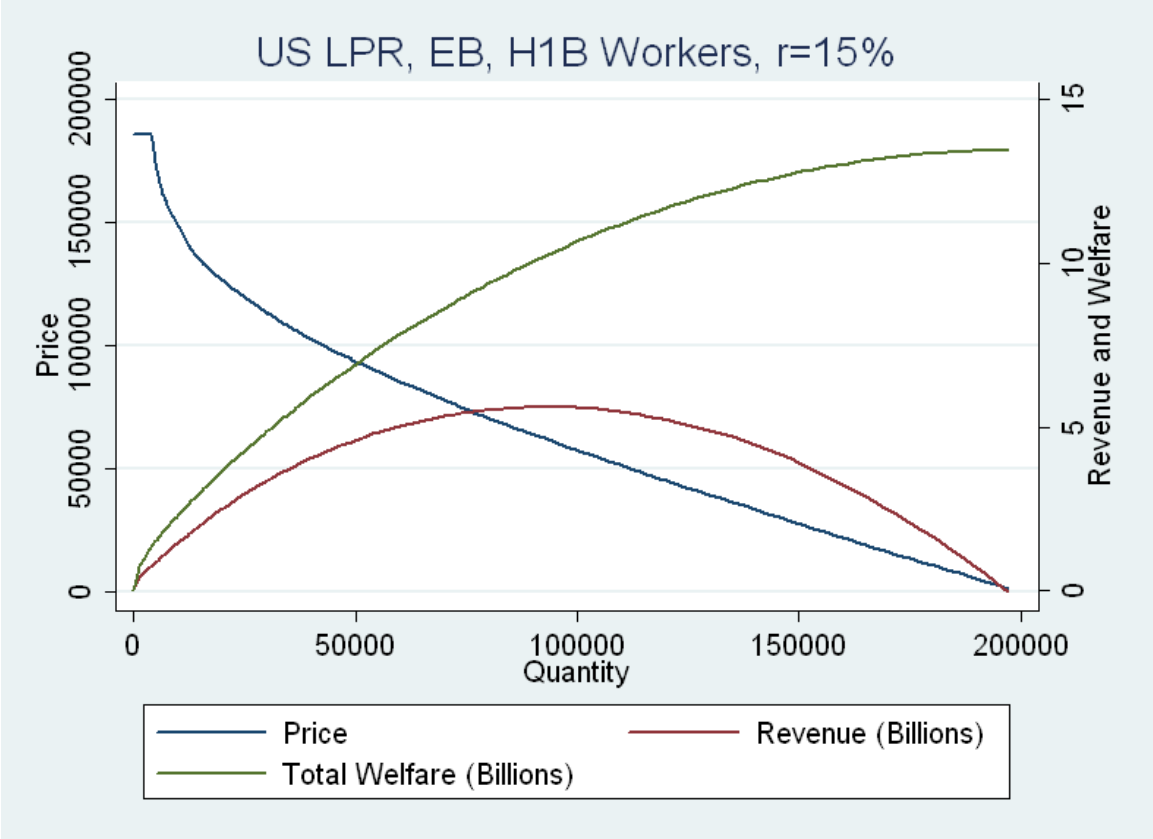

Figure 3.3: Welfare from Skilled Workers, r=.2

Chapter 4

Undocumented Worker Estimation

4.1 Introduction

There is much discussion of undocumented immigration: people living in the US without a residence visa and working jobs that are typically low-skilled. In most years over the past two decades, there has been a net inflow of about half a million undocumented immigrants into the US. Most of these are Mexicans or Central Americans coming to do manual labor in sectors like agriculture or construction.

These large, persistent flows show there is a large demand for residence in the US, even if the residence is unauthorized and therefore lacks many of the benefits of being a citizen or legal resident of the US. People are willing to pay human smugglers, or 'coyotes', thousands of dollars to assist in border crossings. In addition to the monetary cost, there are substantial risks to an illegal border crossing. Many people who attempt the crossing are killed by criminals or the harsh environmental conditions, and many more are caught and deported, therefore gaining no return on their investment.

In recent years, the flow of immigrants has decreased dramatically, due to the recession in the US and also to increased border security. There still exists, however, a large stock of about eleven million people living in the US without proper documentation. There has been much debate about the proper policy toward undocumented immigrants, with some people advocating some form of amnesty and other people advocating harsher measures such as detection and deportation.

In this chapter, I inform the debate by estimating the revenues that the USCIS could earn by selling LPR to undocumented workers. I assume that, in the short term, annual flows will remain low and demand will come from the population currently in the US. After about a decade, most of the undocumented immigrants in the US will have either paid or left, and historical annual flows will resume. If historical flows recover sooner, or are an underestimate of the number of people who would pay for legal residence, then demand will be higher than what I calculate.

These estimates assume that border security is strong enough that immigrants have an incentive pay in order to enter the US. Over the last few years, border security has become more effective, keeping most migrants out. Presumably, the only people still crossing are those with the highest willingness to pay. As long as the total risk-adjusted cost of a successful unauthorized entry is higher than the cost of paying for legal entry, people will pay for legal entry.

I use individual-level income data from surveys where undocumented Mexican immigrants report their current earnings in the US and their former earnings in Mexico, and generalize these salary differences to the entire undocumented population of workers. This generates an underestimate of the true demand curve, because Mexico is a richer country than other major sources of

undocumented immigrants, and wages there are higher, while US wages are not significantly different for undocumented workers from the different countries.

This chapter will proceed as follows: In Section 2, I will describe the existing literature on the salaries of skilled temporary workers. In Section 3, I describe the various data inputs that I use. In Section 4, I present the results and conclude.

4.2 Literature

While there is a vast literature on undocumented immigration, none of it directly answers the question of how much money these immigrants would be willing to pay for Legal Permanent Residence in the US. An overview of the topic is given in Borjas and of Economic Research (2007). Burtless and Singer (2010) discuss the earnings of legal and illegal Mexican immigrants. Hall et al. (2010) show that the wage gap between legal and illegal Mexican immigrants is 8% when human capital and occupation are held constant.

As discussed in Clemens (2011), evidence on the impact of undocumented immigrants is mixed. While immigrants lower the wages of low-skilled workers they compete with, and may cause negative fiscal impacts on state and local governments, they improve the profits of capital owners, reduce the cost of many goods and services, and help the finances of the federal government, for example by paying Social Security taxes and not collecting benefits. There is no clear evidence that they generate large net gains or losses for the US.

Amuedo-Dorantes and Pozo (2006) and Sana (2008) discuss remittances, the money sent by workers to family in their home countries. Undocumented immigrants routinely send thousands of dollars a year to their families, even the ones in unskilled, low-paying jobs. It would not be correct to find willingness to

pay based on the net present value of these remittances, because some amount of wages in the home country would also be transferred to family members, but the magnitude of annual remittances suggests that willingness-to-pay figures of tens of thousands of dollars would be reasonable.

According to Passel and Cohn (2011) and Hoefer et al. (2011), there was a net inflow of approximately 500,000 undocumented immigrants per year in the 2000's, before the financial crisis and increases border security. In 2010, there were 11.2 million undocumented immigrants living in the US, 8 million of whom were in the labor force.

According to the Mexican Migration Project, the average cost of a border crossing has been at least $1,750 since the year 2000. For about a decade, half a million people revealed a willingness to pay an average of $1,750 for a chance to obtain illegal residence in the US. Some of them would have been willing to pay much more, especially given the fact that they were risking their lives in the crossing attempt. Other sources, such as Petros, report similar or larger costs for border crossings.

4.3 Data and Estimation

I use individual-level observations from the Mexican Migration Survey to find the distribution of salary increases experienced by undocumented immigrants. I keep observations where the person is currently in the US and is not legalized, the last wage in Mexico is known, and the last wage in the US is known. For each of those people, I multiply their US wage by 1.08, to reflect the effect of becoming a legal resident, and then find the difference in annual PPP-adjusted salary between the US and Mexico.

The most money that anyone would be willing to pay for US LPR is the net present value of a lifetime of the salary difference between the US and Mexico. Most people would be willing to pay less. I divide the annual flow of 500,000 undocumented immigrants into equal-sized income groups, one corresponding to each income observation from the survey. For each of these groups, I create a straight-line demand curve between two points: a price of the net present value of 45 years of salary differences, and a price of zero. I construct the total demand curve by horizontally summing the demand curves for each income group. See the Code Appendix for details.

4.4 Results and Conclusion

As with the Diversity Visa demand curve, I calculate the price and welfare at a reference quantity, as well as the revenue-maximizing quantity and the associated price and welfare. As there is no current policy of admitting this group of immigrants, I use a reference quantity of 50,000 for comparison to the Diversity Visa graphs and tables. See Table 4.1 and Figure 4.1.

The Welfare calculations in the table are the welfare gains of selling LPR to the specified number of people, relative to the current policy of keeping them out of the country. See Figure 4.2 for the estimate of the total annual welfare gain based on the quantity of immigration. I estimate that reducing immigration from historical levels to the current low net inflows caused a welfare loss of about $20 billion, in addition to the costs of enforcement.

The revenue-maximizing quantity of low-skilled workers to admit is 229,000, or about half the normal annual flow of undocumented immigrants during the 1990's and 2000's. At that quantity, with a combined discount rate and home

country growth rate of 20%, the price would be $46,000, revenues would be $10.16 billion, and total welfare gains would be $18.68 billion.

