ESSAYS ON DEVELOPMENT AND REGIONAL ECONOMICS

by

ABHINAV ALAKSHENDRA

B.A., Pune University, 2003
M.A., Gokhale Institute of Politics and Economics, 2005

AN ABSTRACT OF A DISSERTATION

submitted in partial fulfillment of the requirements for the degree

DOCTOR OF PHILOSOPHY

Department of Economics
College of Arts and Sciences

KANSAS STATE UNIVERSITY
Manhattan, Kansas

2012

Abstract

The dissertation includes three essays on development and regional economics.

Son preference prevails among Indian couples. I test the hypothesis that women who bear sons experience an elevated status within the household, which translates into their increased role in decision-making. The first essay empirically examines the issue. Using data from the Indian Human Development Survey, I find that women who have given birth to at least one son show greater participation in the household's financial decisions as well as other decisions in a household. Presence of a senior member in the household, however, reduces the women's relative household bargaining strength.

The second essay examines the wage differentials of natives, naturalized citizens, and immigrants on the basis of gender, and for the latter two categories, on the basis of region of origin. This paper argues that the assimilation effect for naturalized citizens should be stronger than that for immigrants since a naturalized citizen, on an average, spends more than 15 years in the country, much higher than immigrants. I find that immigrants experience higher increase in wages than naturalized citizens with longer stay in the United States. The essay concludes that this trend in wages cannot be explained by the assimilation argument alone. We also report that naturalized citizens command higher returns to higher education than immigrants.

The third essay explores issues in regional economics. Kansas has the third largest public highway miles and one of the highest miles per person in the country. Due to declining rural population, counties lack the required tax base and fiscal health to support their large ailing rural road infrastructure. The average farm size is increasing and so is the size of vehicles using the rural roads. This paper suggests removing some rural low volume roads from the county road

network as one option. I study three Kansas counties to analyze the cost-benefit of reducing low volume road miles. I find that rural counties will be able to save money by closing some low volume roads.

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Acknowledgements

I would like to express my gratitude to my major advisors, Dr. Dong Li and Dr. Wayne Nafziger for their help, support, and guidance throughout my graduate school experience. This dissertation could not have been written without their encouragement and continuous support. I would like to specially thank Dr. Nafziger for showing confidence in me since the very start of my graduate school career and for giving me a chance to update his excellent book. I also learned a lot from our regular discussions on the international development topics. To Dr. Li, I would also like to express special thanks for being such an amazing mentor, for making me a better researcher, for contributing comments that were always helpful and crucial for my dissertation, and for constantly being so supportive and encouraging during the painful and sustained process of my job search. I hope that one day I would become as good an advisor to my students as he has been to me. To Dr. Michael W. Babcock, I would like to express my heartfelt thanks for giving me the opportunity to work with him on the KDOT project, for relentlessly challenging me until I delivered, for facilitating my first publication in graduate school, and for making those frequent road trips to rural counties really fun and memorable. Dr. Florence Neymotin deserves my special thanks for the many discussions and inputs I gained during and after her labor economics classes, which, in fact, evoked my interest in labor economics. I also wish to thank Dr. Tian Xia for his comments, and I believe incorporating those made the final product much better. I wish to express my sincerest gratitude to all my teachers and other faculty members at the department for being so approachable and extremely helpful. I owe a special thanks to Crystal Strauss and Susan Koch for their constant willingness to help. The economics office was always welcoming because of them.

My colleagues in the department made this journey enjoyable and fulfilling. Thanks are due to Bebonchu for being an awesome friend, and to Vladimir, Patrick and Fahad for making our office a fun place to be. Finally, a big thanks to all my department colleagues, Chris, Laura, Rashmi, Aditi, Nabaneeta, and Mark for their support and friendship, and to Shane and Bhavneet for being great friends, guides, and keen listeners.

During my dissertation, I have made some fantastic friends who deserve special mention, particularly Santanu and Jhinuk, for offering unending support, love, and friendship, and for being second parents to Kaayana. I would also like to thank my friends, Kalpana, Jasdeep, Sandeep, Romil, Avinash Singh, Preeti Singh, Jose, Avinash, Pritha, Harish, and Samantha. My gratitude also goes out to Dr. Rupayan Pal for being an excellent teacher and a great friend. My thanks are due to Devendra for his support and friendship.

Last but not the least, I especially want to thank my immediate and extended family for their unflagging love and support. This dissertation would have been simply impossible without them. I am indebted to my father and mother for their love and constant inspiration. No words can express my gratitude to them for providing me the best throughout my life. I am grateful to my father-in-law and mother-in-law for standing beside me and believing in me. My hearty thanks are due to my siblings Anumedha and Anurag, who were always there for me with their constant support and love. I also express my thanks to Abhishek Vats. Finally, I would like to thank my wife Uma and my daughter Kaayana for their untiring love, support, and understanding. They were always there to cheer me up. I am fortunate to have such an amazing family.

Dedication

I dedicate this dissertation to my wonderful family.

Chapter 1 - Intra Household Bargaining, Son Preference, and the Status of Women in India

Introduction

In the context of India, the declining sex ratio (defined here as the number of females per 1000 males), along with a strong son preference in most families (implying a general belief that sons are more valuable as offspring than daughters) are some of the most discussed topics in social science forums. The existence of a strong preference for sons in Indian society has, in fact, been empirically established (Arnold, Choe and Roy 1996; Bhat and Xavier 2003; Miller 1981). Researchers have attributed cultural, economic, religious and social reasons to this strong son preference among Indian households (Bardhan 1974; Miller 1981; Sen and Sengupta 1983; Basu, 1989; Sen 1992).

This paper discusses the factors responsible for the preference for sons and tests whether giving birth to a son actually translates into empowerment for women in Indian households, even augmenting their decision-making authority to a large extent. Thus, our hypothesis is that given the strong son preference in India, women who are able to have sons are more likely to enjoy greater bargaining power in the household, ranging from basic decision-making to greater say in complex financial matters concerning the family. In addition, women with sons enjoy more respect from the elders of the household, especially in a joint family set-up, which is still prevalent in Indian society. In this paper, through an analysis of secondary data at the household level, we attempt to identify and quantify the preferential treatment given to women who have given birth to at least one son. The household bargaining literature is relatively new. Recently

Li and Wu (2011), using the data from China, have tried to establish a connection between the issues of son preference and the overall bargaining strength enjoyed by women with sons. Thus, the following literature review for the paper will concentrate more on the social determinants in Indian society, which substantiate and largely endorse this son preference, such as the dowry system, joint family system, prevalent socio-economic conditions, and the emphasis on various divisive social indicators like caste and religion.

The remainder of this paper is organized as follows. Section 2 reviews the existing literature. Section 3 describes our data source for this study. Section 4 discusses the econometric specifications. Our main empirical results are discussed in section 5. Section 6 concludes the paper.

Literature Review

The issue of son preference mentioned above signifies the attribution of greater value to the birth of a son in the family than to that of a daughter. The reasons for this preference for sons vary across different societies and are determined by diverse factors including geographical location, economic situation, and religious beliefs and customs. The relationship between the economic well-being of a family and family size has been examined since as far back as the early theoretical work by Malthus. Similarly, Easter Boserup's conceptual elaboration of the 'economies of female survival' argues that the nature of women's participation in the labor force determines the extent of discrimination. In other words, the role of women's labor, when translated from the domain of invisibility (household) to a visible economic role (participation in the labor force as an economic agent) establishes the socio-economic worth of her existence. However, this possibility of increased participation of women in the workforce gets sidelined when socio-cultural beliefs dominate over an economic rationale. A daughter is considered as a

double loss, since the investment in her upbringing and education benefits the family wherein she is going to be married more than the family in which she is born, coupled with the expenditure on her dowry that has to be incurred by her family (Basu 1992). It has also been seen that the investment in a girl depends heavily upon the economic condition of the family (Bhalotra 2009). In India, sons, on attaining adulthood, are expected to provide economic support for their parents (Das 1984; Lahiri 1984; Miller 1981; ORG 1983). In contrast, daughters represent a substantial economic burden in places where their parents are expected to provide a dowry to the families into which they marry. The other social order argument is that sons would assist the family financially through their earnings during their parents' old age (Rangamuthia, Minja and Roy 1997). Ethnographic evidences also suggest that scores of rituals that are considered to be essential for successful family life are performed by males, from birth to the lighting of the funeral pyre. Some other scholars have also suggested that the economic constraints of managing a family, coupled with the prevalence of the patriarchal system of Indian society, is the main reason for this manifested gender bias (Agnihotri 1996; Kishore 1993). Also, regions with very fertile land and heavy dependence on agriculture are more likely to exhibit a strong preference for sons, since having a male child is more beneficial and productive than a female child for families who have to undertake labor-intensive work in the fields.

Another important determinant of this preference for sons pertains to the dowry that has to be paid at the time of a daughter's marriage. Most families in Indian society, especially in North India, follow the practice of dowry. Among some castes and communities, the amount of the dowry to be paid is quite substantial, often exceeding the average lifetime household incomes of agricultural laborers. Although the practice of dowry is illegal in India, it is still widely prevalent in the society, particularly in the case of Hindu marriages. An important point to be

noted in this context is that Hindus are usually rigid about having marriages in the same caste, and the practice of dowry features in marriages when women are married to wealthier men within the same caste group (Caldwell, Reddy and Caldwell 1983). The culture of exchange of dowry can be seen as a sort of economic compensation made by the bride's father to the groom's family for accepting the girl in their household (Rao 1993). This practice of dowry is, however, not so prevalent among the Muslims.

Another important determinant that plays an important role in fueling the son preference in Indian society is religion. In India, there are two major religious groups, Hindus, who constitute around 80 percent of the total population, and Muslims, comprising around 13.4 percent of the total population of India (Census 2001). Also, the fertility rate among Hindus is 2.59 while it is 3.4 among Muslims (NFHS-3 2005-06). There are many explanations for this large difference in fertility among the two groups, but the most commonly discussed reason among scholars concerns the difference in contraceptive use, pregnancy termination methods, and son preference or aversion to daughters (Borooah and Iyer 2004). The use of contraceptives is very low among Muslims as compared to other religious groups, and it is estimated that only 37 percent of the Muslims use contraception as opposed to 49 percent among Hindus (IIPS and Macro International 2000). This is because popular perceived religious notions among Muslims prohibit them from using contraception and terminating pregnancy, though some scholars have argued that the Muslim religion does allow birth control (Sikand 1993). Even though there are differences in the fertility rate among the two religious groups, both the religions directly or indirectly preach son preference. This is because in both religions, traditionally, the last rites of a person after his/her death are always performed by sons, and women are not allowed to participate in any of these rituals (in most cases, they are not even allowed to enter the burial or

cremation sites). Therefore, it is considered inauspicious and even a curse on a family if there is no boy in the family to perform the last rites of his elders. It is because of these retrograde practices that even religious leaders and priests offer newly-wedded couples blessings for having a son.

The fertility rate in India has consistently declined over the last 15 years, though it is still quite high, mainly due to awareness drives initiated by the government, civil societies and NGOs. Unlike China, India has no laws but only awareness drives to achieve population control. Alarmingly, however, the combination of a declining fertility rate and a strong son preference leads to another disastrous situation for not only the country but the Indian subcontinent as a whole—the declining sex ratio. Some researchers have linked the declining sex ratio with the government's policy of propagating a two-child norm (Visaria, Acharya and Raj 2006). This norm has been introduced to help stabilize the population in relation to the existing resources through a reduction in the fertility rate of the country. Nevertheless, this government policy, accompanied by the advent of modernization and the consequent urbanization and preference for the nuclear family system, has failed to reduce the age-old preference for sons in the country (Das 1987; Malhotra, Vanneman and Kishore 1995; Kulkarni 1999). According to a study conducted in one of the prosperous states of India, viz. Punjab, by Das Gupta (1987), when the size of the family in the popular social construct was large, the preference for a son was latent. However, the recent trend of promoting a small nuclear family and the consequent decline in fertility rates has obviously led to shrinking of the family size, which has brought the son preference to the forefront and consequently adversely affected the birth rate of girls, thereby leading to a drastic fall in the sex ratio. A few other regional studies also suggest that the cohort sex ratio at birth is masculine in some parts of country, particularly in northern and western

India. After the introduction of the sex determination technology and the selective abortion of girl babies, that is, the practice of female foeticide, advertisements began to appear on the walls of big and small cities by private doctors practicing such tests claiming, "Pay Rs. 500 (US$ 10) today rather than Rs. 500,000 (US$ 10,000) later." These attractive advertisements were specifically targeted at prospective families that would choose to abort the female foetus in order to avoid having to incur expenditure on dowry later (Mazumdar 1994).

It is estimated that this epidemic (female foeticide) has cost more than 100 million female lives all over the world (Sen 1990) and around 35–37 million lives in India alone (Dreze and Sen 1996). A majority of the developed countries have a sex ratio in favor of girls. For instance, in the United States and Europe, there are 1050 females per 1000 males, whereas in India, there are just 933 females per 1000 males (Census 2001). At the regional level, many states present an even sorrier picture. States like Haryana and Punjab, two of the relatively rich states in India, for example, have less than 900 females per 1000 males.

A paper by Das Gupta and Bhat (1997) examines the changes in juvenile sex ratios (0–4 years), the mortality sex ratio, and fertility rates for the period of 1981-1991. It concluded that during the period of decline in fertility in India, parents were not substituting prenatal for post-natal discrimination against girls but were actually combining these two strategies. The bias towards a male child in India thus appears to be intensifying (Das Gupta and Bhat 1997). A group of other researchers have suggested that the low autonomy among women combined with the high preference for a son are the major factors responsible for the sustained decline in fertility, and rise in neglect of the girl child and female infanticide in India (Basu 1992; Dyson and Moore 1983; Das 1987; Dreze and Murthi 2001; Kulkarni 1999). This can be attributed to the existing socio-cultural order in the country, which considers women inferior to men in the

society. This is discussed in the subsequent sections of this article. Dreze and Sen proposed the concept of "missing women" in the year 1989,[1] forcefully raising the concern for the missing girl children in the public domain at the national level. Subsequently, a UNEPA Report entitled "India toward Population and Development Goal" pointed out that 48 million women were actually 'missing' in India. According to this report, 40 to 50 million girls have gone missing in India since 1901, missing either because they were not allowed to be born, or, if born, were killed immediately thereafter.

Although women in India have traditionally not been empowered enough to make major decisions independently, the recent trends signifying their entry into the labor market and heightened awareness among them about their rights have brought changes in social norms. Women now not only participate in family matters to a much larger extent than before, but are at times even equally responsible for major decision-making at the household level. In India, women who have given birth to son(s) are treated better than those women who have not, even within the same household for the reasons discussed above. Earlier studies have claimed that women's relative bargaining in the household is generally dependent upon many factors such as income from employment (Thomas 1990; Folbre 1984), the amount of dowry that a woman brings to the household at the time of marriage (Zhang and Chan 1999), and the assets held by the individual (Brown 2009). However, it is still difficult to differentiate the income effect from bargaining strength among women (Behrman 1997).