4.5 Tables

Table 4.1: Demand, DV, Mexicans without LPR

r	Reference: 50000			Revenue Maximization			
	Price (USD)	Revenue (USD Billions)	Welfare	Quantity	Price (USD)	Revenue (USD Billions)	Welfare
.05	306000	15.2	20.83	229000	143000	32.45	58.11
.06	268000	13.33	18.29	229000	126000	28.44	51.01
.07	238000	11.83	16.25	229000	112000	25.23	45.33
.08	214000	10.62	14.6	229000	100000	22.62	40.72
.09	194000	9.63	13.24	229000	91000	20.48	36.93
.1	178000	8.8	12.11	229000	83000	18.7	33.78
.11	164000	8.1	11.16	229000	77000	17.2	31.13
.12	152000	7.51	10.36	229000	71000	15.93	28.88
.13	142000	7	9.66	229000	66000	14.84	26.95
.14	133000	6.56	9.07	229000	62000	13.9	25.28
.15	125000	6.18	8.54	229000	59000	13.07	23.83
.16	119000	5.84	8.08	229000	56000	12.35	22.55
.17	113000	5.54	7.68	229000	53000	11.71	21.41
.18	107000	5.28	7.31	229000	50000	11.13	20.4
.19	103000	5.04	6.99	229000	48000	10.62	19.49
.2	98000	4.83	6.7	229000	46000	10.16	18.68
.21	94000	4.63	6.43	229000	44000	9.74	17.94
.22	91000	4.45	6.19	229000	43000	9.36	17.26
.23	88000	4.29	5.97	229000	41000	9.01	16.65
.24	85000	4.14	5.77	229000	40000	8.7	16.09
.25	82000	4.01	5.58	229000	38000	8.4	15.57

4.6 Figures

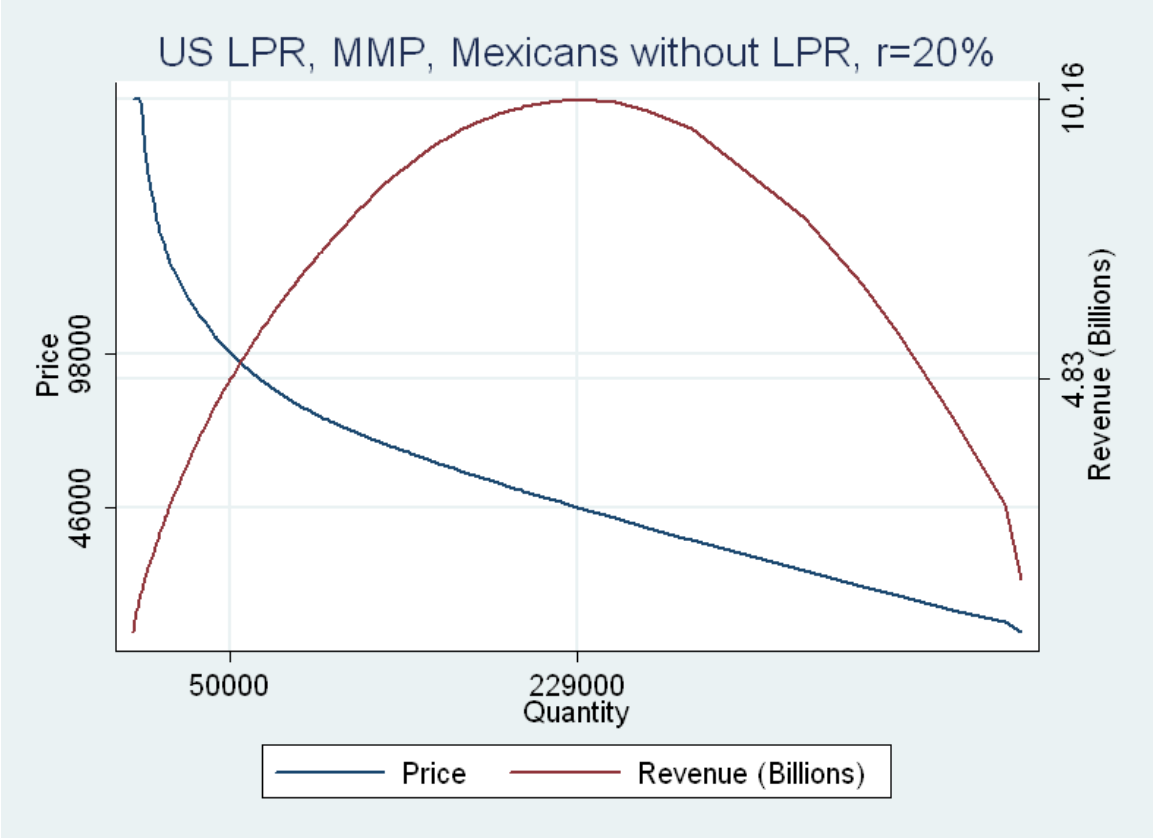

Figure 4.1: Demand and Revenue, Undocumented Flows

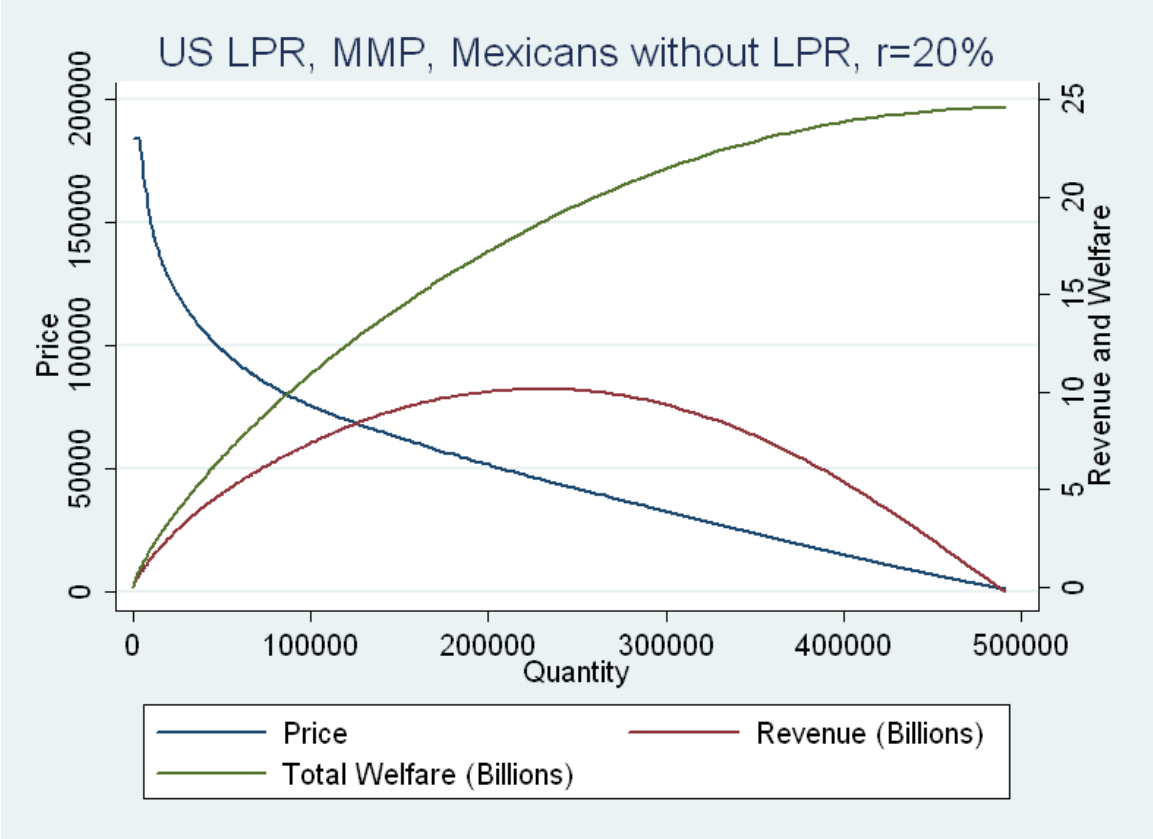

Figure 4.2: Welfare, Undocumented Flows

Chapter 5

Estimated Demand from Noncriminal Aliens Removed

5.1 Introduction

In 2010, over 860,000 aliens were deported from the United States. Many of the people who are deported would be willing and able to pay for Legal Permanent Residence. They have shown a willingness to leave their home countries and pay the costs required to move to the US.

When government officials find an illegal alien in or attempting to enter the US, the result is usually a deportation via a Return or a Removal. Returns are swift and voluntary, while Removals are compulsory and are the result of an Order of Removal issued by a DHS officer or immigration judge. Most Returns are of Mexicans apprehended while attempting to cross the border. Returns do not carry legal penalties, while Removals effectively prevent the alien from ever entering the US legally.

Many people who are Returned try to enter the US again, and eventually

succeed. In order to avoid double-counting the demand for US LPR, I focus on aliens who are Removed. Removals are classified as either Criminal or Non-Criminal. I assume that all of the aliens listed as Criminal would impose severe negative externalities on others and should not be admitted at any price.

This leaves 218,000 non-criminals who were Removed in 2010. This number is close to the average for the 2000's. In this chapter, I estimate the demand for US LPR from this group of people. I find how much money the government could earn by giving them a chance to purchase LPR before being deported.

5.2 Data and Estimation

For the annual quantities, I use Table 38 of the 2010 Yearbook of Immigration Statistics, showing Noncriminal Aliens Removed, by country of origin, in 2010. As with the DV estimation, I divide the people from each country equally into income quintiles. In each of these groups, maximum willingness to pay is based on the average earnings of that quintile, and the demand curve goes in a straight line to zero willingness to pay. I use the wage multipliers in Clemens et al. (2008).

5.3 Results and Conclusion

Because the revenue-maximizing quantity is close to 50,000, I report the price, quantity, and welfare at a reference quantity of 100,000 in Table 5.1 and Figure 5.1. With a combined discount rate and home country growth rate of 20%, selling LPR to 55,000 noncriminal aliens at the profit-maximizing price of $60,000 would generate $3.18 billion in revenue and increase total welfare by $7.73 billion.

The current policy is to admit nobody in this category, meaning that all of the potential welfare gains shown in Figure 5.2 are sacrificed. Dropping the price to $30,000 and selling LPR to 100,000 aliens would only decrease revenue by $0.35 billion while increasing total welfare by $1.93 billion, compared to profit maximization.

To the extent that aliens who are Returned do not eventually find their way to the US, these results underestimate the demand for LPR. To the extent that Removed aliens classified 'Criminal' are only guilty of minor crimes, and could be allowed to purchase LPR after paying fines, these results underestimate revenues and welfare gains from allowing aliens a chance to purchase LPR before being deported.

5.4 Tables

Table 5.1: Demand, Noncriminal Aliens Removed

	Reference: 100000			Revenue Maximization			
r	Price (USD)	Revenue (USD Billions)	Welfare	Quantity	Price (USD)	Revenue (USD Billions)	Welfare
.05	93000	9.16	30.06	55000	184000	10.1	24.17
.06	82000	8.02	26.39	55000	161000	8.85	21.22
.07	73000	7.11	23.45	55000	143000	7.85	18.85
.08	65000	6.37	21.06	55000	129000	7.04	16.92
.09	59000	5.76	19.1	55000	117000	6.38	15.34
.1	54000	5.25	17.47	55000	107000	5.83	14.04
.11	50000	4.83	16.1	55000	99000	5.36	12.94
.12	46000	4.47	14.94	55000	92000	4.97	12
.13	43000	4.16	13.94	55000	85000	4.63	11.2
.14	41000	3.89	13.08	55000	80000	4.34	10.51
.15	38000	3.66	12.32	55000	75000	4.08	9.9
.16	36000	3.45	11.66	55000	71000	3.86	9.37
.17	34000	3.27	11.07	55000	68000	3.66	8.9
.18	33000	3.1	10.55	55000	65000	3.48	8.44
.19	31000	2.96	10.08	55000	62000	3.32	8.06
.2	30000	2.83	9.66	55000	60000	3.18	7.73
.21	29000	2.71	9.28	55000	57000	3.05	7.42
.22	28000	2.6	8.93	55000	55000	2.93	7.14
.23	27000	2.5	8.61	55000	53000	2.82	6.89
.24	26000	2.41	8.32	55000	51000	2.73	6.65
.25	25000	2.33	8.05	55000	50000	2.63	6.44

5.5 Figures

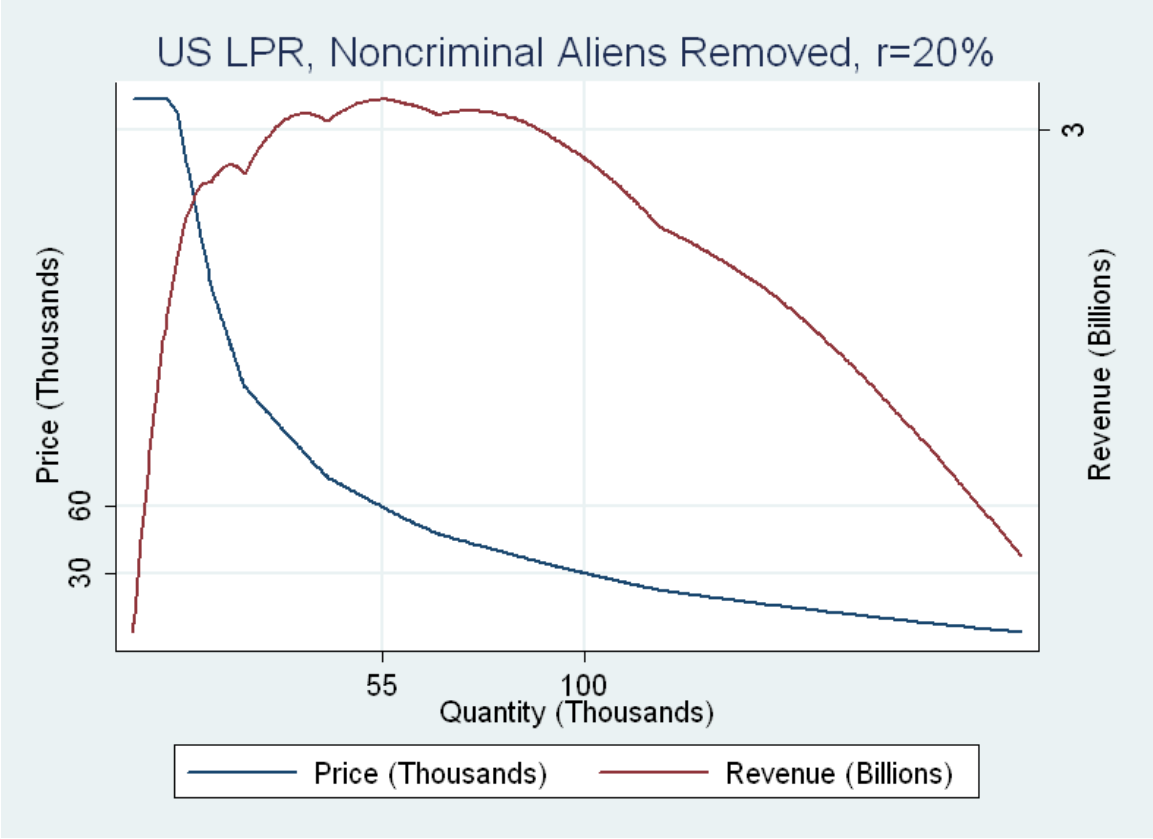

Figure 5.1: Demand and Revenue, Noncriminal Aliens Removed

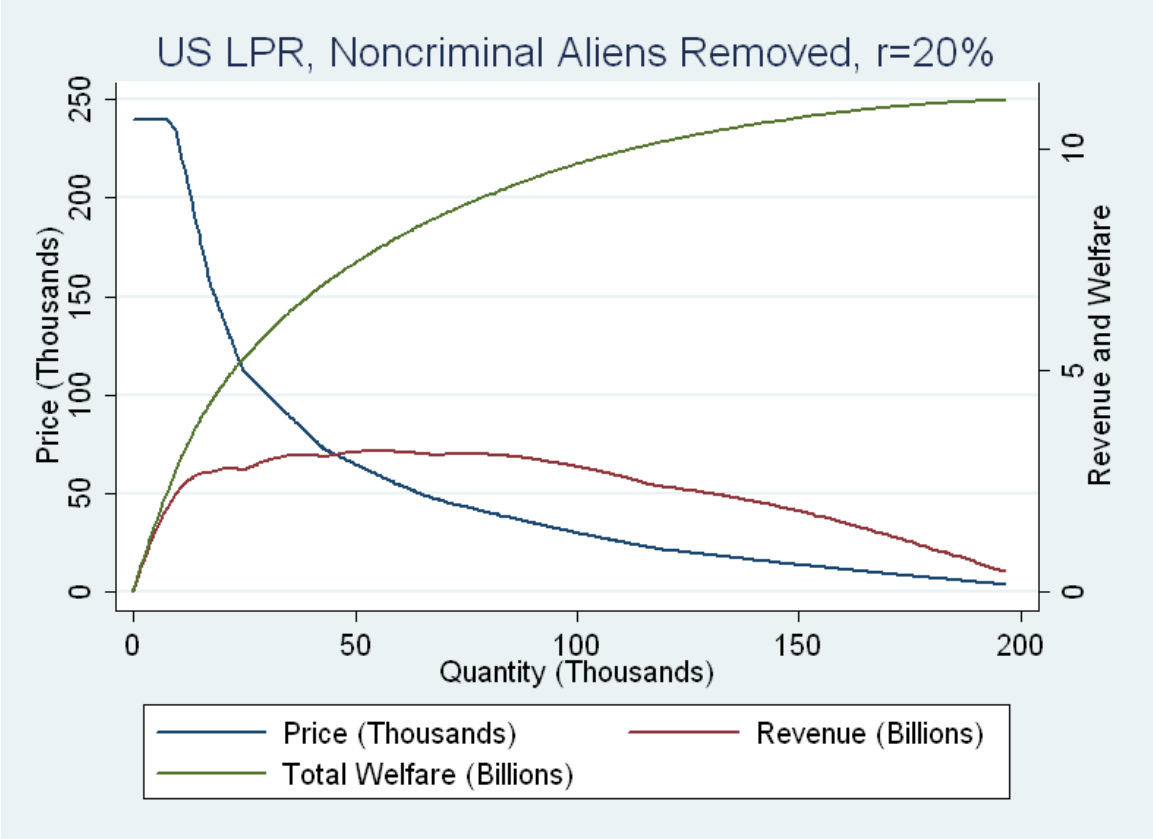

Figure 5.2: Welfare, Noncriminal Aliens Removed

Chapter 6

Family Reunification Visa Estimation

6.1 Introduction

Most of the people who obtain Legal Permanent Residence in the US get it through family connections. Over the past decade, about half of the LPR's are granted to immediate relatives of U.S. citizens and between a forth and a fifth are family-sponsored preferences.

People would be willing to pay to be reunited with relatives. If one spouse is in the United States and one is in another country, than the willingness to pay for the second spouse's LPR would be greater than that predicted by the wage difference alone.

However, if they are willing to pay to be together, then they suffer an equal loss when separated. The willingness of the first spouse to pay to move to the US, or remain in the US, will be reduced by the benefit that they gain from being together. Therefore, any extra amount that one spouse would pay to come to the US must also be subtracted from the amount that the other spouse would pay to come to the US, assuming that the benefit is symmetrical or that decisions are

made jointly.

The same is true of other forms of family ties. Any gain from being reunited with relatives will be mostly canceled by the loss from the first person moving in. If half of all new immigrants were coming for economic reasons and the other half were coming for family reasons, or if people migrate in groups, than the shape of the overall demand curve would not be much affected by the value people place on family connections.

People who gain LPR based on family connections typically find employment. While their average wages are lower than natives and immigrants who entered on employment-based visas, they usually earn higher wages than they would in their home countries. This means that the effect of increased wages will dominate their willingness-to-pay calculation.

The people who apply for LPR based on family ties have demonstrated that they will pay a positive price to move to the US. This means that family-based visa applications, like Diversity Visa applications, can be used as the quantity estimate of a demand curve. Most of them will earn a little less than the marginal immigrant who comes to the US for purely economic reasons. However, this earnings difference will be canceled by the fact that having family in the country lowers the moving and adjustment costs.

6.2 Literature

Hunt (2011) shows that immigrants who came into the US on a family-based visa earn about 20% less than immigrants who came in under a work visa, under most specifications. This is a fairly small difference, compared to the differences in wages between the home countries and the US. If people place a value

on family ties equal to 10% of their income, and people on employment visas are leaving family, then the willingness to pay of the two groups will be the same.

According to 110th Congress (2008), there were four million family-based immigrants waiting to be processed.

6.3 Data and Estimation

I collect information from USCIS reports on the annual flows of people given family visas, as well as the stocks of people waiting to be processed. The flows come from Table 10d of the Yearbook of Immigration Statistics. The backlogs are not published directly, but the length of the backlogs for various countries and visa categories are published regularly by the Office of Immigration Statistics.

I weight these backlog lengths by the amount of people entering in each category to find the average wait time for people in each country. For most countries, the average wait is 4.7 years, but the wait is longer for the Dominican Republic, Mexico, and the Philippines. I then multiply the time by the annual visa awards to people in that country to estimate the number of people waiting for a family visa.