Studies on the role of women in terms of the financial decision for the household have confirmed that women are more sensitive to the needs of households than their personal needs

[1] Before the concept of 'missing women' was introduced by Dreze and Sen in 1989, the analysis of different aspects of social and cultural factors underlying the problem of declining females in total population was discussed by Sen (1988 and 1989).

when asked to make household decisions (Ashraf 2009). Similarly, in the Philippines, women tend to commit to depositing more savings in joint accounts than receiving personal goods (Ashraf 2009). Women also prefer to spend more on health and education as compared to their husbands when asked to make these decisions (Thomas 1990). Overall, these studies indicate that women are good managers and use the household resources efficiently.

However, given the extreme gender bias in Indian society, it is a moot point as to how women can achieve decision-making positions in the household. While women's income, the assets owned by them, and the dowry that they bring into the household are important determinants of the power enjoyed by them in the household, this is not all. Income-related measures have endogeneity issues (Li and Wu, 2011), thus making them redundant for use. Dowry and assets often affect the current consumption factor and cannot be treated as permanent and certainly not as the only factors. Li and Wu (2011) have proposed women's contribution to the next generation as the exogenous determinants which can influence her bargaining power in the household. They argue that given the strong son preference in China, women giving birth to sons are more likely to have a greater say in the household and would be given preferential treatment over women without any sons.

One of the studies on India about the position of women in the household reports that a woman's status is enhanced by marriage and even more so when she has children, which improves her bargaining position in the household in particular (Youssef 1978). In a society characterized by a strong son preference, women not only acquire a superior status after giving birth to a son, but their sons also clearly act as protective shields or a sort of insurance against the threat of divorce or abandonment by their husbands, or in the case of the death of the husbands. Given this argument, it is obvious that women themselves would also exhibit a high degree of

the son preference along with the other household members. It is for this reason that women are expected to continue their childbearing activities throughout their reproductive years to fructify the universal desire of giving birth to sons (Youssef 1978, 79).

Data

The data used in the study is from the India Human Development Survey (IHDS) jointly administered by the University of Maryland and the National Council of Applied Economic Research (NCAER) in India. The IHDS is a nationally representative survey of 41,554 households, covering a total of over 215,000 individuals. The survey includes households from all the 33 states and all Union Territories of India. It covers a wide range of topics and includes health, education, employment status, marriage, gender relations, fertility, income, and employment, among other things. The IHDS includes eight data files which can be merged with each other through a unique identifier. Every individual can be traced through a household number, thus offering the flexibility to merge any of the characteristics present in different files. During the course of this study, we have made extensive use of the Education and Health Questionnaire file, which includes a set of questions posed to ever-married women in the age group of 15–50 years. For the purpose of writing this paper, we have matched data relating to ever-married women, from now onwards 'eligible women', with their fertility history. Further, we have only considered women in the age group of 21-50 years for this paper, primarily keeping in view that the legal age of marriage in India is 18 years. The Education and Health Questionnaire has a detailed section on 'Gender Relations, wherein eligible women are asked about their roles in decision-making within the household. For example, eligible women are asked who in the family decides about the number of children that the couple should have, or about the purchase of expensive durable goods, among other decisions. There are several

questions, which explicitly highlight the women's decision-making strength in the household. However, the questions included in the survey are not limited to decisions taken within the household but extend beyond that to measure the overall bargaining strength and position of women in the household. Questions as to whether the respondent has a bank account or any property ownership documents in her name also directly measure the respondent's position in the household. These responses also provide the flexibility to test how the responses differ when a woman has given birth to at least one boy and how this condition changes women's bargaining strength in the household.

Model

In order to carry out our analysis on the effect of having at least one son on the overall bargaining strength of women in the household, we resort to the following binary dependent variable specification.

$$Prob\ (Y=1) = G\ (Having\ \ son(s),\ Income,\ Education,\ Age,\ Urban,\ldots\ldots)$$

where Y is the women's role in the household decision-making process. 'Having son(s)' is a dummy variable to indicate whether the women in question have at least one son or not, where value of 1 indicates that the woman in question has at least one son and 0 indicates otherwise. In this analysis, we are not interested in the number of sons born or the gender of the first-born child simply because in India there is no strict law to limit the number of children in the family. Families with a strong son preference keep on trying until they have a son. In the model, we are controlling factors for various individual traits, like the age of the women, education of the eligible women, the principal occupation of the household, the education level of the head of the household, the presence of senior citizen(s) in the household, rural–urban disparities, and variables associated with region, socio-religious group, and the income of the household. Most of

the variables are self-explained. But some of them need special mention. We are controlling for the presence of one or more senior citizen(s) in the household, irrespective of the latter's gender. We define household member aged 65 or above as senior. As discussed earlier, the joint family system continues to prevail in India. Having a senior member in the family affects the decision-making capabilities of the eligible woman. Similarly, the educational attainment of the head of the household also matters. Women are more empowered in the households where the head of the household is educated. We also include a dummy variable for socio-religious groups, taking into account the numerous cultural and religious practices prevalent within various households. A common perception is that the household wherein the principal occupation of the members is service (which can also be a proxy for a wealthier and more educated head of the household) accords more freedom to women as compared to the household wherein the principal occupation is agricultural labor (proxy for the economically backward class). However, past research has shown conflicting results on the relationship between wealth and son preference among the households (Pande and Malhotra 2006).

Overall, we have selected fourteen dependent variables for this study, all of which reflect the women's bargaining strength in the household. All the responses have been coded in binary format to facilitate an easier understanding of the findings and inferences.

Results

We use the Logit regression method in estimation. We also run Probit and OLS regression to carry out a robustness check. The results from Logit, Probit and OLS are reported in the table. We have run the regression for all 14 dependent variables.

Table 1.1 reports the Logit regression model estimation results along with the marginal effects. Column 1 of the table presents the Logit regression output with the decision variable on whether to buy expensive durable goods as a dependent variable. Column 2 and 3 reports the marginal effects from the Logit and Probit regression respectively. Column 4 reports the OLS coefficients. The estimation result shows that having son(s) is an important criterion in terms of having a say on buying durable goods in the household. To our surprise, for the women having sons, the probability of making decision on buying durable goods decreases by 1.99 percent in comparison to women with all daughters. However, the participation of women in the decision to purchase durable goods increases marginally with age and decreases by about 3.2 percent with the presence of senior citizens in the household. Women in urban areas exhibit greater participation by about 1.55 percent in such decisions than women in rural areas. Table 1.2 provides the results for the decision regarding the number of children that a woman should have. These results indicate that women with at least one son have a lesser say by 1.84 percent in the decision pertaining to the number of children. Older and more educated women in the household exhibit some decision making power. It can be concluded that the presence of senior members in the household negatively impacts the decision-making capability of younger women by 2.11 percentage points, and that women in the urban areas have greater say by 3 percent in these matters than do women in the rural areas. All the above estimates are statistically significant at 1%.

However, when it comes to money matters, when asked questions like, “Do you and your husband talk about what to spend money on?”, it can be seen from Table 1.3 that women with son(s) have greater say by 2.88 percent than women who do not have any son, and these estimates are statistically significant. Also, it has been found that older, and more educated

women show greater participation in the discussions pertaining to money matters; these results are statistically significant as well. Women in the rural areas enter into more frequent discussions with their husbands by 1.22 percent than women in the urban areas. Albeit, this could be attributed to the fact that couples in rural areas spend more time together than their counterparts in the urban areas, since the former usually work together in the fields or run small businesses from their homes. Also, as compared to the poorest people, that is, people in the lowest income quintile, more affluent couples obviously indulge more in discussions regarding purchase decisions and what to spend the money on, with the gap between the discussions carried out by couples in the two quintiles being about 1.75 percent. These estimates are statistically significant at a 1 percent level of significance. However, having an elderly member in the household decreases the frequency of discussion among the couple by about 1 percent. The decision regarding the menu for daily meals ostensibly seems to be an unimportant variable but a closer analysis reveals that this is not really so, since in traditional Indian society the selection of dishes for the daily menu is often viewed as a proxy for exercising sustained control over the daily affairs of a household. This decision also acquires importance in view of the fact that households usually ponder over it multiple times on a daily basis. Table 1.4 provides estimates for the dependent variable 'who decides what to cook on a daily basis'. Returning to the main hypothesis, it has also been found that if a woman has a son, her role in this decision regarding the menu increases by 3.12 percentage points as opposed to the role of a woman without any son. The decision-making power also marginally increases with age and decreases with education, the reason for which could be that more educated women usually work outside the household and therefore participate less in daily cooking than women who are exclusively home-makers. In cases where a household has a senior member, the decision-making power of the younger

women decreases by 12.4 percentage points, which indicates the importance of this decision-making variable within the households given that usually job of preparing meals are left to younger women in the household.

The prevalence of the *parda* (veil) system in India signifies a centuries-old tradition that prohibits Indian women from openly facing males, particularly men who are not part of the family, which is why they are required to cover their faces most of the time. In fact, in many sections of Indian society, especially in the rural areas, women are not even allowed to show their faces to elderly family members including the father-in-law, brothers-in-law (who are elder to the husband), and other distant male relatives. Various explanations have been offered by the respective societies for the pursuit of this culture. These include the need to accord respect to elders, to maintain the dignity and privacy of the women concerned, and often even superstitious beliefs that forbid women from exposing their faces before strangers. This restriction is especially imposed on almost all pregnant women and mothers with newborn children. This practice is more rampant in rural areas, where when a child falls sick it is often believed that the reason for the ailment is that somebody has cast an evil eye on the child. These beliefs are reinforced due to the strong son preference in India, whereby sons and their mothers become more precious for the household than the other family members. From the estimates in Table 1.5 we have found that women who have sons are more likely to follow the *parda* system than those who do not by 4.7 percentage points. This finding reflects the irony of the situation as the *parda* system is a veritable sign of suppression in modern India, whereas, on the other hand, there are indications that women who deliver sons are more likely to enjoy greater powers and privileges, and by implication they would therefore be less suppressed and more empowered. In this context, therefore, the *parda* system, while definitely symbolizing suppression, to some extent,

can also be viewed as a reflection of the protective instinct of the family that wishes to protect its women and their sons from "evil eyes". As discussed above, since this is a religious and cultural phenomenon, it is followed by most Hindu and Muslim families. As compared to higher caste Hindus, however, Christian and Sikh women are less likely by at least 33 percent and 25 percent respectively to follow the *parda* system (These estimates are not reported in the tables, however, it is available on request). On the other hand, the practice of *parda* among Muslim women exceeds that by higher-caste Hindu women by 43.4 percent. The *parda* system shows a decline with an increase in age and the level of education among the women and the estimates are statistically significant. The education level of the head of the household also plays an important role as it has been observed that if the head of the household has acquired a higher level of education, the women in the family are less likely to follow this system. As discussed earlier, the *parda* system is, however, on the decline in modern India, with education playing a very important role in its downfall. If the household is headed by an individual who has completed at least the first year of graduation, then the women in that household are 9.4 percent less likely to practice the *parda* system than women belonging to a household headed by an illiterate. As expected, urban women have been found to practice the *parda* system by almost 15 percentage points less than rural women. An estimate for regional variation also confirms the negative relation between this system and overall education. In southern India, women are 45.6 percent less likely to practice *parda* than their counterparts in the Himalayan region. South India is known for its high literacy levels, and in fact, one of the south Indian states, Kerala boasts of more than 92 percent literacy as compared to the all-India average literacy figure of around 65 percent (Census of India, 2001).

Regressions estimates for the question regarding who undertakes the daily shopping in the household found in Table 1.6 suggests that women who have given birth to son(s) are more likely to shop for the household than women without any son by 1 percentage points. A subsidiary finding is that older women are more likely to do the daily shopping than younger women in the family, and more educated women participate in the family shopping less. The former could be earning members of the household and therefore less likely to find time for shopping. Further, if there are senior members in the household, the younger women get to shop less by 7.7 percent, and in urban areas, women shop more than their counterparts in the rural areas by 11.6 percentage points.

Another important indicator of the bargaining strength of women in the household could be the leisure time that they spend with their husbands outside of the household. The question as to whether they find time to go for outings with their husbands and children was posed to women. Table 1.7 provides the estimates for the above question. The results suggest that Muslim women are likely to spend 13.4 percent less leisure time with their immediate families than their Hindu counterparts. This also depends, to a great extent, on the household income as it has been observed that women in the highest income quintile go for family outings 12.4 percent more as compared to women in the lowest income quintile. Similarly, older women get to spend less time on leisure activities than their younger counterparts. These estimates are statistically significant. Further, the incidence of educated women going out with their husbands exceeds that by uneducated women by more by 1.77 percent. The presence of elderly in the household negatively impacts the time available for outings. As expected, urban women spend 14.1 percent more time on outings with their husbands and children than rural women. Women belonging to household

headed by educated individual are likely to enjoy about 10 percent more of family time with their husband and children.

Table 1.8 and 1.9 provide estimates for the questions as to whether women have to seek permission from their elders for participating in other forms of social interaction like visiting the local *kirana* shop (grocery store) and friends in the neighborhood. It is clear from the marginal effects that women who have sons are more likely to indulge in these social interactions, however, the coefficients are not statistically significant. Another important result which emerges from this analysis is that if there are senior members in the household, the women are more likely to seek permission from them to visit friends in the neighborhood and the *kirana* shop by 3.8 percent and 4.2 percent, respectively.

Another question that was examined was whether women also seek permission from their elderly relatives to visit the local health center as well as who decides what to do when a child in the family falls sick. We did not find any strong evidence that a woman who has sons gains an upper hand. Estimates from Table 1.10 suggest that when there is an elderly person in the household, the younger women are 5 percent more likely to seek the former's permission to visit the health center. Table 1.11 provides the estimates when we regress the dependent variable 'what to do when child falls sick'. We find that when a child in the family falls sick, the mother is 1.2 percent less likely to get the opportunity to make an independent decision about the course of action to be followed in presence of senior members in the household. Independent decision-making instances increases with education and age. Urban women are more independent.

We also explored a few other questions that have a direct bearing on the bargaining power of women in households. The women were asked whether their names are appended to their house documents, whether they are provided any money for incurring household

expenditures, and whether they have any bank accounts in their own names. Table 1.12 reports the estimates when we regress the question on house ownership. Results suggest that women with sons are more likely to see their names appended on documents of house ownership but these findings are not statistically significant. An important point to be noted is that the ownership of the household properties could be several years old, often purchased before having kids, and most households cannot be expected to buy new property frequently or to alter the ownership rights often. This question can, therefore, be answered more comprehensively and accurately only if additional data on the length of the ownership of the property is available. Women belonging to the higher income quintiles are more likely to find their names on the property documents in view of the fact that the families included in this quintile purchase properties more often than those in the lower income quintiles. It was thus observed that women belonging to the fourth and highest income quintile would have greater opportunities by 2.45 percent and 6.29 percent, respectively, of having their names on the property documents in comparison to women belonging to the lowest income quintile. Further, older and more educated women would have greater instances of having property ownership than their younger and less educated counterparts. Not surprisingly, the presence of senior citizens in the household has a negative effect by about 3.4 percentage points on the power and authority exerted by the younger women.