I convert the backlog into an annual flow using the Pent-Up Demand model. The total expected annual equilibrium quantity, at a price of zero, is the annual quantity admitted on family visas, plus the number of people in the backlog multiplied by $\frac{L}{M}$.

As with the DV and Removals estimations, I divide the people from each country equally into income quintiles. In each of these groups, maximum willingness to pay is based on the average earnings of that quintile, and the demand curve goes in a straight line to zero willingness to pay. I use the wage multipliers

in Clemens et al. (2008).

6.4 Results and Conclusion

The current policy is to admit almost everyone in this category, rationing by willingness to queue. I calculate the price and welfare at a reference quantity of 50,000, as well as the revenue-maximizing quantity and the associated price and welfare. See Table 6.1 and Figure 6.1.

With a combined discount rate and home country growth rate of 20%, the revenue-maximizing quantity is 238,000, which would result in a price of $41,000 and revenues of $9.23 billion.

Current policy gives a total welfare gain of about $33.4 billion to 750,000 people, as shown in figure 6.2. Revenue-maximizing would reduce that welfare by $8.8 billion. However, as seen in previous sections, the welfare gains from admitting more people in other categories would more than outweigh these welfare losses.

6.5 Tables

Table 6.1: Demand, Family, CMP Multiplier

r	Reference: 50000			Revenue Maximization			
	Price (USD)	Revenue (USD Billions)	Welfare	Quantity	Price (USD)	Revenue (USD Billions)	Welfare
.05	425000	21.18	36.43	258000	121000	30.84	81.04
.06	373000	18.58	31.75	257000	106000	26.84	70.66
.07	329000	16.38	28.33	254000	95000	23.67	62.36
.08	296000	14.71	25.32	247000	87000	21.12	55.19
.09	268000	13.33	22.86	246000	79000	19.04	49.85
.1	242000	12.03	20.87	244000	73000	17.32	45.4
.11	223000	11.08	19.18	244000	67000	15.88	41.71
.12	207000	10.25	17.8	243000	62000	14.67	38.6
.13	193000	9.56	16.57	242000	58000	13.63	35.9
.14	180000	8.92	15.58	241000	55000	12.74	33.61
.15	170000	8.4	14.66	241000	51000	11.96	31.61
.16	161000	7.95	13.85	240000	49000	11.28	29.84
.17	153000	7.54	13.13	239000	46000	10.68	28.29
.18	145000	7.18	12.5	239000	44000	10.14	26.91
.19	138000	6.82	12.02	238000	42000	9.66	25.68
.2	132000	6.54	11.51	238000	41000	9.23	24.57
.21	127000	6.27	11.04	237000	39000	8.84	23.57
.22	122000	6.03	10.62	237000	38000	8.49	22.66
.23	118000	5.82	10.23	236000	36000	8.17	21.82
.24	114000	5.62	9.88	236000	35000	7.87	21.06
.25	110000	5.43	9.56	236000	34000	7.6	20.37

6.6 Figures

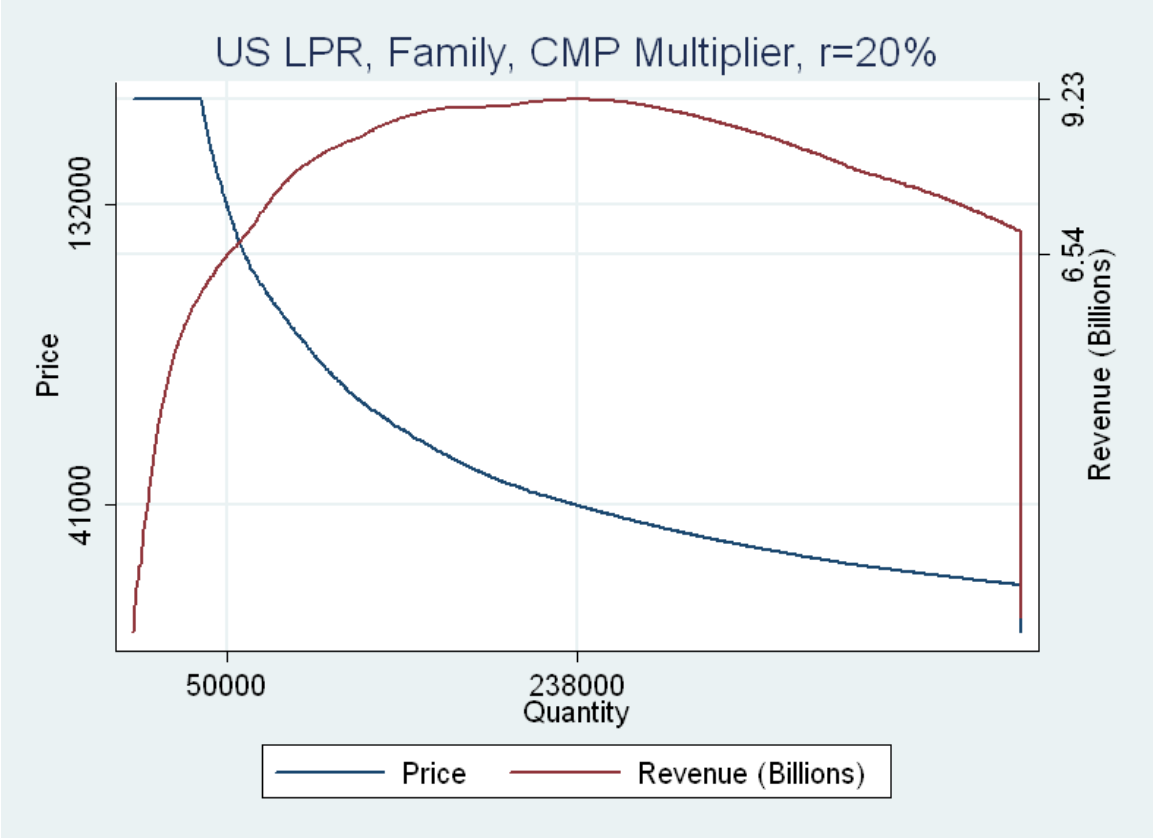

Figure 6.1: Demand and Revenue, Family

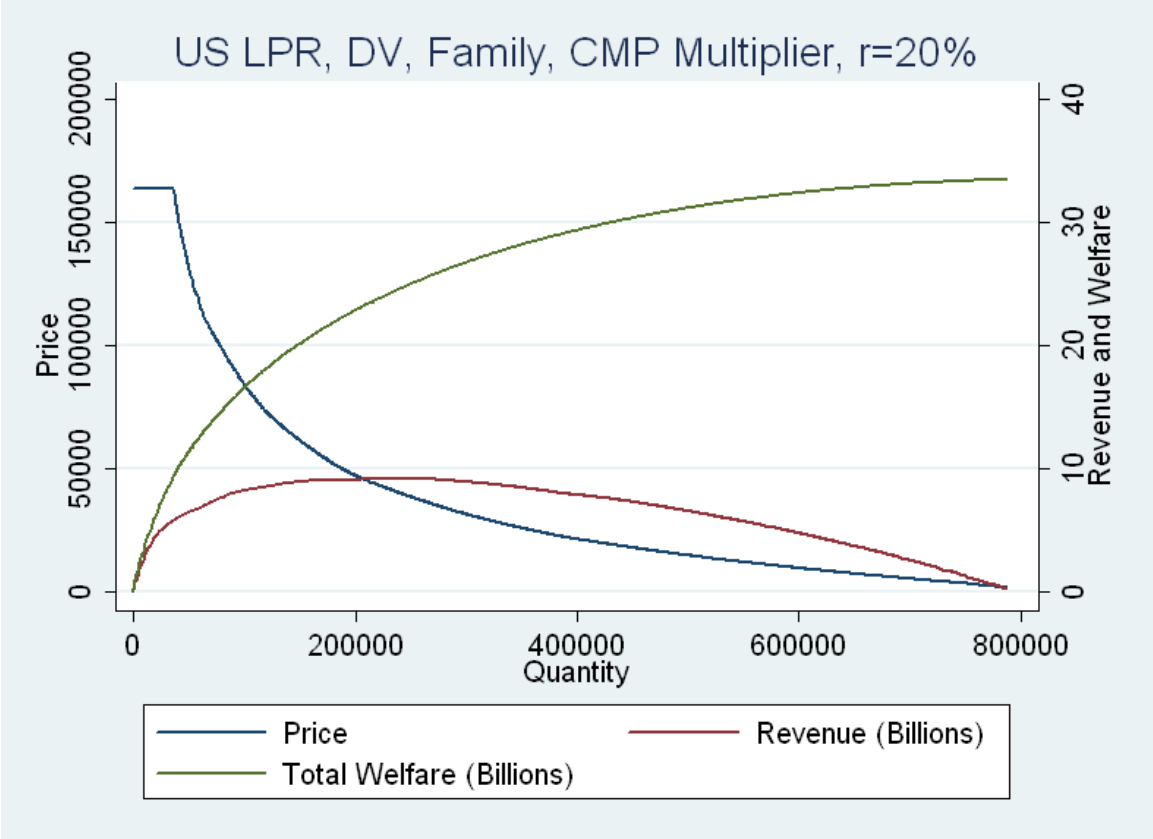

Figure 6.2: Welfare, Family

Chapter 7

Estimated Demand from Refugees and Asylees

7.1 Introduction

Many people seek to live in the US not because they see opportunity here, but because the conditions in their home countries are especially bad. US law gives Legal Permanent Residence who are fleeing persecution in their home countries, if they are approved by UISCIS staff, as described in Martin (2011). In 2009, over 177,000 former refugees and asylees were granted LPR status.

Refugees are people who apply for residence while in their home country. Asylees are people who apply after arriving in the US. People who fail to gain asylum are counted as Noncriminal Aliens Removed, so their demand has already been estimated. In 2010, the USCIS interviewed 95,000 refugee applicants and granted refugee status to 73,000 of them. The USCIS does not publish statistics on the number of people who apply for refugee status but do not get interviewed.

In this chapter, I estimate the demand curve of refugees and asylees for

US LPR. Kerwin (2012) shows that refugees have significantly worse employment prospects than other immigrants. To account for these lower wages and employment prospects, and to more accurately model the situation of refugees, I draw them from the bottom three income quintiles of the home country rather than splitting them among all five.