Results from Table 1.13 suggest that women who have given birth to at least one son are 1 percent more likely to have cash in hand for their personal and household expenditures. The presence of a senior member decreases the probability of making a decision by 3.74 percentage points. In Urban areas women are about 4.8 percentage points more likely to have cash in hand to spend. All the discussed estimates are statistically significant.

Table 1.14 analyzes the question 'whether the woman has her name on bank account'. Results suggest that women with sons are almost 1.1 percent more likely to have their names on bank accounts than women with all daughters. Unlike property rights, it is much less cumbersome to open bank accounts in the names of the women or add their names to an existing account since this does not entail any lengthy legal process. Similarly, it was also found that women who belong to the two highest income quintiles are more likely to have cash in hand as well as bank accounts in their names. In fact, women in the fifth income quintile have an almost 11.4 percent greater opportunity of having bank accounts in their own names as well as a 5.7 percent higher possibility of having cash in hand to spend on themselves or on their households. These possibilities go up further with an increase in the age and education levels of the women studied. The possibility of having one's own bank account is, in fact, not affected in any way even by the presence of a senior member in the household, and it goes up even further by 1.87 percent for urban women as compared to their counterparts in the rural areas.

Conclusion

In this paper, we have tried to empirically investigate the impact of having son(s) on the relative and overall bargaining strength enjoyed by women in the household in Indian society. We test the hypothesis that given the strong son preference in India, whether giving birth to son(s) increases status of women in the household. We have used various household decisions in this study as dependent variables. We found that a woman who has given birth to a boy is more likely to have a significant say in household decisions such as the menus for daily meals, and the purchases on which to incur daily expenditures. In addition, such women are also more likely to go for outings and shop more frequently than those without sons. Similarly, these women would have more cash in hand to spend and would have a greater likelihood of having bank accounts in

their own names. We also observe that the presence of an older family member in the household is another important variable, which determines a woman's overall bargaining strength in the family. In most of the cases, the overall bargaining power of women diminishes with the presence of senior members in the household. These results raise important questions about the manner in which household resources are allocated among two generations living in the same household. Further, it would also be an interesting exercise to determine gender of the senior member in the household in order to ascertain whether any power struggle is likely to occur in the household and if so, whether it is between women of the two different generations or just between the two generations, regardless of gender. We will leave this issue for a future study.

Tables

Table 1.1 Women's participation in making decision on "Whether to buy expensive item such as a TV"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	-0.208***	-0.0199***	-0.0210***	-0.0221***
	(0.0541)	(0.00549)	(0.00567)	(0.00569)
Women Age	0.0440***	0.00397***	0.00427***	0.00433***
	(0.00269)	(0.000240)	(0.000253)	(0.000271)
Women Education	-0.0220***	-0.0020***	-0.0020***	-0.0021***
	(0.00556)	(0.000501)	(0.000515)	(0.000524)
Presence of Senior Citizen in the Household	-0.392***	-0.0322***	-0.0333***	-0.0332***
	(0.0548)	(0.00407)	(0.00422)	(0.00427)
Urban	0.169***	0.0155***	0.0172***	0.0172***
	(0.0486)	(0.00456)	(0.00478)	(0.00508)
N	28535	28535	28535	28535
R-Square				0.041

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.2 Women's participation in decision making on "How many children to have"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	-0.116***	-0.0184***	-0.0182***	-0.0189***
	(0.0430)	(0.00699)	(0.00705)	(0.00705)
Women Age	0.0189***	0.00292***	0.00300***	0.00295***
	(0.00216)	(0.000333)	(0.000338)	(0.000338)
Women Education	0.0156***	0.00241***	0.00255***	0.00245***
	(0.00421)	(0.000651)	(0.000656)	(0.000664)
Presence of Senior Citizen in the Household	-0.140***	-0.0211***	-0.0211***	-0.0204***
	(0.0402)	(0.00589)	(0.00594)	(0.00585)
Urban	0.195***	0.0307***	0.0317***	0.0322***
	(0.0387)	(0.00618)	(0.00625)	(0.00634)
N	28250	28250	28250	28250
R-Square				0.032

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.3 Women's participation in decision making on "What to spend money on"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.299***	0.0288***	0.0309***	0.0310***
	(0.0524)	(0.00549)	(0.00575)	(0.00583)
Women Age	0.00461*	0.000408*	0.000419	0.000477*
	(0.00279)	(0.000247)	(0.000259)	(0.000275)
Women Education	0.0552***	0.00488***	0.00511***	0.00507***
	(0.00547)	(0.000480)	(0.000502)	(0.000493)
Presence of Senior Citizen in the Household	-0.114**	-0.0104**	-0.0108**	-0.0106**
	(0.0484)	(0.00452)	(0.00474)	(0.00479)
Urban	-0.135***	-0.0122***	-0.0129***	-0.0136***
	(0.0491)	(0.00448)	(0.00473)	(0.00501)
N	28331	28331	28331	28331
R-Square				0.032

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.4 Women's participation in decision-making on "What to cook on daily basis"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.180***	0.0312***	0.0325***	0.0329***
	(0.0410)	(0.00734)	(0.00745)	(0.00730)
Women Age	0.0482***	0.00803***	0.00797***	0.00785***
	(0.00224)	(0.000366)	(0.000367)	(0.000351)
Women Education	-0.0210***	-0.0035***	-0.00353***	-0.0035***
	(0.00401)	(0.000666)	(0.000679)	(0.000673)
Presence of Senior Citizen in the Household	-0.670***	-0.124***	-0.126***	-0.123***
	(0.0345)	(0.00698)	(0.00695)	(0.00678)
Urban	0.167***	0.0274***	0.0275***	0.0269***
	(0.0395)	(0.00640)	(0.00646)	(0.00633)
N	28513	28513	28513	28513
R-Square				0.071

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.5 "Do you practice ghungat/ purdah/ pallu"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.188***	0.0470***	0.0437***	0.0290***
	(0.0436)	(0.0109)	(0.0101)	(0.00691)
Women Age	-0.0175***	-0.0044***	-0.00404***	-0.0027***
	(0.00212)	(0.000530)	(0.000497)	(0.000342)
Women Education	-0.0421***	-0.0105***	-0.00974***	-0.0068***
	(0.00401)	(0.00100)	(0.000943)	(0.000673)
Presence of Senior Citizen in the Household	0.0341	0.00852	0.00836	0.00885
	(0.0370)	(0.00922)	(0.00869)	(0.00608)
Urban	-0.605***	-0.150***	-0.139***	-0.100***
	(0.0389)	(0.00949)	(0.00894)	(0.00624)
N	28808	28808	28808	28808
R-Square				0.347

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.6 "Whether you do the food and vegetables shopping in your household"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.0448	0.0105	0.0101	0.00930
	(0.0384)	(0.00904)	(0.00883)	(0.00769)
Women Age	0.0359***	0.00840***	0.00820***	0.00717***
	(0.00194)	(0.000451)	(0.000440)	(0.000379)
Women Education	-0.0296***	-0.0069***	-0.0066***	-0.0056***
	(0.00372)	(0.000868)	(0.000845)	(0.000720)
Presence of Senior Citizen in the Household	-0.325***	-0.0777***	-0.0754***	-0.0656***
	(0.0334)	(0.00811)	(0.00786)	(0.00685)
Urban	0.510***	0.116***	0.115***	0.0980***
	(0.0353)	(0.00780)	(0.00772)	(0.00692)
N	28741	28741	28741	28741
R-Square				0.171

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.7 "Do you and your husband sometimes go out by yourselves (or with children) to movies, fair, restaurants?

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.0231	0.00575	0.00560	0.00577
	(0.0373)	(0.00930)	(0.00903)	(0.00800)
Women Age	-0.0218***	-0.0054***	-0.00535***	-0.0048***
	(0.00183)	(0.000456)	(0.000444)	(0.000400)
Women Education	0.0711***	0.0177***	0.0174***	0.0158***
	(0.00348)	(0.000867)	(0.000846)	(0.000762)
Presence of Senior Citizen in the Household	-0.0376	-0.00936	-0.00909	-0.00810
	(0.0323)	(0.00807)	(0.00787)	(0.00713)
Urban	0.573***	0.141***	0.139***	0.128***
	(0.0334)	(0.00803)	(0.00787)	(0.00744)
N	28753	28753	28753	28753
R-Square				0.120

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.8 "Whether permission is required to visit Kirana Shop"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.0412	0.0102	0.0101	0.00577
	(0.0388)	(0.00962)	(0.00954)	(0.00800)
Women Age	-0.0173***	-0.0043***	-0.00423***	-0.0048***
	(0.00193)	(0.000478)	(0.000473)	(0.000400)
Women Education	-0.00627*	-0.00155*	-0.00153*	0.0158***
	(0.00368)	(0.000911)	(0.000904)	(0.000762)
Presence of Senior Citizen in the Household	0.155***	0.0381***	0.0375***	-0.00810
	(0.0350)	(0.00856)	(0.00849)	(0.00713)
Urban	-0.0207	-0.00512	-0.00543	0.128***
	(0.0346)	(0.00858)	(0.00852)	(0.00744)
N	23982	23982	23982	28753
R-Square				0.120

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.9 "Whether permission is required from husband or elders in the household to visit friend or family"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.0543	0.0100	0.0101	0.0105
	(0.0409)	(0.00760)	(0.00762)	(0.00746)
Women Age	-0.0301***	-0.0055***	-0.00555***	-0.0055***
	(0.00200)	(0.000364)	(0.000368)	(0.000363)
Women Education	-0.00280	-0.000510	-0.000526	-0.000492
	(0.00391)	(0.000713)	(0.000714)	(0.000704)
Presence of Senior Citizen in the Household	0.241***	0.0422***	0.0421***	0.0412***
	(0.0378)	(0.00635)	(0.00638)	(0.00622)
Urban	0.0554	0.0101	0.00920	0.00968
	(0.0364)	(0.00658)	(0.00666)	(0.00676)
N	28346	28346	28346	28346
R-Square				0.039

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.10 "Whether permission is required to visit local health center"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.0497	0.00928	0.00934	0.0102
	(0.0403)	(0.00759)	(0.00765)	(0.00739)
Women Age	-0.0416***	-0.0077***	-0.00781***	-0.0076***
	(0.00199)	(0.000365)	(0.000372)	(0.000358)
Women Education	-0.0260***	-0.0048***	-0.00481***	-0.0048***
	(0.00378)	(0.000699)	(0.000709)	(0.000704)
Presence of Senior Citizen in the Household	0.288***	0.0509***	0.0511***	0.0490***
	(0.0375)	(0.00630)	(0.00638)	(0.00614)
Urban	-0.121***	-0.0226***	-0.0237***	-0.0258***
	(0.0353)	(0.00665)	(0.00675)	(0.00684)
N	28752	28752	28752	28752
R-Square				0.066

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.11 Women's participation in decision making on "What to do if child falls sick"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	-0.0595	-0.0127	-0.0126	-0.0127
	(0.0382)	(0.00819)	(0.00817)	(0.00791)
Women Age	0.0248***	0.00524***	0.00528***	0.00507***
	(0.00187)	(0.000395)	(0.000397)	(0.000383)
Women Education	0.0111***	0.00235***	0.00235***	0.00224***
	(0.00359)	(0.000758)	(0.000761)	(0.000752)
Presence of Senior Citizen in the Household	-0.158***	-0.0327***	-0.0325***	-0.0317***
	(0.0343)	(0.00695)	(0.00697)	(0.00674)
Urban	0.0184	0.00388	0.00488	0.00461
	(0.0339)	(0.00718)	(0.00721)	(0.00726)
N	28578	28578	28578	28578
R-Square				0.052

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.12 "Is your name on the ownership or rental papers for your home?"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.00615	0.000792	-0.0000664	-0.000545
	(0.0488)	(0.00628)	(0.00649)	(0.00637)
Women Age	0.0466***	0.00601***	0.00623***	0.00631***
	(0.00237)	(0.000301)	(0.000313)	(0.000322)
Women Education	0.0182***	0.00234***	0.00231***	0.00229***
	(0.00455)	(0.000585)	(0.000606)	(0.000623)
Presence of Senior Citizen in the Household	-0.278***	-0.0338***	-0.0355***	-0.0368***
	(0.0441)	(0.00504)	(0.00523)	(0.00537)
Urban	-0.0791*	-0.0101*	-0.0101*	-0.0123**
	(0.0428)	(0.00543)	(0.00565)	(0.00566)
N	27603	27603	27603	27603
R-Square				0.057

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.13 "Do you yourself have any cash in hand to spend on household expenditures?"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.0909*	0.0109*	0.0124**	0.0109*
	(0.0473)	(0.00579)	(0.00611)	(0.00631)
Women Age	0.0152***	0.00177***	0.00195***	0.00188***
	(0.00246)	(0.000287)	(0.000299)	(0.000304)
Women Education	-0.00943**	-0.00110**	-0.000885	-0.00118**
	(0.00463)	(0.000540)	(0.000568)	(0.000548)
Presence of Senior Citizen in the Household	-0.300***	-0.0374***	-0.0384***	-0.0377***
	(0.0406)	(0.00539)	(0.00559)	(0.00568)
Urban	0.431***	0.0483***	0.0503***	0.0493***
	(0.0465)	(0.00498)	(0.00516)	(0.00549)
N	28828	28828	28828	28828
R-Square				0.061

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.14 "Is your name on any bank account?"

	Logit Coefficients	Logit Marginal Effects	Probit Marginal Effects	OLS Coefficients
Having Sons	0.0836*	0.0110*	0.0120*	0.0119*
	(0.0496)	(0.00641)	(0.00688)	(0.00670)
Women Age	0.0457***	0.00615***	0.00641***	0.00613***
	(0.00249)	(0.000330)	(0.000349)	(0.000326)
Women Education	0.127***	0.0171***	0.0180***	0.0192***
	(0.00460)	(0.000609)	(0.000645)	(0.000670)
Presence of Senior Citizen in the Household	0.00745	0.00100	0.000213	0.000226
	(0.0432)	(0.00583)	(0.00615)	(0.00583)
Urban	0.137***	0.0187***	0.0207***	0.0269***
	(0.0431)	(0.00595)	(0.00632)	(0.00626)
N	26055	26055	26055	26055
R-Square				0.205

Note: Column 1 reports the coefficients for Logit regression. Column 2 and 3 reports the marginal effects from Logit and Probit regression respectively. Column 4 is the coefficients from OLS regression. Dummies included in the regression but not shown include income, principal occupation of the household, socio religious group, education of the head of the household, and geographic region.

* p<0.1, ** p<0.05, *** p<0.01

Heteroskedastic robust standard errors are in parentheses.