7.2 Data and Estimation

The number of refugees and asylees granted LPR, by country of origin, is given in table 10b of the Yearbook of Immigration Statistics. I multiply this number by 1.3, to include the number of people who are interviewed and declined. The quantity naturalized is split equally among the lowest three quintiles, with the highest wage being set to the average wage for that quintile. These low home country wages are multiplied by the CMP multipliers to find their US wages. Time working is set to 35 years, to account for the fact that refugees have a higher average age than economic migrants.

7.3 Results and Conclusion

I report the price, quantity, and welfare at a reference quantity of 100,000 in Table 7.1 and Figure 7.1, in addition to the profit-maximizing price and quantity. The revenue-maximizing price is $15,000, which could be afforded by 64,000 refugees for total revenues of $0.83 billion. If the price was dropped to $9,000, then about 100,000 people could afford it and revenues, after subtracting processing costs, would be $0.71 billion.

Welfare gains reported in the table are the gains, from increased income

only, experienced by refugees. Current policy generates a welfare gain of $2.63 billion from refugee income, not counting the considerable benefits of the refugees' improved quality of life. Profit-maximizing would not greatly reduce this income-based welfare, but it would keep over 100,000 refugees out of the country. See Figure 7.2 for the welfare estimation.

7.4 Tables

Table 7.1: Demand, Refugees and Asylees

	Reference: 100000			Revenue Maximization			
r	Price (USD)	Revenue (USD Billions)	Welfare	Quantity	Price (USD)	Revenue (USD Billions)	Welfare
.05	25000	2.36	6.61	70000	39000	2.6	5.65
.06	23000	2.1	5.91	69000	35000	2.32	5.02
.07	20000	1.87	5.33	69000	32000	2.08	4.52
.08	19000	1.68	4.84	67000	30000	1.88	4.04
.09	17000	1.53	4.43	67000	27000	1.71	3.7
.1	16000	1.39	4.08	67000	25000	1.56	3.4
.11	15000	1.28	3.78	66000	24000	1.44	3.13
.12	14000	1.18	3.52	66000	22000	1.33	2.92
.13	13000	1.09	3.3	66000	21000	1.24	2.73
.14	12000	1.02	3.1	66000	19000	1.16	2.57
.15	11000	.95	2.93	66000	18000	1.09	2.42
.16	11000	.89	2.77	65000	18000	1.03	2.29
.17	10000	.84	2.64	65000	17000	.97	2.17
.18	10000	.79	2.51	65000	16000	.92	2.07
.19	9000	.75	2.4	65000	15000	.87	1.98
.2	9000	.71	2.3	64000	15000	.83	1.89
.21	8000	.68	2.21	64000	14000	.8	1.81
.22	8000	.64	2.13	64000	14000	.76	1.74
.23	8000	.62	2.05	64000	13000	.73	1.68
.24	8000	.59	1.99	64000	13000	.7	1.62
.25	7000	.56	1.92	63000	12000	.68	1.56

7.5 Figures

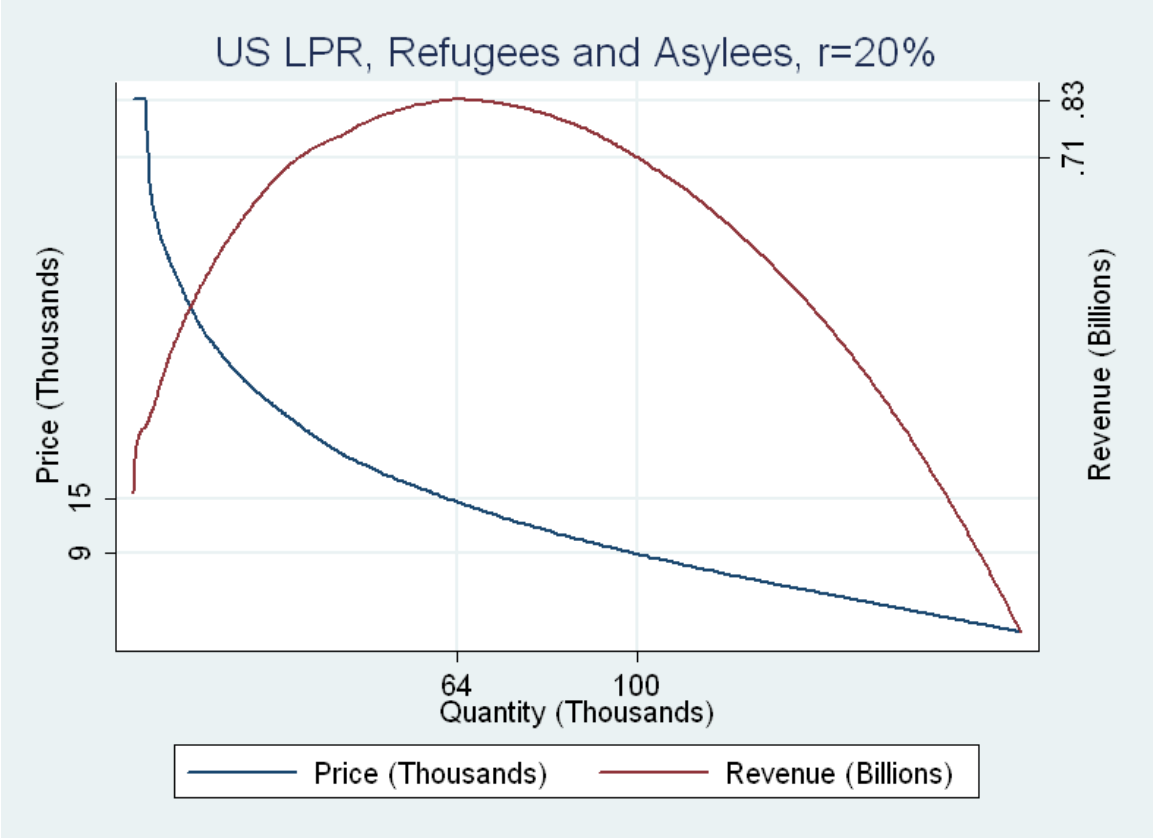

Figure 7.1: Demand and Revenue, Refugees and Asylees

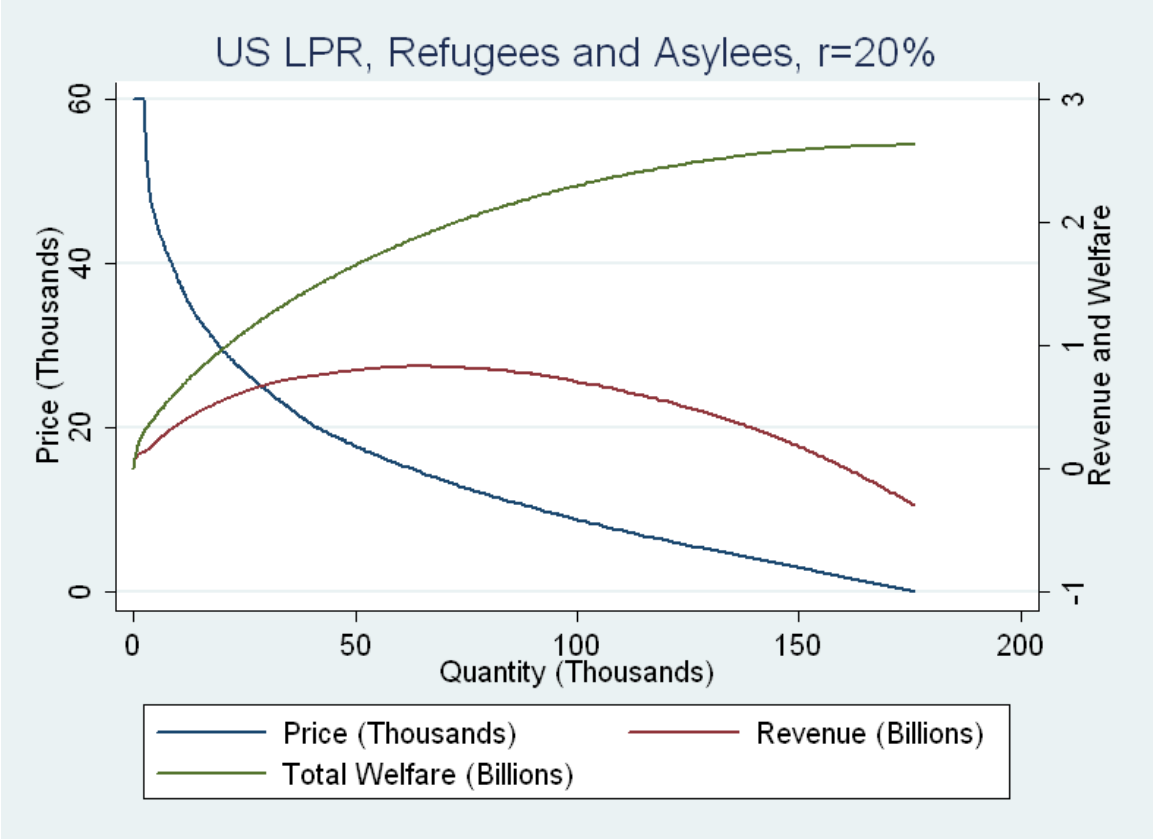

Figure 7.2: Welfare, Refugees and Asylees

Chapter 8

Summary Results and Conclusion

8.1 Investor Visas

Under the EB-5 Investor Visa program, investors are able to obtain LPR by making an investment of at least $500,000 in an economically disadvantaged area and proving that this investment generates at least ten jobs and meets other requirements. Thiele and Decker (2010) give an overview of the process. In practice, obtaining an EB-5 visa is difficult and risky. The USCIS explicitly says, "If it is determined that the investor's money is not truly at risk then the investor's petition may be denied."

According to quotes from immigration law offices, as described in Parnell et al. (2010), EB-5 investors must pay fees averaging $50,000 to law firms, investment advisors, and the USCIS. Investors are also subject to US taxes on all of their earnings. Even after paying all of this money, they are not guaranteed a visa. In the early years of the program, up to half of the petitions were denied.

Initially, only a few hundred investors took the risk of making the investment and applying. In recent years, after immigration law offices have learned

how to make the process more reliable, the numbers have risen to about $3,000.

When generating my final demand curve, I add a segment to represent the EB-5 investor demand. The line segment has a price-intercept of $100,000 and a quantity-intercept of 6,000. This matches the observed facts that at a price of $50,000, there was a quantity demanded of 3,000, with smaller demand at higher risk-adjusted prices.