Table 1.15 Summary Statistics 1:

	Women with at least one son					Women with at least one child but no son				
Variable	***N***	*Mean*	*Std. Dev*	*Min*	*Max*	***N***	*Mean*	*Std. Dev*	*Min*	*Max*
Income Quintiles	**25592**	2.8939	1.4018	1	5	**4286**	3.1442	1.4133	1	5
Women Age	**25588**	34.6874	7.1976	21	50	**4286**	31.1423	7.3644	21	49
Women Education (Years)	**25228**	4.2504	4.6806	0	15	**4255**	6.1474	5.1192	0	15
Presence of Senior Citizen in the Household	**25592**	0. 1961	0.3970	0	1	**4286**	0.2028	0.4021	0	1
Urban	**25592**	0. 3516	0.4775	0	1	**4286**	0.4349	0.4958	0	1

Table 1.16 Summary Statistics 2:

	Women with at least one son			**Women with at least one child but no son**		
	N	*Percent*	*Cum*	*N*	*Percent*	*Cum*
Region						
North	4467	17.45	17.45	527	12.3	12.3
Bihar/UP	3914	15.29	32.75	513	11.97	24.27
Central	3992	15.6	48.35	522	12.18	36.44
East	3728	14.57	62.91	752	17.55	53.99
West	3566	13.93	76.85	589	13.74	67.73
South	5925	23.15	100	1383	32.27	100
Total	**25592**			**4286**		
Head of the Household Education						
Illiterate	15107	60.24	60.24	2193	52.14	52.14
Below Primary	3254	12.98	73.22	587	13.96	66.1
Prim & Above	3307	13.19	86.41	672	15.98	82.07
Junior	1201	4.79	91.2	250	5.94	88.02
Secondary	1360	5.42	96.62	292	6.94	94.96
Senior Secondary	379	1.51	98.13	66	1.57	96.53
Grad	468	1.87	100	146	3.47	100
Total	**25076**			**4206**		
Socio Religious Groups						
HCH	5809	22.7	22.7	1054	24.59	24.59
H/OBCs	8624	33.7	56.4	1494	34.86	59.45
H/SC	4747	18.55	74.95	738	17.22	76.67
H/ST	1666	6.51	81.46	278	6.49	83.15
Muslims	3114	12.17	93.62	408	9.52	92.67
Sikhs&Jains	768	3	96.62	86	2.01	94.68
Others	864	3.38	100	228	5.32	100
Total	**25592**			**4286**		

Chapter 2 - Gender and Region of Origin Differences in the United States Labor Market

Introduction

In the contemporary highly globalized world, one of the most talked about aspects of demographic composition is the immigration flow. It has been documented that labor migration occurs from a country that has a high level of unemployment to another country that faces a labor shortage. In this case, both nations are in a win-win situation wherein the country with a high unemployment rate reduces its workforce while the nation with labor shortage gains in terms of acquiring able and willing workers. However, things are not so simple in the international arena wherein capital movement is virtually free but labor movement is highly restricted. Further, during the post-War era, among all the developed countries, the United States (U.S.) has faced the influx of one of the most rapidly growing immigrant populations from all parts of the world. Being one of the oldest and most stable democracies, as also one of the most developed countries in the world, the U.S. has been viewed as a land of opportunity by people across the globe, thereby leading to their large-scale migration here.

Immigration to a new country is driven by many different factors, such as positive attributes of the destination, intervening obstacles, and economic reasons (Lee, 1966). This view has been supported by a plethora of research undertaken by social scientists. Further, in order to assess the importance of immigration to the U.S., what is required is not only information about the shifting magnitude and nature of migration flow into the country occurring over the past few decades but also an understanding of the history of such immigration flows and theories about the reason for their occurrence (Massey, *et al*., 1993). Neo-classical theorists like Harris and

Todaro (1970) argue that utility-maximization is one of the most important factors affecting the migration decision. Socio-economic and other conditions also play a vital role in immigration decisions (Blau, *et al*., 2008) while even the changing characteristics of the home country greatly influence outcomes in the labor market of the host country (Lopez and Lozano, 2009).

Further, the current immigration research has moved into a very different sphere, as now researchers are talking more about the cost-benefit analysis through the net dollar contribution that immigrants make in the economy in terms of the taxes they pay and the dollar amount of the services they use, and the impact on compositional amenities (Card, *et al*., 2009), on productivity of the workplace (Peri, 2009), and on the overall economic and wage inequality created by the large influx of immigrants (Card, 2009). A debate is also currently raging regarding the use of public assistance programs by natives and immigrants, and how the use of this program has changed over time. However, one of the notable absences from the literature is the agreement among the researchers on the impact of immigrants on the wages, income, and the labor force participation of the natives.

Also, the influx of the population from outside the U.S. has gradually become a problem for the country, especially since the mid-1990s. With the declining fertility and mortality rate, immigration has played a major role in the demographic fluctuations of the U.S. Further, with the recession in the U.S. economy, the issue of immigration has gathered lots of attention from the popular media and from politicians across the party line. The subject of immigration has also been questioned and debated in public forums and meetings: issues like illegal immigration, naturalization, citizenship, and the influx of guest workers in the U.S. are increasingly becoming major topics of election debates.

The earlier literature has established the fact that immigrants undoubtedly play an important role in the U.S. labor market. With the high influx of able and educated immigrants into the U.S., the natural question which arises in the minds of millions of Americans is whether these immigrants are hurting their livelihoods. However, the common perception that immigrants take away natives' jobs and create a downward pressure on wages (Samuelson, 1964) has been empirically tested by researchers and literature provides a very contrary view on this issue. However, the growing interest in immigration studies is also because of the rapidly growing number of immigrants in the country, which went up from 9.2 percent of the total population in 1995 to 12.6 percent of the total population in 2007. States like New York, New Jersey, and California have more than 1 in 5 people as immigrants.

The contemporary literature provides several instances of disagreement between researchers on the impact of immigrants on the labor market outcome such as on wages and income. Initially, it was widely believed that immigrants do not pose a great threat to native employment opportunities, and that they are essentially helping in building the American economy (Borjas, 1995). However, a decade later, Borjas concluded that immigrants indeed lowered the wages for all education groups, doing most of the damage to high school dropouts (Borjas, 2003) and that in the case of higher education, an increase of 10 percent in the supply of doctorates reduces the earning of the whole cohort by 3 percent (Borjas, 2005). Card (2005), on the other hand, finds that an increased labor supply due to high immigration is not responsible for lower wages. Card's finding suggests that the wage gap between school dropouts and college graduates has remained almost constant over two decades, and hence the notion that the immigrants are responsible for the relatively lower wages earned by dropouts is misplaced. More recent studies, however, suggest that immigrants have a positive effect on the wages of workers

having at least a high school degree, and a very small negative effect on the wages of workers having no high school degree (Ottaviano and Peri, 2008). There has been some sort of consensus regarding the wages earned by immigrants when they enter the labor market. Borjas (2000) suggests that immigrants enter the market with lower wages as compared to the natives but that over time, the gap between the two reduces. Similarly, Borjas and Freidberg (2009) report that the new cohort of immigrants is doing well in the labor market as compared to the old cohort.

Another pressing issue being covered in the recent migration literature is the significant rise in the number of female immigrants to the U.S. from throughout the world. This new wave of female immigrants includes highly educated and independent women. According to the recent data, nearly half of the immigrants entering the U.S. are female, and are equipped with high levels of education and skills that enable them to challenge the labor force. However, literature also documents the fact that traditionally, women have been heavily discriminated against in the labor market in terms of the wages they earn, and the number of hours of work they have to put in, among other things. In fact, the literature also provides justification for this discrimination through claims that the women workers are less educated and less skilled than their male counterparts, and that they are not able to work full-time like the men, as they have to take care of family. Thus, if the prevalent gender discriminations in the labor market are coupled with discrimination against the foreign-born workers, it would be reasonable to assume that immigrant women would doubtless have a much harder time in the labor market than the male immigrants, *cetris peribus*.

A few studies have tried to test the above-mentioned assumption and have come up mixed results (see Long, 1980; Shamsuddin, 1998). Previous literature on the gap in wages earned by immigrant women and that earned by the men actually finds a negative wage gap for

immigrant women in the U.S. (Long, 1980). Similarly, various similar findings on the Canadian labor market seem to suggest that there is no double negative effect on the earnings of immigrant women (Beach and Worswick, 1993). However, these results seem very puzzling, as a vast literature on men clearly indicates that at the time of their entry into the labor market, immigrant men earn lower wages as compared to those earned by native males and that with time, the initial wage gap closes down (Borjas, 1987). Wage gaps in the labor market have also been observed because of many differences in mutual characteristics among workers. Immigrant men face a disadvantage in the labor market at the time of their entry due to differences in the birthplace. However, researchers have not found birthplace characteristics to be the dominating factor responsible for differences. Instead, immigrant women are discriminated against in the labor market largely because of gender rather than due to birthplace differences (Shamsuddin, 1998). Women also get lower wages in the labor market because of their historically lower workforce participation rate due to their responsibilities of childbirth and childcare. However, Shamsuddin (1998) claims that labor market assimilation for women moves much faster than men.

As mentioned earlier, the number of women immigrants has been rising steadily in the U.S., resulting in a concomitant rise in the number of females as naturalized citizens in the U.S.[2] Recently, the increasing number of naturalized citizens in the U.S. has been providing a great opportunity to researchers to re-examine the wage gaps in the labor market with one additional category to look at. A naturalized citizen enjoys the same level of benefits as natives in the labor market such as access to federal jobs, priority in receiving federal assistance, and unemployment

[2] Naturalization is the process through which a person who was not born in the U.S. can obtain citizenship. The process of naturalization has gone through various revisions and has been amended multiple times during the last three centuries. In order to get naturalized, an applicant has to fulfill various requirements pertaining to residency, minimum age, the intent to stay, character, a knowledge of U.S. history, and language proficiency (Bratsberg, *et al*., 2002).

benefits, among other things. Since the process of naturalization requires applicants to meet certain conditions like residency requirements, and language proficiency, it is not surprising to see members of this group generally attaining a higher level of education than natives. On a comparative note, this also explains the higher incidence of the attainment of advanced degrees by naturalized citizens than natives.

Literature on the effect on wages after naturalization has heavily focused on the assimilation argument and is again male-centric. Since citizenship acquired through the naturalization process has to be earned, involves lengthy paper work, and is costly, it can be assumed that citizenship has great economic benefits apart from social benefits like voting rights, and property rights, among other things. Further, it is also clear that naturalized citizens definitely have more employment avenues, and are more likely to have better English-speaking abilities, and that the length of their stay in the U.S. would, on an average, be higher than that of immigrants. However, a majority of the migration literature puts naturalized citizens in the same group as immigrants when discussing the shifts, trends and implications of immigrants in the labor market (Borjas, 2006). Some of the papers like the study on the effect of naturalization on wages by Chiswick shows that naturalized men earn as much as 15 percent more than non-citizens (Chiswick, 1978) and that there is a 5 percent earning premium associated with citizenship for males. Bratsberg, *et al*. (2002) report positive gains associated with naturalization for male immigrants from the less developed countries. There is thus no doubt that citizenship brings greater labor market opportunities. Bratsberg, *et al*., (2002) discuss two channels through which citizenship may affect wage growth—firstly, citizenship allows access to federal jobs and U.S. passports allow the holders to gain easier entry into many countries, and secondly, the employer may see acquired citizenship as a long-term commitment to the U.S. job market.

In a study on the impact of highly-skilled immigrants on the labor market, where only doctoral receipts from the U.S. are included in the sample, Borjas (2005) reports that the prevalence of more foreign-born PhDs in the labor market has no negative impact on wages earned by natives. However, Borjas arrives at the simple demand and supply relation, that is, a 10 percent increase in doctoral receipts would bring down the wages of the whole cohort by about 3 percent, regardless of whichever group may be increasing the supply (Borjas, 2003). Now, more people are going to college and finishing their degrees. According to the 1990 census, naturalized citizens are at the top of this list with more than 4.54 percent of them obtaining professional and PhD degrees, followed by immigrants at about 3 percent, and natives at 2.19 percent. In 2000, this percentage went up for all categories and natives are fast catching up with the others. The education level among immigrants differs widely on the basis of the source country. Asian immigrants generally have a higher level of educational attainment as compared to natives, and immigrants from regions like Central and South America have lower levels of schooling than the natives and schooling of immigrants has some positive effect on employment (Chiswick, *et al*., 1997).

Thus, given this latest shift in the magnitude and pattern of immigration in the U.S., it is important to study the participation trends of women immigrants and their experiences in the labor market. Overall, the current literature on immigrants is very male-oriented in nature. The reference to the experiences of women immigrants vis-à-vis their naturalized counterparts in the literature and policy debate is conspicuously missing. Also, there are very few papers that study the labor market outcomes for naturalized citizens in comparison to those for natives and immigrants, including especially those focusing on women. It is important to study the performance of women for mostly two reasons—firstly, during the last few years, more women

have become naturalized citizens than men, and secondly, various studies on the performance of women in the labor market indicate different outcomes for women than for men.

This study attempts to answer some fundamental questions that have not been examined in the extant literature in depth. It focuses on the labor market outcome of educated women immigrants, and compares and contrasts it with the labor market performance of naturalized citizens and natives. The paper also investigates the labor market outcome of highly educated female immigrants, and how this changes with marital status and having children. Further, it assesses the effect of their birthplace on the wages earned by immigrants and naturalized citizens. The paper is divided into four sections—the Introduction, which discusses the literature related to the study, the second section, which provides an overview of the research statement, and description of the data and methodology, followed by the third section on empirical results and interpretation. The final section presents the conclusions.

Data

This study draws data from the 1990 and 2000 Integrated Public Use Microdata Series (IPUMS) of the United States Census. The chosen data represents a 1 percent sample of the population. The sample consists of persons aged 21-64 years, and the sample does not include any person serving in the military or a person living in group quarters. For the analysis, a person is categorized as 'immigrant' if he/she was born outside the border of U.S., and his/her parents were not U.S. citizens. Similarly, a naturalized person is a person who is a legal immigrant and has been granted citizenship by the U.S. after fulfilling required conditions. All other persons are classified as natives in the sample. For the analysis, the sample has been categorized into three sub-samples consisting of natives, naturalized citizens, and immigrants.

While analyzing labor market outcomes for immigrants and naturalized citizens, I will also be utilizing birthplace data. The sample has been divided into 10 groups on the basis of the birthplace of the respondents. I have also constructed the educational attainment variable, which categorizes the population into six groups. They are as follows: high school dropouts (having less than 12 years of formal education), high school graduates, some college, college graduates, Master's degree holders, and persons with professional or PhD degrees.

Table 2.1 shows the educational attainment by gender for the years 1990 and 2000. In 1990, female enrollment in college topped male enrollment, though a lesser number of females completed their college degree and pursued further higher education. During the year 2000, we see a huge increase in the educational attainments of women. By the year 2000, more women had gone to college and acquired Master's degrees as compared to their male counterparts. Also, as compared to the earlier period, females had acquired higher-level PhD or professional degrees. Table 2.1 includes all persons regardless of their citizenship status and birthplace.