8.2 Results

I add together all of the demand curves presented so far to estimate the revenues that USCIS could earn for the US government by replacing the entire immigration system with a Uniform Price Auction, and subjecting the winners to the same scrutiny as current Diversity Visa winners. See Tables 8.1 and 8.2 and Figure 8.1 for the results.

At the current level of one million naturalizations per year, with a combined discount rate and home country growth rate of 20%, the long-run equilibrium price would be $35,000 and revenues would be $33 billion after processing costs. The profit-maximizing quantity would be 845,000, resulting in a price of $42,000 and revenues of $34 billion. This extra billion in revenue would be obtained at a cost of $6 billion in social welfare from restricting the number of immigrants. See Figure 8.2 for the welfare estimates under the auction system.

8.3 Discussion and Conclusion

As discussed in the chapters on demand curves, this is a conservative estimate. The estimation procedure required me to make guesses and assumptions,

and I always made the ones that reduced the demand curve. The demand curve is almost certainly higher than what I have presented. I am confident that the opportunity cost of out current immigration system, in terms of lost revenues to the federal government, is at least $33 billion per year. The actual price, revenues, and welfare gains could be double or triple that amount.

The current system does not, in most cases, select for the people who earn the highest salaries. It also harms migrant welfare by excluding people who would earn higher salaries in the US. The largest inefficiencies are in border controls, the Diversity Visa Lottery, and Removals of Noncriminal Aliens. A revenue-maximixing auction of LPR to the the population of workers who have historically entered illegally would generate $10.2 billion in revenues and $8.5 billion in gains to the migrants. Changing the Diversity Visa Lottery to an auction, while keeping the number of visas the same, would give the government $5 billion in revenue annually, while increasing migrant welfare by $2.3 billion. Expanding the annual sales to the revenue-maximizing quantity generates $6.8 billion in revenue, and $8.5 billion in gains for the migrants. Giving non-criminal aliens the chance to purchase LPR for $30,000 before being deported would generate $2.8 billion in revenues and $6.8 billion in gains for the migrants.

If the government auctioned all green cards, at the current level of one million naturalizations per year, the price would be $35,000 and revenues would be $33 billion after processing costs. Migrant welfare would increase by $10.6 billion. The profit-maximizing quantity would be 845,000, resulting in a price of $42,000 and revenues of $34 billion. This extra billion in revenue would be obtained at a cost of $6.7 billion in lost migrant welfare.

Given that the annual numbers of immigrants admitted under an auction are very similar to current amounts, there should be no major external costs intro-

duced by this system. The composition of immigrants would likely change, with an auction system bringing in more high-skilled immigrants. This would almost certainly be good for the US, producing welfare gains that I have not specified.

My results say that annual immigration of half a percent of the US population could cause efficiency gains equal to half a percent of US GDP. These match the results of earlier studies presented in Clemens (2011), although my methodology is very different.

The choice of which immigration system to implement is extremely complex, and a full discussion of the issues is beyond the scope of this dissertation. There are reasons for keeping the current system and avoiding major changes in policy. The contribution of this dissertation is in showing that any system other than a price-based allocation system has an opportunity cost of at least $33 billion per year in lost government revenue and $10 billion in lost migrant welfare.

8.4 Tables

Table 8.1: Demand, Total Demand Curve

r	Current Capacity: 1e6			Revenue Maximization			
	Price (USD)	Revenue (USD Billions)	Welfare	Quantity	Price (USD)	Revenue (USD Billions)	Welfare
.05	117000	116	273	933000	126000	116	265
.06	102000	100	238	920000	111000	100	230
.07	89000	88	210	913000	98000	88	202
.08	79000	78	188	904000	88000	78	180
.09	72000	70	170	896000	80000	71	162
.1	65000	63	155	891000	74000	64	147
.11	60000	58	142	882000	68000	59	135
.12	55000	53	132	878000	63000	54	124
.13	51000	50	123	874000	59000	50	116
.14	48000	46	115	870000	56000	47	108
.15	45000	43	108	866000	52000	44	101
.16	42000	41	102	863000	50000	41	96
.17	40000	38	97	861000	47000	39	91
.18	38000	36	92	852000	45000	37	86
.19	36000	35	88	851000	43000	35	82
.2	35000	33	84	845000	42000	34	78
.21	33000	32	81	844000	40000	32	75
.22	32000	30	78	842000	39000	31	72
.23	31000	29	75	840000	37000	30	69
.24	30000	28	72	825000	37000	29	66
.25	29000	27	70	824000	35000	28	64

Table 8.2: Welfare, Total, Main Specification

		Current Capacity: 1e6			Revenue Maximization		
r	Current Welfare	Auction Welfare	Auction Revenue	Migrant Gain	Welfare	Revenue	Migrant Gain
.05	124.36	273.33	115.52	33.45	265.03	115.75	24.92
.06	109.37	238.21	99.82	29.02	229.67	100.29	20.01
.07	97.34	210.4	87.69	25.37	202.19	88.12	16.74
.08	87.56	188.06	77.75	22.75	179.99	78.41	14.02
.09	79.52	169.85	70.13	20.21	161.93	70.53	11.89
.1	72.81	155.01	63.46	18.73	147.24	64.04	10.39
.11	67.17	142.34	57.94	17.23	134.69	58.63	8.89
.12	62.37	131.67	53.35	15.95	124.43	54.07	7.99
.13	58.25	122.58	49.51	14.82	115.61	50.19	7.18
.14	54.68	114.78	46.11	13.99	108.02	46.85	6.5
.15	51.56	107.98	43.15	13.27	101.47	43.95	5.97
.16	48.81	102.09	40.61	12.67	95.72	41.41	5.5
.17	46.38	96.84	38.39	12.07	90.71	39.17	5.17
.18	44.21	92.09	36.49	11.39	85.93	37.19	4.54
.19	42.26	87.93	34.69	10.99	81.98	35.42	4.31
.2	40.5	84.19	33.08	10.6	78.26	33.82	3.93
.21	38.91	80.9	31.62	10.36	75.07	32.38	3.77
.22	37.47	77.77	30.37	9.93	72.13	31.08	3.58
.23	36.14	74.92	29.23	9.55	69.45	29.89	3.41
.24	34.93	72.32	28.18	9.21	66.49	28.8	2.76
.25	33.81	69.96	27.06	9.09	64.29	27.81	2.67

8.5 Figures

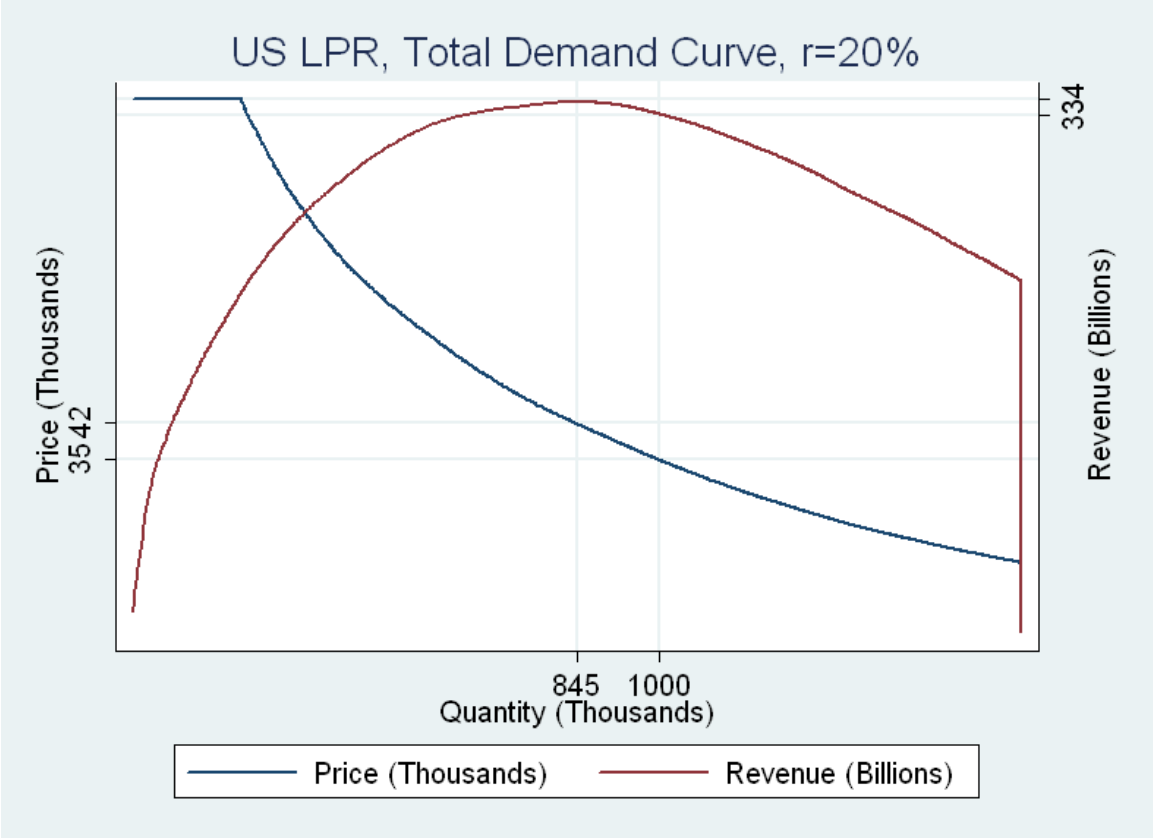

Figure 8.1: Demand and Revenue, Total Demand Curve

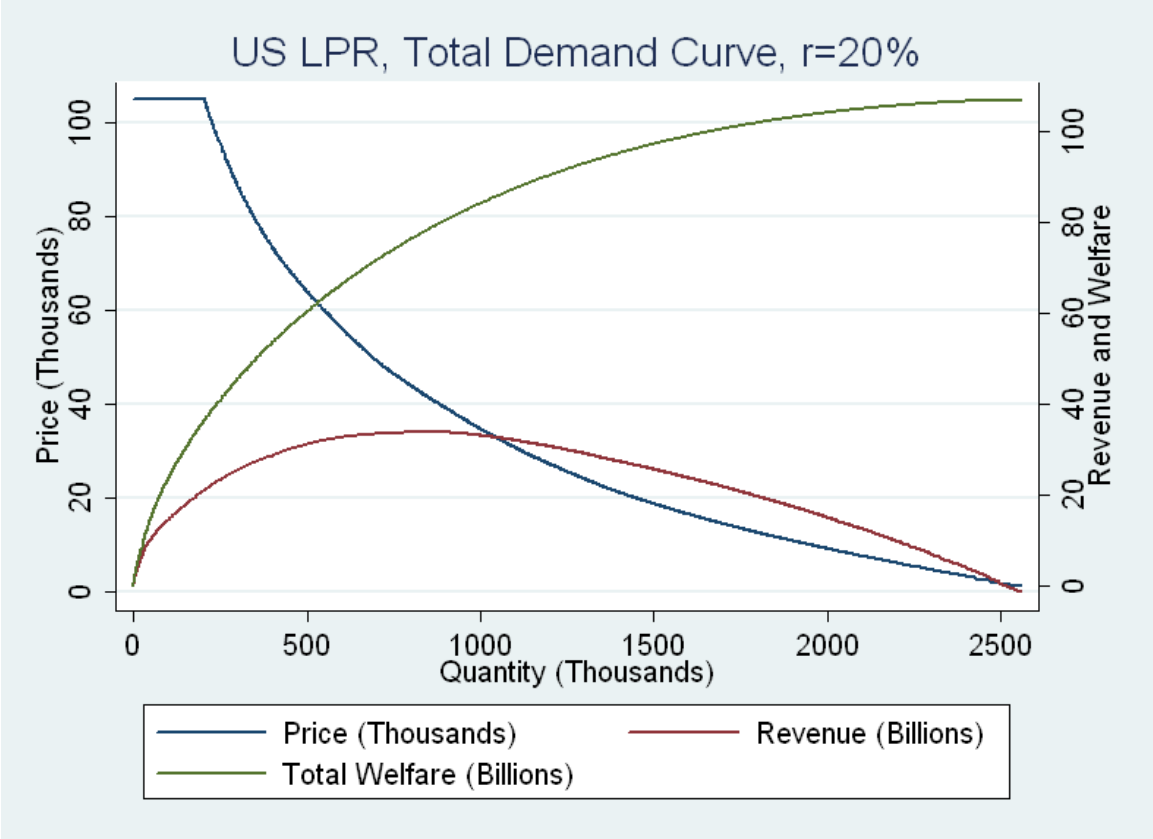

Figure 8.2: Welfare, Total Demand Curve

Appendices

Appendix A Code Appendix

```
*The input file has, for each country, the number of DV
*applicants (quantity), income multipliers from several
*sources, and data on income distributions.

use "\dcurve8.dta", clear

*choose the variable name of the income multiplier to use

local mult "cmpmult"

*Describe the multiplier

local multdesc "CMP Wage Mult Only"

*Choose a graph to generate (set larger than .3 for no graph)

local rgraph .20
local rg = `rgraph'*100

*set the number of years working (omega in the paper)

local T 45

*Set the number that will be admitted annually
```

```
local N 50000

*Define the cost of processing an immigrant

local marginalcost 1730

*Generate the expected salary boost for each income quintile

replace asb_1st_20 = (‘mult’-1)*bestGDP* lowest20 / 20
replace asb_2nd_20 = (‘mult’-1)*bestGDP* second20 / 20
replace asb_3rd_20 = (‘mult’-1)*bestGDP* third20 / 20
replace asb_4th_20 = (‘mult’-1)*bestGDP* fourth20 / 20
replace asb_5th_20 = (‘mult’-1)*bestGDP* top20 / 20

*reduce the data to individual demand curve segments

keep wbcode quantity asb_1st_20 asb_2nd_20 asb_3rd_20
  asb_4th_20 asb_5th_20
reshape long asb, i( wbcode ) j( quintile ) string
replace quantity = quantity/5
drop if asb==.
drop if asb<=0

*start generating the output tables
```

```
file open rates using rates_‘mult’.txt, write append
file write rates "‘mult’ : ‘multdesc’ : " _n
file write rates "See Table \ref{table-‘mult’}." _n
file write rates "See Figure \ref{figure-‘mult’-‘rg’}." _n

*LaTeX table formatting

[Deleted]

*loop over a range of discount rates

forval r = .05 (.01) .26 {

*These variables are used for summation

local totalslope 0
local qchange 0
local qsum 0
local wchange 0
local welfaresum 0

*These variables are for defining the results

local capacityprice 0
local capacityrev 0
local capacitywelfare 0
```

```
local idealqty 0
local idealprice 0
local idealrev 0
local idealwelfare 0

*generate discount factor

local B 1/(1+‘r’)

*Calculate maximum willingness to pay for a
*lifetime of increased wages

generate float maxwtp = asb*(1-‘B’^‘T’)/(1-‘B’)

*Calculate expected equilibrium quantity

generate float annualquantity = quantity*
  (1-‘B’^‘T’)/(‘T’-(‘B’-‘B’^(‘T’+1))/(1-‘B’))

*The horizontal summation process starts here

gsort -maxwtp

generate float slope = - annualquantity / maxwtp
generate float totalquantity = .
```

```
generate float totalwelfare = .

*Loop to generate the worldwide demand curve

forval c = 1/‘=_N’ {
 quietly replace totalquantity = ‘qsum’ in ‘c’
 quietly replace totalwelfare = ‘welfaresum’ in ‘c’
 local totalslope = ‘totalslope’ + slope[‘c’]
 local qchange = ‘totalslope’ * ( maxwtp[‘c’] - maxwtp[‘c’+1] )
 local qsum = ‘qsum’ - ‘qchange’
 local wchange = ‘qchange’ * ( maxwtp[‘c’+1] + maxwtp[‘c’] ) / -2
 local welfaresum = ‘welfaresum’ + ‘wchange’

*if at the capacity, record price and welfare

 if (‘capacityprice’ == 0 & ‘qsum’ > ‘N’) {
local capacityprice = maxwtp[‘c’]
local capacitywelfare = ‘welfaresum’
}
}

local capacityrev = (‘capacityprice’ - ‘marginalcost’)  * ‘N’

generate float revenue = (maxwtp - ‘marginalcost’) * totalquantity

*Find the revenue-maximizing quantity and record values
```

```
gsort -revenue
local idealqty = totalquantity[1]
local idealprice = maxwtp[1]
local idealrev = revenue[1]
local idealwelfare = totalwelfare[1]

gsort -maxwtp

*Round numbers and divide for presentation

local capacityprice = round(‘capacityprice’, 1000)
local capacityrev = round(‘capacityrev’, 1e7)/1e9
local capacitywelfare = round(‘capacitywelfare’, 1e7)/1e9

local idealrev = round(‘idealrev’, 1e7)/1e9
local idealqty = round(‘idealqty’, 1000)
local idealprice = round(‘idealprice’, 1000)
local idealwelfare = round(‘idealwelfare’, 1e7)/1e9

*generate the line in the output table

file write rates (‘r’) " & " (‘capacityprice’) " & "
file write rates (‘capacityrev’) " & " (‘capacitywelfare’) " & "
file write rates (‘idealqty’) " & " (‘idealprice’) " & "
file write rates (‘idealrev’) " & " (‘idealwelfare’) " \\" _n
```

```
*Generate a graph for the specified rate

if ‘r’ == ‘rgraph’{

*Define graph boundaries for better presentation

local graphmaxq ‘idealqty’*2
local graphmaxp ‘idealprice’*4

generate float totalquantityg = totalquantity
generate float maxwtpg = maxwtp
generate float revenueg = revenue/1e9

replace totalquantityg=‘graphmaxq’ if (totalquantityg>‘graphmaxq’)
replace maxwtpg=‘graphmaxp’ if (maxwtpg>‘graphmaxp’)

label variable maxwtpg "Price"
label variable revenueg "Revenue (Billions)"

local title "US LPR, DV, ‘multdesc’, r=‘rg’%"

*Generate and save the graph.

twoway (line maxwtpg totalquantityg)
  (line revenueg totalquantityg, yaxis(2)),
```

```
  xlabel(‘N’ ‘idealqty’, ticks grid )
  ylabel(‘capacityprice’ ‘idealprice’, ticks grid)
  ylabel(‘capacityrev’ ‘idealrev’, grid axis(2))
  xtitle(Quantity) title("‘title’")
graph export "Demand_‘mult’_‘rg’.png", replace

}

*clear all new variables to start over

keep wbcode quintile asb quantity

}

*More LaTex Table formatting

[Deleted]

*Generate the code to add the figure to the document

[Deleted]

file close rates
```

Appendix B Data Appendix

Cohen, Joseph N. (2010) "WDI/GDF Data Conversion to Country-Year Format for Stata", accessed Feb 6, 2011 at
http://josephncohen.com/?p=974

The Conference Board, "Total Economy Database", accessed Feb 7, 2011 at
http://sites.google.com/site/md4stata/linked/total-economy-database

Daniel Kaufmann, Aart Kraay and Massimo Mastruzzi (2009). "Governance Matters VIII: Governance Indicators for 1996-2008". World Bank Policy Research June 2009, accessed Feb 7, 2011 at
http://sites.google.com/site/md4stata/linked/aggregat-governance-indicators

Gallup, Inc. "700 Million Worldwide Desire to Migrate Permanently",
http://www.gallup.com/poll/124028/700-Million-Worldwide-Desire-Migrate-Permanently.aspx

Lee, James (2010) "U.S. Naturalizations: 2010"
http://www.dhs.gov/xlibrary/assets/statistics/publications/natz_fr_2010.pdf

Mexican Migration Project, Person Level Data
http://mmp.opr.princeton.edu/

Monger, Randall and Yankay, James (2010) "U.S. Legal Permanent Residents: 2010"
http://www.dhs.gov/xlibrary/assets/statistics/publications/lpr_fr_2010.pdf

USCIS, Office of Immigration Statistics. "2009 Yearbook of Immigration Statistics Table 10d".
www.dhs.gov/xlibrary/assets/statistics/yearbook/2009/table10d.xls

USCIS, Office of Immigration Statistics. "December 2010 Visa Bulletin".
http://www.travel.state.gov/visa/bulletin/bulletin_5197.html

U.S. Department of State. “Diversity Visa Lottery 2010 (DV-2010) Results”. accessed Feb 5, 2011 at
http://travel.state.gov/visa/immigrants/types/types_4574.html

U.S. Department of State. “Diversity Visa Lottery 2009 (DV-2009) Results”. accessed Feb 5, 2011 at
http://travel.state.gov/visa/immigrants/types/types_4317.html

U.S. Department of State. “Diversity Visa Lottery 2008 (DV-2008) Results”. accessed Feb 5, 2011 at
http://travel.state.gov/visa/immigrants/types/types_1317.html

U.S. Department of State. “Total Number of DV Lottery Applicants by Country”. accessed Feb 4, 2011 at
http://www.travel.state.gov/pdf/TotalDVApplicantsbyCountry.pdf

U.S. Department of State. “Total Number of DV Lottery Applicants by Country”. accessed Feb 4, 2011 at

World Bank (2010) World Development Indicators. Online data base at: data.worldbank.org. Accessed November 7, 2010.