Table 2.2 examines the educational attainment by the citizen status during the years 1990 and 2000. During both time periods, naturalized citizens are clearly ahead of both the groups in terms of a higher level of educational attainment. In 1990, 15.60 percent of the naturalized citizens had acquired a college degree as compared to 14 and 10.5 percent, respectively, for natives and immigrants. Similarly, naturalized citizens did better than the other two groups for a Master's degree and a PhD or professional degree attainment. During the year 2000 again, naturalized citizens were seen to do well at the higher levels but a higher level of educational attainment was also seen in the case of the natives and immigrants. It should not come as a surprise that naturalized citizens have better levels of educational attainment than the natives or immigrants, firstly, because the process of naturalization favors more educated immigrants

(through programs like EB-1 Green Card), and secondly, because a majority of the naturalized citizens constitute a group of people who came to the U.S. either to acquire higher degrees or to work in highly skilled professions on an H1-B visa.

Table 2.3 summarizes the weekly wages and education by birthplace. There is a direct relationship between the level of education and wages. However, the differences in wages are also highly evident by the birthplace. In 1990, a typical worker born in South America, having the same level of education as someone born in Europe, was earning almost 25 percent less than his/her European counterpart. Similarly, Asian and African born workers were earning significantly less than their Canadian and European counterparts relative to their education attainment. In 2000, wages across the board improved, though a disparity is still clearly to be seen. Africans and Asians were still earning less than their European and Australian counterparts with similar levels of education.

Empirical Specification

One of the main focuses of this paper is to compare and contrast the labor market outcomes for natives, naturalized citizens and immigrants by gender and educational attainment. This would facilitate an assessment of how immigrants and natives are performing in the labor market within the same gender group and relatively to the opposite gender during the years 1990 and 2000. It is important to collate two data points, in my case 1990 and 2000, in order to determine the change, if any, in the labor market outcomes for the natives and immigrants.

I will be using the following specifications to achieve this:

$$\log(wage) = \beta_0 + \beta_1 x_1 + \beta_2 x_2 + \beta_3 x_3 + \beta_4 x_4 + \beta_5 x_5 + \beta_6 x_6 + \beta_7 x_7 + \upsilon$$

where x_1 is age of the person and x_2 is the age squared. The sex of the person is represented by the dummy variable x_3, where 0 represents male and 1 represents female. In order to determine how much work the natives and immigrants perform in the labor market, observations for the log of weeks worked during the preceding year (prior to the Census year) are captured by x_4. The number of own children is characterized by x_5. Marital status is captured by x_6. Martial status is divided into the following five categories: married but spouse present, separated, divorced, widowed, and never married. The education category is captured by x_7.

Estimation and Results

The regression estimation results are presented in Table 2.4. As one would expect, age has a positive effect on wages in all the three categories. However, a magnitude difference is seen across three citizenship status categories. More specifically, as natives aged by a year, they experienced a 5.6 percent increase in the wages in 1990 and 2000. Naturalized citizens, on the other hand, experienced a rise in wages by 4.5 percent in 1990, which declined to 4.3 percent in 2000. In 1990, there was an increase in wages for immigrants by 4.2 percent when they grew older by a year. However, this proportion of the increase declined to 3.9 percent in the year 2000.

As expected, age-square is seen to negatively influence the log of wages. The gender wage gap is significantly high for three categories. However, it varies significantly across the categories and declined for all the categories during the estimation period. Interestingly, a close examination revealed the least wage discrimination for immigrant women among all the categories, followed by naturalized citizens. Native women are seen to be the most discriminated against on the basis of gender, and the gender wage gap for native women stood at almost 33

percent in 1990, which declined somewhat to 28 percent in 2000. The possible explanation for this trend could be the actual level of female labor participation. The wage gap for immigrant women may be lower because of the higher participation due to visa requirements. Also, the immigrant population generally reflects homogeneity in terms of educational attainment. When immigrants are granted citizenship status, the visa requirements in terms of the number of working hours disappear. In that case, the naturalized citizen labor force participation would show the native's participation trend. Thus, lower participation and a similar level of educational attainment can explain the gender wage gap to some extent. Having children reduced the wages for all citizenship categories in 1990. For natives, having one more child resulted in a 1 percent reduction in wages in 1990 and about a 0.3 percent increase in 2000. The wages of naturalized citizens and immigrants declined by about 1.1 percent in 1990, and by about 0.7 percent and 0.6 percent, respectively in 2000. Longer periods of stay in the U.S. are associated with higher wages, as immigrants get assimilated into the local society over time. However, these gains can be seen to be declining over time. In 1990, naturalized citizens present in the U.S. for six years or more but for less than 10 years, experienced an increase of about 4.7 percent in wages as compared to a corresponding figure of 8.1 percent in the case of immigrants. In the case of longer stays, such as those extending between 11 to 15 years, the increase in wages was 15.2 percent and 16.6 percent, respectively for naturalized citizens and immigrants. This increasing trend in wages continues with the immigrants benefiting marginally more than naturalized citizens with an average stay of 21 years or more. While naturalized citizens experienced an increase in wages by 24.7 percent, immigrants experienced an increase of 26 percent. However, in 2000, the relative increase in wages associated with the duration of the worker's stay in the labor market decreased substantially for both the groups. This relative decline in the increase in

wages could be associated with the imposition of stricter requirements on the process of naturalization. Also, once the immigrants are granted citizenship, they may look for human capital more specific to the labor market, which may mean a longer wait for the returns to higher education, and in the short term, a lower level of participation in the labor market. This behavioral change could be justified by arguing that with citizenship, more employment avenues open up. Citizens would tend to take up employment that provides more job stability even if they lose some monetary benefits.

On the other hand, immigrants would look to maximize their monetary gains rather than maximizing job stability, as they are unsure whether they would be able to live in the host country forever. Here, we argue that the assimilation effect is stronger for both the groups but it alone cannot explain the trend. The above argument holds true in the data also, as we see that the acquisition of a PhD or some professional degree increases the wages earned by naturalized citizens more than that earned by immigrants during both the time periods under study. Tables 2.5 and 2.6 show the regression estimates by gender for 1990 and 2000. In 1990 naturalized citizens constantly benefit more than immigrants in terms of increase in wages after acquiring higher education compare to the person who has no education in higher education categories. However, we notice that a longer duration of stay is associated with a higher relative increase in wages for females than for males both in 1990 and 2000 for both the groups for first 15 years of stay. Immigrant women enjoy relatively higher increase than men for first 20 years of stay in United States for both the time periods. In 1990 an immigrant woman who has stayed in U.S. for more than 16 years but less than 21 years experience increase in wages by 21.2 percent, whereas, for immigrant men this increase in 18.7 percent. The corresponding figures for 2000 is 14.6 percent for immigrant women and 12.7 percent for men. This result is consistent with the

previous literature on assimilation which claims that women are assimilated at a faster pace than men in the labor market (Shamsuddin, 1998).

Birthplace Differences

This paper also investigates the birthplace differences among naturalized citizens and immigrants. Previous studies on birthplace differences have focused only on immigrants as a single group and have paid little attention to women in particular. One of the seminal studies on the European labor market confirms the presence of differences pertaining to country of origin for earnings (Chiswick and Adsera, 2007). Tables 2.7 and 2.8 show the regression estimates for male and female naturalized citizens respectively. All things being equal, in 1990, a naturalized Mexican male and a naturalized European male had the lowest increments in their wages as they grew older by a year. Canadian males experience an increase of 6.8 percent in wages, as they grew older by a year, in 1990, and an increase of 8.2 percent in 2000. Naturalized Canadian females, on the other hand, experienced lower increments in wages relative to their male counterpart and the estimates are statistically insignificant. On an average, naturalized females experienced lower returns to age relative to their male counterparts, regardless of their region of origin with the exception of Central America and Asia. Having one more child increased the wages for naturalized European males by 2.1 percent, while the estimates for all other regions of origin were statistically insignificant for the year 1990. In 2000, having one more child positively affected wages by 1.2 percent and 1.1 percent for Mexican and Asian males, respectively.

However, in the case of female naturalized citizens, having more children is seen to negatively affect wages. In 1990, having one more child reduced wages by 2.2 percent for a typical Mexican female, whereas the corresponding decline was much higher for females from

Central America at 4.5 percent. Europeans, Asians and females from the Australian and New Zealand regions also experienced a decline in their wages by 4 percent, 1.5 percent, and 2.8 percent, respectively. The effect of marital status on earnings and other labor market outcomes has been studied thoroughly for different markets, as for a paper on the Swedish market, Richardson (2000) reports a large marriage premium for men, and the marriage premium has not been declining as is popularly believed (Cohen, 2002). However, as far as I know, the marriage premium has not been compared or contrasted on the basis of citizenship status or more specifically, between naturalized citizens and immigrants. A larger marriage premium for males than for females can be observed and it is consistent with the previous studies (Goldin, 1990). However, a larger marriage premium can also be seen for naturalized citizens as compared to that for immigrants in Tables 2.9 and 2.10. Also, this premium is more concentrated in two categories, that is, 'married but spouse not present' and 'never married'. In 1990, a male naturalized citizen from Mexico earned 18.4 percent (Table 2.7) less wages than his married counterpart, while an immigrant from Mexico earned 14.2 percent (Table 2.11) less wages than his married counterpart. Caribbean males have the largest marriage premium in terms of relative magnitude. In 1990 a naturalized male from the Caribbean who was married but whose spouse was not present in the country of destination received about 35 percent (Table 2.7) less wages than their married counterparts. Male Caribbean immigrants received about 20 percent (Table 2.11) less wages than married Caribbean who were married and whose spouses were present in the household. Similar statistically significant marriage premiums can be observed for those who were married as compared to persons on the 'never married' category for most of the regions of origin. As regards the year 2000, Tables 2.13 and 2.14 show similar trends pertaining to marriage premium, as male naturalized citizens enjoy a higher premium than immigrants

across the regions of origin. The possible reason for this trend could be the fact that naturalized citizens, on an average, spend more time in the U.S. as compared to immigrants, and are thus more likely to be married. Also, it might be a possibility that the naturalization process favors more family-oriented people. An assessment of the impact of the length of stay in the U.S. indicates that for a majority of the regions of origin, the length of stay positively affects wages. However, in 2000, as per Table 2.6 if the length of stay was more than 21 years in the U.S., male immigrants male were being benefited more than male naturalized citizens. This trend was also observed for females in 1990 and 2000. For the first 20 years of stay in U.S. immigrant female enjoy higher relative increase in their wages compare to their male counterparts for both the time period.

Further, a lot has been said about the returns to education in the labor market in the U.S. Higher education results in higher wages, and this observation is also reflected in the analysis. We compare the returns to education on wages for naturalized citizens and for immigrants on the basis of their regions of origin for the years 1990 and 2000. While focusing on higher education levels, we also find that in most of the cases, naturalized citizens benefit in terms of earning higher wages, much more than immigrants for both the years under study. The gains are especially higher for Bachelor degree holders and beyond such as Master's degree holders and PhD or some professional degree holders. This result is consistent for both males and females in this analysis. This result also confirms that naturalized citizens not only enjoy constitutional rights but also command more privileges, such as higher returns of their education in the labor market. In terms of magnitude, Mexican immigrants and naturalized citizen experience the highest advantage.

Conclusion

In the U.S., immigration issues have been the subject of intense debate since very long, and are bound to lead to more discussions. The absolute number of immigrants in the country stands at an all-time high, as immigrants perceive this country as a land of opportunities. During the last few decades, both the profile as wells as the pattern of immigrants have changed dramatically. The U.S. also has one of the highest numbers of naturalized citizens. This paper attempts to analyze the effect of citizenship status on labor market outcomes. One of the focus points of this paper is an identification of gender and birthplace differences in labor market returns on the basis of the citizenship status. I report that naturalized citizens enjoy much higher returns to education but they also command higher marriage premiums. Interestingly, a reverse in trend is also seen when it comes to the effect of the length of stay in the U.S. Immigrant females are seen to earn higher wages after a long stay in the U.S. as compared to naturalized citizens.

Overall, it can be said that the assimilation effect takes place and assimilated immigrants (including naturalized citizens and immigrants with longer periods of stay in the U.S.) exhibit better labor market outcomes, though the assimilation argument alone cannot explain the trend that has been explored in this paper. Naturalized citizens who have some sense of job security may be indulging in human capital accumulation that pays in the long run, while on the other hand, immigrants look to maximize the monetary benefits and short-term gains. This paper has raised a few key issues, which need to be seriously considered for determining the factors that influence the labor market behavior of immigrants and naturalized citizens.

Tables

Table 2.1 Summary Statistics: Educational Attainment in 1990 and 2000

Education Category	**1990**			**2000**		
	Total	***Male***	***Female***	***Total***	***Male***	***Female***
Some High School	9.71	9.73	9.68	7.63	8.16	7.11
High School Graduates	35	33.18	36.71	32.72	33.08	32.38
Some College	27.91	26.97	28.79	30.09	28.32	31.8
College Degree	13.89	14.58	13.24	15.89	15.67	16.11
Master's Degree	4.66	4.99	4.35	5.63	5.45	5.81
Professional and PhD	2.32	3.34	1.36	2.66	3.36	1.99

Table 2.2 Summary Statistics: Education by Citizenship Status in 1990 and 2000

Education Category	**1990**			**2000**		
	Native	***NCitizen***	***Immigrant***	***Native***	***NCitizen***	***Immigrant***
Some High School	9.78	7.21	10.09	7.33	6.8	11.41
High School Graduates	35.99	26.71	24.42	33.82	25.75	25.6
Some College	28.62	24.82	18.35	31.71	25.51	15.73
College Degree	14.02	15.6	10.52	16.22	17.52	11.17
Master's Degree	4.62	5.96	4.45	5.62	6.57	5.08
Professional and PhD	2.19	4.54	3.01	2.47	4.6	3.39

Table 2.3: Weekly Wages and Education by Birthplace in 1990 and 2000

	1990		2000	
	Wages ($)	Education	Wages ($)	Education
U.S. Born	476	3.59	722	3.77
Canada	557	3.83	975	4.23
Mexico	315	1.87	493	2.02
C. America	340	2.57	515	2.50
Caribbean	457	3.11	659	3.26
South America	452	3.56	658	3.63
Europe	556	3.56	836	3.97
Asia	521	3.91	830	4.12
Africa	562	4.49	830	4.25
AUS & NZ	615	4.25	1064	4.34
Others	435	2.96	667	3.26
Total	475	3.55	718	3.70

Source: Author's calculation from US Census 1990 and 2000

Note: Education variable is coded as following.

No Schooling=0, Completed Middle School=1, Some High School=2, High School Graduate or GED=3, Some College=4, Graduate=5, Master's=6, PhD or Professional Degree=7.