World Bank (2010) Global Development Finance. Online data base at: data.worldbank.org. Accessed November 7, 2010.

Bibliography

110th Congress. Hearing on wasted visas, growing backlogs. Report, Subcommittee on Immigration, April 2008. URL http://judiciary.house.gov/hearings/printers/110th/42118.PDF.

Catalina Amuedo-Dorantes and Susan Pozo. Remittances as insurance: Evidence from mexican immigrants. *Journal of Population Economics*, 19(2):pp. 227–254, 2006. ISSN 09331433. URL http://www.jstor.org/stable/20008008.

Gary Becker. The challenge of immigration: A radical solution. 2010. URL http://www.iea.org.uk/multimedia/video/annual-hayek-memorial-lecture-2010-prof-gary-becker.

Steven Berry, James Levinsohn, and Ariel Pakes. Automobile prices in market equilibrium. *Econometrica*, 63(4):pp. 841–890, 1995. ISSN 00129682. URL http://www.jstor.org/stable/2171802.

Steven T. Berry. Estimating discrete-choice models of product differentiation. *The RAND Journal of Economics*, 25(2):pp. 242–262, 1994. ISSN 07416261. URL http://www.jstor.org/stable/2555829.

George J. Borjas. Self-selection and the earnings of immigrants. *The American Economic Review*, 77(4):pp. 531–553, 1987. ISSN 00028282. URL http://www.jstor.org/stable/1814529.

G.J. Borjas and National Bureau of Economic Research. *Mexican immigration to the United States*. Conference report. University of Chicago Press, 2007. ISBN 9780226066325. URL http://books.google.com/books?id=_iONl31AMQYC.

Gary Burtless and Audrey Singer. The Earnings and Social Security Contributions of Documented and Undocumented Mexican Immigrants. Working paper series, 2010.

B.R. Chiswick. *The gateway: US immigration issues and policies*. American Enterprise Institute Press, 1982. ISBN 0844722219.

Michael A. Clemens. The roots of global wage gaps: Evidence from randomized processing of us visas. *Center for Global Development Working Paper Series*, 2010. URL http://cgdev.org/files/1424188_file_Clemens_wage_gaps.pdf.

Michael A. Clemens. Economics and emigration: Trillion-dollar bills on the sidewalk? *Journal of Economic Perspectives*, 25(3):83–106, 2011. doi: 10.1257/jep.25.3.83. URL http://www.aeaweb.org/articles.php?doi=10.1257/jep.25.3.83.

Michael A. Clemens, Claudio E. Montenegro, and Lant Pritchett. The Place Premium: Wage Differences for Identical Workers Across the US Border. *SSRN eLibrary*, 2008. URL http://ssrn.com/paper=1233047.

R. H. Coase. Durability and monopoly. *Journal of Law and Economics*, 15(1):pp. 143–149, 1972. ISSN 00222186. URL http://www.jstor.org/stable/725018.

Richard B. Freeman. People flows in globalization. Working Paper 12315, National Bureau of Economic Research, June 2006. URL http://www.nber.org/papers/w12315.

Jeffrey Grogger and Gordon H. Hanson. Income maximization and the selection and sorting of international migrants. *Journal of Development Economics*, 95(1): 42 – 57, 2011. ISSN 0304-3878. doi: 10.1016/j.jdeveco.2010.06.003. URL http://www.sciencedirect.com/science/article/pii/S0304387810000647.

Matthew Hall, Emily Greenman, and George Farkas. Legal status and wage disparities for mexican immigrants. *Social Forces*, 89(2):491–513, 2010. doi: 10.1353/sof.2010.0082. URL http://sf.oxfordjournals.org/content/89/2/491.abstract.

Michael Hoefer, Nancy Rytina, and Bryan Baker. Estimates of the unauthorized immigrant population residing in the united states. Report, Department of Homeland Security, January 2011. URL http://www.dhs.gov/xlibrary/assets/statistics/publications/ois_ill_pe_2011.pdf.

Jennifer Hunt. Which immigrants are most innovative and entrepreneurial? distinctions by entry visa. *Journal of Labor Economics*, 29(3):pp. 417–457, 2011. ISSN 0734306X. URL http://www.jstor.org/stable/10.1086/659409.

Curtis J. Simon John T. Warner, Saul Pleeter. The virtues of patience: Saving, financial well being, and awareness. forthcoming. URL http://people.clemson.edu/~cjsmn/working%20papers/WPS_PDR_Saving_May_23_2011.pdf.

Donald Kerwin. The faltering us refugee protection system: Legal and policy responses to refugees, asylum-seekers, and others in need of protection. *Refugee Survey Quarterly*, 31(1):1–33, 2012. doi: 10.1093/rsq/hdr019. URL http://rsq.oxfordjournals.org/content/31/1/1.abstract.

V. Krishna. *Auction theory*. Academic Press, 2008. ISBN 9780124262973. URL http://books.google.com/books?id=JxjBjwEACAAJ.

Magnus Lofstrom and Joseph J. Hayes. H-1bs: How do they stack up to us born workers? *SSRN eLibrary*, 2012. URL http://ssrn.com/paper=1981215.

Daniel C. Martin. Refugees and asylees: 2010. Report, Office of Immigration Statistics, May 2011. URL http://www.dhs.gov/xlibrary/assets/statistics/publications/ois_rfa_fr_2010.pdf.

P.R. Milgrom. *Putting auction theory to work*. Churchill lectures in economics. Cambridge University Press, 2004. ISBN 9780521536721. URL http://books.google.com/books?id=AkeHTU7XW4kC.

Sunil Mithas and Henry C. Lucas. Are foreign it workers cheaper? u.s. visa policies and compensation of information technology professionals. *Manage. Sci.*, 56:745–765, May 2010. ISSN 0025-1909. doi: http://dx.doi.org/10.1287/mnsc.1100.1149. URL http://dx.doi.org/10.1287/mnsc.1100.1149.

J.B. Muaddi. Alienable Elements of Citizenship: Can Market Reasoning Help Solve America's Immigration Puzzle, The. *Emory LJ*, 56:229, 2006.

Sankar Mukhopadhyay and David Oxborrow. The value of an employment based green card. *Working Paper*, 2012.

Aviv Nevo. A practitioner's guide to estimation of random-coefficients logit models of demand. *Journal of Economics and Management Strategy*, 9(4):513–548, 2000. ISSN 1530-9134. doi: 10.1111/j.1430-9134.2000.00513.x. URL http://dx.doi.org/10.1111/j.1430-9134.2000.00513.x.

S. Parnell, A. Bartlett, and A. Olson. *Green Card Via the Red Carpet: A Comprehensive Guide to Immigrating to the U.S. by Investing in an EB-5 Regional Center*. Createspace, 2010. ISBN 9781439260715. URL http://books.google.com/books?id=llY8sIhchdkC.

Jeffrey Passel and D'Vera Cohn. Unauthorized immigrant population: National and state trends, 2010. Report, Pew Hispanic Center, February 2011. URL http://www.pewhispanic.org/files/reports/133.pdf.

Melanie Petros. The costs of human smuggling and trafficking. *Global Migration Perspectives*, (31). URL http://www.gcim.org/attachements/GMP%20No%2031.pdf.

Eric B. Rasmusen. The Blp Method of Demand Curve Estimation in Industrial Organization. *Kelley School of Business, Department of Business Economics and Public Policy Working Papers*, 2006.

Mariano Sana. Growth of migrant remittances from the united states to mexico, 1990-2004. *Social Forces*, 86(3):995 – 1025, 2008. ISSN 00377732.

J.L. Simon. *The economic consequences of immigration*. Univ of Michigan Pr, 1999. ISBN 0472086162.

Larry A. Sjaastad. The costs and returns of human migration. *Journal of Political Economy*, 70(5):pp. 80–93, 1962. ISSN 00223808. URL http://www.jstor.org/stable/1829105.

Nancy L. Stokey. Rational expectations and durable goods pricing. *The Bell Journal of Economics*, 12(1):pp. 112–128, 1981. ISSN 0361915X. URL http://www.jstor.org/stable/3003511.

Leslie K. L. Thiele and Scott T. Decker. Residence in the united states through investment: Reality or chimera? 2010. URL http://www.albanygovernmentlawreview.org/files/Thiele.pdf.

Hendrik Van den Berg and Orn B. Bodvarsson. Immigration policy in the united states. In *The Economics of Immigration*, pages 349–377. Springer Berlin Heidelberg, 2009. ISBN 978-3-540-77796-0. URL http://www.springerlink.com/content/mn0m82767u100008/.

John T. Warner and Saul Pleeter. The personal discount rate: Evidence from military downsizing programs. *The American Economic Review*, 91(1):pp. 33–53, 2001. ISSN 00028282. URL http://www.jstor.org/stable/2677897.

Ruth Ellen Wasem. Diversity immigrant visa lottery issues. 2011. URL http://www.fas.org/sgp/crs/misc/R41747.pdf.

Jeffrey G. Williamson. The evolution of global labor markets since 1830: Background evidence and hypotheses. *Explorations in Economic History*, 32 (2):141 – 196, 1995. ISSN 0014-4983. doi: DOI:10.1006/exeh.1995.1006. URL http://www.sciencedirect.com/science/article/B6WFJ-45PMMC9-19/2/1e1a0af2d212937976cdb53b2477a8b5.

Jeffrey G. Williamson. Globalization, convergence, and history. *The Journal of Economic History*, 56(2):pp. 277–306, 1996. ISSN 00220507. URL http://www.jstor.org/stable/2123967.