Table 2.4 Estimation by citizenship status for year 1990 and 2000

VARIABLES	(1990) Native	(1990) Naturalized Citizen	(1990) Immigrants	(2000) Native	(2000) Naturalized Citizen	(2000) Immigrants
Age	0.056***	0.045***	0.042***	0.056***	0.043***	0.039***
	(0.000)	(0.003)	(0.002)	(0.000)	(0.002)	(0.002)
Age-square	-0.001***	-0.000***	-0.000***	-0.001***	-0.000***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex	-0.332***	-0.308***	-0.252***	-0.279***	-0.229***	-0.227***
	(0.001)	(0.007)	(0.006)	(0.001)	(0.005)	(0.005)
Log of Weeks	0.037***	-0.048***	-0.053***	-0.053***	-0.147***	-0.118***
	(0.001)	(0.007)	(0.005)	(0.001)	(0.006)	(0.004)
Number of Children	-0.010***	-0.011***	-0.011***	0.003***	-0.007***	-0.006***
	(0.001)	(0.003)	(0.003)	(0.001)	(0.002)	(0.002)
Married no spouse	-0.148***	-0.179***	-0.193***	-0.204***	-0.155***	-0.172***
	(0.006)	(0.021)	(0.012)	(0.005)	(0.015)	(0.009)
Separated	-0.114***	-0.100***	-0.115***	-0.130***	-0.112***	-0.103***
	(0.004)	(0.022)	(0.016)	(0.004)	(0.016)	(0.013)
Divorced	-0.062***	-0.064***	-0.062***	-0.075***	-0.048***	-0.041***
	(0.002)	(0.013)	(0.013)	(0.002)	(0.010)	(0.011)
Widowed	-0.093***	-0.061***	-0.081***	-0.093***	-0.056***	-0.070***
	(0.005)	(0.023)	(0.025)	(0.005)	(0.020)	(0.023)
Never Married	-0.130***	-0.128***	-0.129***	-0.128***	-0.102***	-0.112***
	(0.002)	(0.012)	(0.008)	(0.002)	(0.009)	(0.007)
6-10 years in US		0.047**	0.081***		-0.011	0.085***
		(0.021)	(0.008)		(0.019)	(0.007)
11-15 years in US		0.152***	0.166***		0.060***	0.122***
		(0.020)	(0.009)		(0.018)	(0.007)
16-20 years in US		0.183***	0.199***		0.091***	0.137***
		(0.020)	(0.010)		(0.018)	(0.008)
21+ years in US		0.247***	0.260***		0.174***	0.214***
		(0.020)	(0.010)		(0.017)	(0.008)
Middle School	0.006	0.091***	0.002	0.007	0.009	-0.020*
	(0.013)	(0.024)	(0.014)	(0.013)	(0.019)	(0.011)
High School Drop	0.111***	0.187***	0.129***	0.070***	0.069***	0.056***
	(0.013)	(0.026)	(0.016)	(0.012)	(0.020)	(0.012)
High School Degree	0.290***	0.315***	0.237***	0.238***	0.192***	0.171***
	(0.013)	(0.023)	(0.014)	(0.012)	(0.018)	(0.011)
Some College	0.446***	0.470***	0.392***	0.406***	0.389***	0.355***
	(0.013)	(0.023)	(0.014)	(0.012)	(0.018)	(0.012)
Graduate Degree	0.718***	0.722***	0.643***	0.719***	0.685***	0.707***
	(0.013)	(0.023)	(0.015)	(0.012)	(0.018)	(0.012)
Master's Degree	0.868***	0.886***	0.747***	0.866***	0.877***	0.898***
	(0.013)	(0.025)	(0.018)	(0.012)	(0.020)	(0.014)
Professional or PhD	0.975***	1.122***	0.810***	1.011***	1.043***	0.793***
	(0.014)	(0.027)	(0.020)	(0.013)	(0.021)	(0.016)
Constant	0.945***	1.359***	1.401***	1.554***	2.130***	2.020***
	(0.016)	(0.061)	(0.045)	(0.015)	(0.051)	(0.037)
Observations	966,256	38,158	53,744	1,059,398	65,198	86,872
R-squared	0.213	0.238	0.185	0.208	0.209	0.189

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.5 Estimates by citizenship status for 1990

VARIABLES	(1) Native	(2) Native Male	(3) Native Female	(4) Naturalized	(5) Nat. Male	(6) Nat. Female	(7) Immigrants	(8) Im. Male	(9) Im.Female
Age	0.056***	0.064***	0.055***	0.045***	0.053***	0.043***	0.042***	0.052***	0.032***
	(0.000)	(0.001)	(0.001)	(0.003)	(0.004)	(0.003)	(0.002)	(0.003)	(0.003)
Age-square	-0.001***	-0.001***	-0.001***	-0.000***	-0.001***	-0.000***	-0.000***	-0.001***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex	-0.332***			-0.308***			-0.252***		
	(0.001)			(0.007)			(0.006)		
Log of weeks	0.037***	-0.013***	0.047***	-0.048***	-0.106***	-0.018**	-0.053***	-0.088***	-0.026***
	(0.001)	(0.002)	(0.002)	(0.007)	(0.011)	(0.009)	(0.005)	(0.007)	(0.007)
Number of children	-0.010***	0.009***	-0.042***	-0.011***	-0.011***	-0.026***	-0.011***	-0.016***	-0.012***
	(0.001)	(0.001)	(0.001)	(0.003)	(0.004)	(0.004)	(0.003)	(0.003)	(0.004)
Married no spouse	-0.148***	-0.229***	-0.052***	-0.179***	-0.271***	-0.032	-0.193***	-0.261***	-0.074***
	(0.006)	(0.009)	(0.009)	(0.021)	(0.027)	(0.033)	(0.012)	(0.015)	(0.022)
Separated	-0.114***	-0.172***	-0.046***	-0.100***	-0.191***	-0.032	-0.115***	-0.174***	-0.054**
	(0.004)	(0.007)	(0.005)	(0.022)	(0.037)	(0.028)	(0.016)	(0.024)	(0.021)
Divorced	-0.062***	-0.153***	0.024***	-0.064***	-0.184***	0.026*	-0.062***	-0.131***	0.009
	(0.002)	(0.004)	(0.003)	(0.013)	(0.022)	(0.016)	(0.013)	(0.019)	(0.017)
Widowed	-0.093***	-0.143***	-0.000	-0.061***	-0.084	0.017	-0.081***	-0.125**	-0.014
	(0.005)	(0.012)	(0.006)	(0.023)	(0.057)	(0.025)	(0.025)	(0.055)	(0.028)
Never married	-0.130***	-0.220***	-0.023***	-0.128***	-0.208***	-0.030*	-0.129***	-0.189***	-0.042***
	(0.002)	(0.003)	(0.003)	(0.012)	(0.016)	(0.017)	(0.008)	(0.011)	(0.013)
6-10 years in US				0.047**	0.030	0.052	0.081***	0.073***	0.097***
				(0.021)	(0.027)	(0.032)	(0.008)	(0.010)	(0.012)
11-15 years in US				0.152***	0.133***	0.147***	0.166***	0.156***	0.179***
				(0.020)	(0.027)	(0.031)	(0.009)	(0.012)	(0.014)
16-20 years in US				0.183***	0.185***	0.146***	0.199***	0.187***	0.212***
				(0.020)	(0.027)	(0.031)	(0.010)	(0.014)	(0.016)
21+ years in US				0.247***	0.294***	0.165***	0.260***	0.292***	0.230***
				(0.020)	(0.026)	(0.030)	(0.010)	(0.014)	(0.015)
Middle School	0.006	0.001	0.001	0.091***	0.096***	0.086**	0.002	0.016	-0.021
	(0.013)	(0.017)	(0.021)	(0.024)	(0.031)	(0.037)	(0.014)	(0.017)	(0.023)
High School Drop	0.111***	0.148***	0.078***	0.187***	0.233***	0.131***	0.129***	0.156***	0.087***
	(0.013)	(0.017)	(0.020)	(0.026)	(0.034)	(0.039)	(0.016)	(0.020)	(0.025)
High School Degree	0.290***	0.332***	0.263***	0.315***	0.358***	0.271***	0.237***	0.249***	0.218***
	(0.013)	(0.017)	(0.020)	(0.023)	(0.030)	(0.035)	(0.014)	(0.018)	(0.022)
Some College	0.446***	0.453***	0.440***	0.470***	0.468***	0.449***	0.392***	0.384***	0.386***
	(0.013)	(0.017)	(0.020)	(0.023)	(0.030)	(0.035)	(0.014)	(0.018)	(0.023)
Graduate Degree	0.718***	0.705***	0.721***	0.722***	0.707***	0.711***	0.643***	0.630***	0.641***
	(0.013)	(0.017)	(0.020)	(0.023)	(0.030)	(0.036)	(0.015)	(0.020)	(0.024)
Master's Degree	0.868***	0.800***	0.930***	0.886***	0.874***	0.875***	0.747***	0.742***	0.735***
	(0.013)	(0.017)	(0.020)	(0.025)	(0.033)	(0.040)	(0.018)	(0.022)	(0.030)
Professional or PhD	0.975***	0.972***	0.946***	1.122***	1.120***	1.065***	0.810***	0.816***	0.756***
	(0.014)	(0.017)	(0.021)	(0.027)	(0.034)	(0.044)	(0.020)	(0.024)	(0.036)
Constant	0.945***	0.599***	0.350***	1.359***	1.072***	0.784***	1.401***	1.107***	1.023***
	(0.016)	(0.022)	(0.024)	(0.061)	(0.086)	(0.084)	(0.045)	(0.060)	(0.066)
Observations	966,256	506,004	460,252	38,158	20,152	18,006	53,744	31,827	21,917
R-squared	0.213	0.202	0.155	0.238	0.254	0.158	0.185	0.195	0.138

Table 2.6 Estimates by citizen status for the year 2000

VARIABLES	(1) Native	(2) Native Male	(3) Native Female	(4) Naturalized	(5) Nat. Male	(6) Nat. Female	(7) Immigrants	(8) Im. Male	(9) Im. Female
Age	0.056***	0.059***	0.058***	0.043***	0.045***	0.043***	0.039***	0.045***	0.034***
	(0.000)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)	(0.002)	(0.002)	(0.003)
Age-square	-0.001***	-0.001***	-0.001***	-0.000***	-0.000***	-0.000***	-0.000***	-0.001***	-0.000***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Sex	-0.279***			-0.229***			-0.227***		
	(0.001)			(0.005)			(0.005)		
Log of weeks	-0.053***	-0.094***	-0.041***	-0.147***	-0.198***	-0.118***	-0.118***	-0.155***	-0.086***
	(0.001)	(0.002)	(0.002)	(0.006)	(0.009)	(0.007)	(0.004)	(0.006)	(0.006)
Number of children	0.003***	0.020***	-0.025***	-0.007***	-0.006*	-0.018***	-0.006***	-0.001	-0.022***
	(0.001)	(0.001)	(0.001)	(0.002)	(0.003)	(0.003)	(0.002)	(0.003)	(0.003)
Married no spouse	-0.204***	-0.284***	-0.102***	-0.155***	-0.230***	-0.064***	-0.172***	-0.236***	-0.022
	(0.005)	(0.007)	(0.007)	(0.015)	(0.020)	(0.022)	(0.009)	(0.011)	(0.018)
Separated	-0.130***	-0.196***	-0.061***	-0.112***	-0.152***	-0.075***	-0.103***	-0.146***	-0.051***
	(0.004)	(0.007)	(0.005)	(0.016)	(0.028)	(0.020)	(0.013)	(0.019)	(0.018)
Divorced	-0.075***	-0.163***	0.006**	-0.048***	-0.131***	0.012	-0.041***	-0.114***	0.036**
	(0.002)	(0.003)	(0.003)	(0.010)	(0.016)	(0.012)	(0.011)	(0.016)	(0.015)
Widowed	-0.093***	-0.183***	-0.021***	-0.056***	-0.069	-0.022	-0.070***	-0.119***	-0.026
	(0.005)	(0.011)	(0.006)	(0.020)	(0.049)	(0.021)	(0.023)	(0.043)	(0.026)
Never Married	-0.128***	-0.218***	-0.031***	-0.102***	-0.182***	-0.028**	-0.112***	-0.162***	-0.033***
	(0.002)	(0.003)	(0.003)	(0.009)	(0.013)	(0.012)	(0.007)	(0.009)	(0.011)
6-10 years in US				-0.011	-0.026	0.002	0.085***	0.077***	0.100***
				(0.019)	(0.026)	(0.027)	(0.007)	(0.008)	(0.010)
11-15 years in US				0.060***	0.048*	0.068***	0.122***	0.109***	0.139***
				(0.018)	(0.025)	(0.026)	(0.007)	(0.009)	(0.012)
16-20 years in US				0.091***	0.081***	0.097***	0.137***	0.127***	0.146***
				(0.018)	(0.024)	(0.025)	(0.008)	(0.011)	(0.013)
21+ years in US				0.174***	0.188***	0.156***	0.214***	0.215***	0.208***
				(0.017)	(0.024)	(0.025)	(0.008)	(0.011)	(0.013)
Middle School	0.007	0.037**	-0.052**	0.009	0.027	-0.015	-0.020*	-0.003	-0.049**
	(0.013)	(0.017)	(0.021)	(0.019)	(0.025)	(0.029)	(0.011)	(0.014)	(0.019)
High School Drop	0.070***	0.122***	-0.008	0.069***	0.087***	0.050*	0.056***	0.075***	0.018
	(0.012)	(0.016)	(0.019)	(0.020)	(0.027)	(0.030)	(0.012)	(0.015)	(0.021)
High School Degree	0.238***	0.288***	0.172***	0.192***	0.214***	0.176***	0.171***	0.179***	0.147***
	(0.012)	(0.016)	(0.019)	(0.018)	(0.024)	(0.027)	(0.011)	(0.014)	(0.019)
Some College	0.406***	0.427***	0.361***	0.389***	0.369***	0.406***	0.355***	0.341***	0.347***
	(0.012)	(0.016)	(0.019)	(0.018)	(0.024)	(0.027)	(0.012)	(0.015)	(0.019)
Graduate Degree	0.719***	0.734***	0.673***	0.685***	0.655***	0.712***	0.707***	0.726***	0.658***
	(0.012)	(0.016)	(0.019)	(0.018)	(0.024)	(0.027)	(0.012)	(0.016)	(0.020)
Master's Degree	0.866***	0.836***	0.856***	0.877***	0.878***	0.871***	0.898***	0.932***	0.813***
	(0.012)	(0.016)	(0.019)	(0.020)	(0.026)	(0.030)	(0.014)	(0.018)	(0.024)
Professional or PhD	1.011***	1.033***	0.940***	1.043***	1.061***	0.995***	0.793***	0.824***	0.699***
	(0.013)	(0.016)	(0.020)	(0.021)	(0.027)	(0.033)	(0.016)	(0.019)	(0.027)
Constant	1.554***	1.347***	0.988***	2.130***	2.064***	1.561***	2.020***	1.849***	1.560***
	(0.015)	(0.021)	(0.023)	(0.051)	(0.073)	(0.069)	(0.037)	(0.048)	(0.057)
Observations	1,059,398	542,928	516,470	65,198	33,768	31,430	86,872	53,664	33,208
R-squared	0.208	0.205	0.170	0.209	0.209	0.181	0.189	0.203	0.153

Table 2.7 Regression estimates by birthplace for male naturalized citizen, 1990

VARIABLES	(1) Canada	(2) Mexico	(3) C America	(4) Caribbean	(5) S America	(6) Europe	(7) Asia	(8) Africa	(9) Aus & NZ	(10) Others
Age	0.068***	0.035***	0.053***	0.054***	0.067***	0.036***	0.060***	0.102***	-0.104	0.027
	(0.022)	(0.009)	(0.019)	(0.012)	(0.016)	(0.007)	(0.007)	(0.030)	(0.108)	(0.019)
Age-square	-0.001***	-0.000***	-0.001***	-0.001***	-0.001***	-0.000***	-0.001***	-0.001***	0.001	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Number of children	0.013	0.003	0.032	-0.000	0.034	0.021**	-0.007	0.014	-0.039	0.001
	(0.029)	(0.009)	(0.023)	(0.016)	(0.022)	(0.009)	(0.008)	(0.035)	(0.120)	(0.027)
Married no spouse	0.409	-0.270***	-0.223**	-0.349***	-0.052	-0.218***	-0.074	0.001	-1.060	-0.244**
	(0.338)	(0.050)	(0.110)	(0.099)	(0.131)	(0.080)	(0.051)	(0.254)	(0.844)	(0.097)
Separated	0.135	-0.287***	0.107	-0.186*	-0.157	-0.098	-0.136*	-0.115		-0.163
	(0.191)	(0.082)	(0.155)	(0.096)	(0.154)	(0.080)	(0.079)	(0.278)		(0.159)
Divorced	-0.203**	-0.127**	0.007	-0.065	-0.116	-0.159***	-0.206***	-0.285**	-0.158	-0.239**
	(0.103)	(0.063)	(0.130)	(0.065)	(0.082)	(0.038)	(0.046)	(0.144)	(0.522)	(0.117)
Widowed	0.465	-0.304**	0.110	0.151	-0.466	0.012	-0.183			0.063
	(0.448)	(0.138)	(0.262)	(0.190)	(0.449)	(0.093)	(0.116)			(0.263)
Never Married	-0.187*	-0.184***	-0.065	-0.189***	-0.077	-0.256***	-0.148***	-0.109	-1.836**	-0.153*
	(0.103)	(0.038)	(0.080)	(0.054)	(0.074)	(0.034)	(0.029)	(0.127)	(0.654)	(0.089)
6-10 years in US	-0.049	0.047	-0.034	-0.014	-0.138	-0.008	0.058	-0.099		0.020
	(0.310)	(0.046)	(0.114)	(0.104)	(0.106)	(0.081)	(0.052)	(0.187)		(0.123)
11-15 years in US	0.049	0.181***	0.046	0.019	-0.025	0.015	0.174***	0.136	-1.061	0.156
	(0.256)	(0.047)	(0.119)	(0.106)	(0.105)	(0.077)	(0.051)	(0.192)	(0.818)	(0.124)
16-20 years in US	0.234	0.212***	0.076	0.157	-0.002	0.084	0.216***	0.202	-0.016	0.140
	(0.245)	(0.049)	(0.123)	(0.100)	(0.101)	(0.075)	(0.052)	(0.190)	(0.643)	(0.124)
21+ years in US	0.177	0.316***	0.247**	0.211**	0.152	0.132*	0.309***	0.251	0.003	0.208*
	(0.217)	(0.049)	(0.122)	(0.096)	(0.098)	(0.072)	(0.053)	(0.189)	(0.507)	(0.118)
Middle School	2.180***	0.072*	-0.183	0.010	-0.090	0.060	-0.119	-1.153*		0.035
	(0.412)	(0.041)	(0.148)	(0.144)	(0.227)	(0.083)	(0.084)	(0.629)		(0.170)
High School Drop	2.122***	0.271***	-0.044	0.110	0.051	0.047	-0.020	-1.421**		-0.028
	(0.401)	(0.048)	(0.159)	(0.148)	(0.221)	(0.086)	(0.086)	(0.592)		(0.173)
High School Degree	2.219***	0.308***	-0.055	0.241*	0.159	0.168**	0.109	-0.931*		0.179
	(0.389)	(0.045)	(0.143)	(0.138)	(0.205)	(0.080)	(0.073)	(0.523)		(0.155)
Some College	2.352***	0.465***	0.201	0.299**	0.244	0.243***	0.248***	-0.749	-0.474	0.278*
	(0.387)	(0.050)	(0.146)	(0.139)	(0.205)	(0.080)	(0.072)	(0.516)	(0.521)	(0.158)
Graduate Degree	2.559***	0.544***	0.249	0.612***	0.478**	0.475***	0.493***	-0.557	-0.779	0.494***
	(0.390)	(0.073)	(0.163)	(0.141)	(0.208)	(0.081)	(0.072)	(0.516)	(0.533)	(0.166)
Master's Degree	2.671***	0.793***	0.506**	0.725***	0.583***	0.573***	0.738***	-0.576	0.585	0.310
	(0.401)	(0.119)	(0.210)	(0.154)	(0.218)	(0.084)	(0.074)	(0.520)	(0.632)	(0.191)
Professional or PhD	2.916***	0.836***	0.825***	0.876***	0.897***	0.852***	0.991***	-0.187	0.779	0.505**
	(0.399)	(0.123)	(0.206)	(0.148)	(0.215)	(0.086)	(0.075)	(0.520)	(0.696)	(0.213)
Constant	-1.542**	0.940***	1.079***	0.902***	0.630	1.397***	0.770***	0.821	6.033**	1.203***
	(0.642)	(0.169)	(0.403)	(0.301)	(0.386)	(0.183)	(0.157)	(0.793)	(2.476)	(0.414)
Observations	679	3,189	617	2,059	952	5,505	6,050	420	28	653
R-squared	0.203	0.172	0.206	0.165	0.239	0.147	0.278	0.295	0.730	0.163

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.8 Regression estimates by birthplace for female naturalized citizen, 1990

VARIABLES	(1) Canada	(2) Mexico	(3) C America	(4) Caribbean	(5) S America	(6) Europe	(7) Asia	(8) Africa	(9) Aus & NZ	(10) Others
Age	0.029	0.032***	0.047***	0.039***	0.041***	0.029***	0.056***	0.030	0.097	0.057***
	(0.018)	(0.011)	(0.017)	(0.010)	(0.015)	(0.007)	(0.007)	(0.037)	(0.096)	(0.021)
Age-square	-0.000	-0.000***	-0.001***	-0.000***	-0.000**	-0.000***	-0.001***	-0.000	-0.001	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Number of children	-0.020	-0.022*	-0.045**	0.001	0.012	-0.040***	-0.015*	0.046	-0.278*	0.014
	(0.027)	(0.011)	(0.022)	(0.013)	(0.021)	(0.010)	(0.008)	(0.048)	(0.147)	(0.022)
Married no spouse	0.076	0.028	0.076	0.018	-0.056	-0.159*	-0.001	-0.008		-0.162
	(0.256)	(0.102)	(0.146)	(0.078)	(0.130)	(0.087)	(0.053)	(0.427)		(0.123)
Separated	0.249	-0.094	0.004	-0.019	-0.056	0.015	-0.020	-0.018		-0.032
	(0.175)	(0.067)	(0.096)	(0.064)	(0.112)	(0.059)	(0.059)	(0.249)		(0.152)
Divorced	0.116*	-0.004	0.151**	0.045	0.044	0.014	0.045	-0.140	-0.094	-0.057
	(0.066)	(0.052)	(0.073)	(0.038)	(0.062)	(0.028)	(0.035)	(0.162)	(0.378)	(0.097)
Widowed	0.058	-0.190**	-0.011	-0.032	0.176	0.044	0.051	-0.527*	0.392	0.251*
	(0.108)	(0.087)	(0.134)	(0.068)	(0.120)	(0.039)	(0.054)	(0.292)	(0.654)	(0.136)
Never Married	0.027	-0.083*	-0.231***	0.027	0.072	-0.041	-0.032	-0.124	-0.499	0.236***
	(0.084)	(0.048)	(0.076)	(0.040)	(0.068)	(0.039)	(0.029)	(0.162)	(0.542)	(0.089)
6-10 years in US	-0.132	0.079	-0.050	0.106	0.063	-0.041	0.047	0.315	0.539	0.087
	(0.267)	(0.080)	(0.117)	(0.100)	(0.118)	(0.096)	(0.053)	(0.264)	(1.198)	(0.137)
11-15 years in US	-0.355	0.127	0.148	0.128	0.168	0.062	0.163***	0.490*		0.094
	(0.252)	(0.078)	(0.116)	(0.099)	(0.116)	(0.091)	(0.052)	(0.262)		(0.136)
16-20 years in US	-0.155	0.118	0.256**	0.128	0.171	0.088	0.150***	0.435	0.772	0.063
	(0.249)	(0.076)	(0.116)	(0.094)	(0.113)	(0.089)	(0.053)	(0.263)	(0.926)	(0.134)
21+ years in US	-0.247	0.209***	0.282**	0.166*	0.201*	0.087	0.189***	0.564**	0.796	0.225*
	(0.228)	(0.075)	(0.116)	(0.092)	(0.110)	(0.086)	(0.054)	(0.264)	(0.875)	(0.129)
Middle School	-0.410	0.082	0.057	0.131	0.151	0.073	-0.153*	0.090		0.262
	(0.650)	(0.058)	(0.146)	(0.181)	(0.264)	(0.106)	(0.080)	(0.791)		(0.169)
High School Drop	-0.314	0.087	-0.135	0.126	0.153	0.087	-0.087	0.581		0.163
	(0.630)	(0.069)	(0.152)	(0.184)	(0.262)	(0.108)	(0.081)	(0.799)		(0.171)
High School Degree	-0.151	0.290***	0.054	0.254	0.281	0.149	0.017	0.395	-0.785	0.414***
	(0.624)	(0.062)	(0.136)	(0.176)	(0.253)	(0.103)	(0.073)	(0.731)	(0.755)	(0.151)
Some College	0.047	0.423***	0.098	0.415**	0.427*	0.309***	0.258***	0.404	-0.469	0.488***
	(0.623)	(0.064)	(0.137)	(0.176)	(0.253)	(0.103)	(0.073)	(0.728)	(0.745)	(0.153)
Graduate Degree	0.347	0.676***	0.317**	0.641***	0.690***	0.515***	0.506***	0.705	0.099	0.824***
	(0.625)	(0.089)	(0.153)	(0.178)	(0.255)	(0.105)	(0.073)	(0.728)	(0.852)	(0.160)
Master's Degree	0.498	1.077***	0.701***	0.938***	0.815***	0.669***	0.643***	1.110	-0.367	0.929***
	(0.628)	(0.167)	(0.183)	(0.183)	(0.264)	(0.108)	(0.078)	(0.743)	(0.777)	(0.193)
Professional or PhD	0.607	0.649***	0.665**	0.854***	0.613**	0.823***	1.000***	0.945		1.361***
	(0.632)	(0.224)	(0.299)	(0.192)	(0.279)	(0.116)	(0.082)	(0.747)		(0.260)
Constant	1.631**	0.869***	1.003***	0.864***	0.713*	1.255***	0.724***	0.543	0.359	0.209
	(0.764)	(0.221)	(0.374)	(0.268)	(0.387)	(0.196)	(0.151)	(1.077)	(2.345)	(0.430)
Observations	705	1,907	636	2,160	927	4,995	5,808	225	37	606
R-squared	0.160	0.116	0.160	0.130	0.123	0.093	0.186	0.208	0.255	0.173

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.9 Regression estimates by birthplace for male naturalized citizen, 2000

VARIABLES	(1) Canada	(2) Mexico	(3) C America	(4) Caribbean	(5) S America	(6) Europe	(7) Asia	(8) Africa	(9) Aus & NZ	(10) Others
Age	0.082***	0.038***	0.022*	0.062***	0.048***	0.038***	0.043***	0.045**	0.095	0.091**
	(0.023)	(0.006)	(0.013)	(0.009)	(0.012)	(0.007)	(0.005)	(0.021)	(0.086)	(0.044)
Age-square	-0.001***	-0.000***	-0.000*	-0.001***	-0.001***	-0.000***	-0.000***	-0.000**	-0.001	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Number of children	-0.026	0.012*	0.001	-0.004	-0.003	0.001	0.011*	-0.010	0.119	0.006
	(0.029)	(0.006)	(0.015)	(0.011)	(0.014)	(0.010)	(0.006)	(0.019)	(0.128)	(0.038)
Married no spouse	0.058	-0.174***	-0.229***	-0.217***	-0.319***	-0.218***	-0.128***	-0.227*	-0.309	-0.443
	(0.269)	(0.035)	(0.084)	(0.058)	(0.082)	(0.072)	(0.037)	(0.118)	(0.678)	(0.360)
Separated	-0.249	-0.218***	-0.076	-0.062	-0.137	-0.201***	-0.023	-0.050		0.249
	(0.243)	(0.053)	(0.088)	(0.064)	(0.090)	(0.074)	(0.066)	(0.134)		(0.544)
Divorced	-0.224**	-0.140***	-0.030	-0.130***	-0.090	-0.176***	-0.033	-0.152*	0.276	-0.144
	(0.094)	(0.035)	(0.066)	(0.042)	(0.055)	(0.035)	(0.033)	(0.080)	(0.442)	(0.217)
Widowed	-0.597	-0.072	-0.118	0.038	-0.075	-0.061	-0.033	0.089		0.851
	(0.459)	(0.104)	(0.194)	(0.140)	(0.171)	(0.097)	(0.103)	(0.247)		(0.750)
Never Married	-0.212**	-0.171***	-0.131**	-0.086**	-0.244***	-0.230***	-0.109***	-0.152*	0.012	-0.209
	(0.102)	(0.026)	(0.053)	(0.041)	(0.051)	(0.035)	(0.023)	(0.082)	(0.303)	(0.225)
6-10 years in US	0.231	-0.066	-0.031	-0.050	0.053	0.012	-0.087*	0.259**	-0.646	0.294
	(0.226)	(0.046)	(0.112)	(0.090)	(0.104)	(0.069)	(0.051)	(0.128)	(0.691)	(0.292)
11-15 years in US	0.152	0.041	0.065	-0.000	0.068	0.103	0.012	0.359***	-0.965	0.214
	(0.235)	(0.041)	(0.102)	(0.086)	(0.096)	(0.069)	(0.050)	(0.123)	(0.694)	(0.278)
16-20 years in US	0.107	0.059	0.064	0.008	0.132	0.129*	0.083*	0.315***	-0.631	0.123
	(0.217)	(0.041)	(0.101)	(0.085)	(0.095)	(0.069)	(0.049)	(0.122)	(0.546)	(0.256)
21+ years in US	-0.003	0.118***	0.212**	0.170**	0.213**	0.204***	0.168***	0.447***	-0.677	0.374
	(0.197)	(0.039)	(0.103)	(0.084)	(0.094)	(0.064)	(0.049)	(0.122)	(0.622)	(0.240)
Middle School	-0.079	-0.005	-0.157*	-0.044	0.006	0.061	0.039	0.420		0.501
	(0.816)	(0.031)	(0.089)	(0.110)	(0.148)	(0.104)	(0.066)	(0.402)		(0.478)
High School Drop	0.158	0.053	-0.066	0.005	0.068	0.034	0.063	0.028		0.352
	(0.803)	(0.034)	(0.093)	(0.108)	(0.148)	(0.106)	(0.064)	(0.372)		(0.465)
High School Degree	0.416	0.143***	0.018	0.115	0.126	0.152	0.240***	-0.000	0.527	0.284
	(0.793)	(0.032)	(0.084)	(0.100)	(0.130)	(0.099)	(0.054)	(0.334)	(0.742)	(0.423)
Some College	0.565	0.299***	0.145*	0.228**	0.243*	0.307***	0.416***	0.105	0.689	0.365
	(0.792)	(0.034)	(0.086)	(0.100)	(0.130)	(0.099)	(0.054)	(0.332)	(0.733)	(0.424)
Graduate Degree	0.945	0.478***	0.298***	0.503***	0.462***	0.534***	0.730***	0.332	1.046	0.730
	(0.793)	(0.048)	(0.097)	(0.103)	(0.133)	(0.099)	(0.054)	(0.332)	(0.720)	(0.457)
Master's Degree	1.052	0.568***	0.593***	0.682***	0.766***	0.673***	0.999***	0.426	1.028	0.818
	(0.795)	(0.084)	(0.126)	(0.113)	(0.141)	(0.101)	(0.056)	(0.333)	(0.846)	(0.547)
Professional or PhD	1.133	0.746***	0.569***	0.749***	0.985***	0.838***	1.202***	0.798**	1.718**	1.025**
	(0.796)	(0.079)	(0.142)	(0.113)	(0.143)	(0.103)	(0.056)	(0.334)	(0.814)	(0.506)
Constant	0.451	1.531***	2.044***	1.109***	1.347***	1.554***	1.315***	1.234**	0.386	0.240
	(0.926)	(0.130)	(0.285)	(0.231)	(0.290)	(0.194)	(0.130)	(0.543)	(1.918)	(1.023)
Observations	747	7,230	1,607	3,384	1,985	5,559	11,922	1,121	43	170
R-squared	0.176	0.089	0.101	0.150	0.181	0.152	0.219	0.173	0.583	0.183

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.10 Regression estimates by birthplace for female naturalized citizen, 2000

VARIABLES	(1) Canada	(2) Mexico	(3) C America	(4) Caribbean	(5) S America	(6) Europe	(7) Asia	(8) Africa	(9) Aus & NZ	(10) Others
Age	0.026	0.018**	0.048***	0.058***	0.038***	0.031***	0.042***	0.025	0.012	0.003
	(0.019)	(0.007)	(0.012)	(0.008)	(0.011)	(0.007)	(0.005)	(0.022)	(0.092)	(0.045)
Age-square	-0.000	-0.000**	-0.001***	-0.001***	-0.000***	-0.000***	-0.000***	-0.000	-0.000	-0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Number of children	-0.048*	-0.001	-0.055***	-0.013	-0.004	-0.008	-0.007	-0.025	-0.065	-0.012
	(0.029)	(0.007)	(0.014)	(0.010)	(0.014)	(0.010)	(0.006)	(0.023)	(0.168)	(0.042)
Married no spouse	-0.156	-0.011	-0.024	-0.044	-0.058	-0.017	-0.132***	-0.017		0.865**
	(0.257)	(0.055)	(0.086)	(0.054)	(0.086)	(0.072)	(0.037)	(0.147)		(0.384)
Separated	-0.160	-0.019	-0.090	0.008	-0.228***	-0.129**	-0.059	-0.148		-0.135
	(0.171)	(0.042)	(0.061)	(0.044)	(0.070)	(0.061)	(0.047)	(0.120)		(0.274)
Divorced	0.001	0.073**	0.003	0.015	0.032	0.005	0.004	-0.125	-0.215	-0.074
	(0.068)	(0.032)	(0.047)	(0.030)	(0.040)	(0.026)	(0.023)	(0.082)	(0.327)	(0.170)
Widowed	0.056	-0.066	0.071	0.025	0.006	-0.003	-0.046	0.231	-0.687	0.161
	(0.130)	(0.054)	(0.114)	(0.065)	(0.084)	(0.042)	(0.038)	(0.147)	(0.603)	(0.471)
Never Married	-0.098	0.013	-0.067	-0.038	-0.103**	0.012	-0.020	-0.246***	-0.268	-0.277
	(0.089)	(0.030)	(0.046)	(0.033)	(0.046)	(0.035)	(0.020)	(0.082)	(0.550)	(0.213)
6-10 years in US	-0.185	-0.002	0.057	-0.068	-0.046	0.152**	-0.014	-0.035	-0.843	0.007
	(0.177)	(0.062)	(0.116)	(0.077)	(0.106)	(0.075)	(0.046)	(0.125)	(1.290)	(0.286)
11-15 years in US	-0.228	0.081	0.070	-0.003	0.054	0.182**	0.070	-0.068	0.421	-0.450*
	(0.172)	(0.057)	(0.109)	(0.073)	(0.099)	(0.076)	(0.045)	(0.118)	(1.005)	(0.257)
16-20 years in US	-0.118	0.115**	0.075	-0.016	0.063	0.280***	0.097**	0.042	0.267	0.026
	(0.169)	(0.055)	(0.106)	(0.072)	(0.099)	(0.075)	(0.044)	(0.116)	(1.188)	(0.248)
21+ years in US	-0.151	0.167***	0.211**	0.068	0.165*	0.286***	0.174***	0.104	-0.227	-0.010
	(0.146)	(0.053)	(0.106)	(0.071)	(0.097)	(0.071)	(0.044)	(0.114)	(0.856)	(0.242)
Middle School	-0.316	0.002	0.065	-0.143	0.004	-0.096	-0.074	0.273		0.164
	(0.685)	(0.044)	(0.094)	(0.120)	(0.155)	(0.136)	(0.057)	(0.508)		(0.321)
High School Drop	-0.439	0.012	0.050	-0.018	-0.090	-0.034	0.038	0.197	1.476	0.050
	(0.646)	(0.047)	(0.097)	(0.118)	(0.152)	(0.140)	(0.057)	(0.489)	(1.255)	(0.355)
High School Degree	-0.120	0.174***	0.194**	0.028	0.109	-0.015	0.100**	0.345	0.745	0.226
	(0.627)	(0.043)	(0.087)	(0.111)	(0.139)	(0.131)	(0.049)	(0.452)	(0.851)	(0.273)
Some College	0.193	0.314***	0.346***	0.241**	0.277**	0.225*	0.355***	0.567	0.498	0.590**
	(0.626)	(0.045)	(0.087)	(0.111)	(0.139)	(0.131)	(0.049)	(0.451)	(0.812)	(0.281)
Graduate Degree	0.428	0.635***	0.535***	0.535***	0.513***	0.516***	0.659***	0.699	0.823	0.539*
	(0.626)	(0.058)	(0.097)	(0.113)	(0.141)	(0.132)	(0.049)	(0.451)	(0.848)	(0.305)
Master's Degree	0.584	0.676***	0.664***	0.731***	0.734***	0.623***	0.838***	0.904**	1.062	0.948**
	(0.627)	(0.085)	(0.130)	(0.119)	(0.148)	(0.134)	(0.052)	(0.455)	(0.859)	(0.396)
Professional or PhD	0.549	0.770***	0.465***	0.718***	0.658***	0.757***	1.004***	1.383***	1.789*	1.271**
	(0.632)	(0.118)	(0.151)	(0.126)	(0.158)	(0.137)	(0.055)	(0.459)	(0.968)	(0.517)
Constant	2.084***	1.549***	1.078***	1.070***	1.473***	1.417***	1.214***	1.600**	2.027	2.347**
	(0.778)	(0.151)	(0.261)	(0.209)	(0.271)	(0.211)	(0.115)	(0.631)	(2.340)	(0.960)
Observations	705	4,928	1,684	4,105	2,155	5,445	11,538	671	48	151
R-squared	0.162	0.083	0.111	0.140	0.130	0.137	0.187	0.198	0.286	0.242

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.11 Regression estimates by birthplace for male immigrants, 1990

VARIABLES	(1) Canada	(2) Mexico	(3) C America	(4) Caribbean	(5) S America	(6) Europe	(7) Asia	(8) Africa	(9) Aus & NZ	(10) Others
Age	0.109***	0.033***	0.015*	0.033***	0.035***	0.057***	0.071***	0.027	0.115	0.065***
	(0.017)	(0.004)	(0.009)	(0.009)	(0.011)	(0.009)	(0.007)	(0.028)	(0.079)	(0.015)
Age-square	-0.001***	-0.000***	-0.000	-0.000***	-0.000***	-0.001***	-0.001***	-0.000	-0.001	-0.001***
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Number of children	0.009	-0.005	0.016	0.003	0.027*	0.023*	0.010	-0.014	0.106	-0.018
	(0.022)	(0.005)	(0.012)	(0.013)	(0.014)	(0.012)	(0.009)	(0.031)	(0.121)	(0.021)
Married no spouse	-0.200	-0.206***	-0.111**	-0.196***	-0.203***	-0.174***	-0.149***	-0.235*	0.215	-0.184**
	(0.237)	(0.021)	(0.048)	(0.056)	(0.060)	(0.060)	(0.035)	(0.126)	(0.742)	(0.072)
Separated	-0.267	-0.110***	-0.101	-0.091	-0.134*	-0.181**	-0.140*	-0.068	-0.066	-0.101
	(0.181)	(0.040)	(0.065)	(0.066)	(0.076)	(0.087)	(0.076)	(0.138)	(0.548)	(0.108)
Divorced	-0.176**	-0.067*	0.004	-0.086*	-0.104*	-0.139***	-0.056	-0.043	-0.285	-0.319***
	(0.085)	(0.038)	(0.066)	(0.052)	(0.062)	(0.051)	(0.051)	(0.149)	(0.374)	(0.090)
Widowed	0.595	-0.127	-0.085	-0.012	-0.032	0.018	-0.140	0.107		0.006
	(0.666)	(0.081)	(0.267)	(0.142)	(0.171)	(0.191)	(0.157)	(0.563)		(0.220)
Never Married	-0.189***	-0.142***	-0.151***	-0.167***	-0.136***	-0.156***	-0.108***	-0.132	-0.016	-0.168***
	(0.072)	(0.017)	(0.034)	(0.039)	(0.042)	(0.037)	(0.026)	(0.082)	(0.297)	(0.061)
6-10 years in US	0.063	0.070***	0.154***	0.085**	0.101***	0.057*	0.082***	0.011	0.247	-0.011
	(0.084)	(0.017)	(0.029)	(0.037)	(0.036)	(0.034)	(0.020)	(0.069)	(0.275)	(0.053)
11-15 years in US	0.009	0.186***	0.267***	0.160***	0.151***	0.127***	0.151***	0.175*	0.284	0.011
	(0.081)	(0.018)	(0.041)	(0.045)	(0.047)	(0.038)	(0.026)	(0.093)	(0.273)	(0.059)
16-20 years in US	0.049	0.220***	0.294***	0.229***	0.192***	0.086**	0.251***	0.128	0.512	0.103
	(0.088)	(0.021)	(0.057)	(0.045)	(0.050)	(0.042)	(0.038)	(0.127)	(0.359)	(0.071)
21+ years in US	-0.081	0.371***	0.406***	0.215***	0.346***	0.142***	0.347***	0.044	0.129	0.019
	(0.063)	(0.023)	(0.061)	(0.045)	(0.051)	(0.034)	(0.046)	(0.155)	(0.387)	(0.076)
Middle School	-1.272***	0.010	-0.050	0.052	0.077	0.023	-0.021	0.007		-0.189**
	(0.394)	(0.020)	(0.048)	(0.076)	(0.113)	(0.097)	(0.058)	(0.386)		(0.093)
High School Drop	-1.260***	0.083***	0.044	0.178**	0.197*	0.179*	0.150**	-0.035		-0.037
	(0.390)	(0.024)	(0.054)	(0.079)	(0.115)	(0.102)	(0.060)	(0.371)		(0.100)
High School Degree	-1.010***	0.146***	0.038	0.272***	0.227**	0.172*	0.252***	0.293	-0.585	0.027
	(0.386)	(0.023)	(0.049)	(0.073)	(0.108)	(0.094)	(0.049)	(0.254)	(0.558)	(0.092)
Some College	-1.007***	0.223***	0.205***	0.402***	0.325***	0.346***	0.389***	0.273	-0.457	0.090
	(0.385)	(0.028)	(0.053)	(0.076)	(0.109)	(0.094)	(0.049)	(0.248)	(0.553)	(0.095)
Graduate Degree	-0.805**	0.352***	0.328***	0.455***	0.503***	0.526***	0.667***	0.421*	-0.176	0.373***
	(0.386)	(0.049)	(0.071)	(0.089)	(0.113)	(0.096)	(0.048)	(0.248)	(0.537)	(0.109)
Master's Degree	-0.863**	0.417***	0.365***	0.739***	0.439***	0.652***	0.772***	0.418*	-0.162	0.661***
	(0.392)	(0.077)	(0.101)	(0.120)	(0.124)	(0.099)	(0.051)	(0.251)	(0.582)	(0.142)
Professional or PhD	-0.647*	0.438***	0.247**	0.605***	0.714***	0.633***	0.868***	0.799***	-0.523	0.292*
	(0.390)	(0.067)	(0.112)	(0.119)	(0.121)	(0.100)	(0.054)	(0.257)	(0.577)	(0.166)
Constant	1.286**	1.162***	1.525***	1.151***	1.108***	0.870***	0.365***	1.225**	0.209	0.787***
	(0.525)	(0.084)	(0.174)	(0.197)	(0.232)	(0.197)	(0.138)	(0.583)	(1.558)	(0.288)
Observations	858	10,969	2,396	2,622	2,038	3,909	6,824	743	112	1,356
R-squared	0.197	0.099	0.121	0.094	0.137	0.133	0.195	0.114	0.206	0.121

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.12 Regression estimates by birthplace for female immigrants, 1990

VARIABLES	(1) Canada	(2) Mexico	(3) C America	(4) Caribbean	(5) S America	(6) Europe	(7) Asia	(8) Africa	(9) Aus & NZ	(10) Others
Age	0.064***	0.019***	0.021**	0.036***	0.001	0.035***	0.038***	0.033	0.139**	0.001
	(0.016)	(0.007)	(0.010)	(0.009)	(0.012)	(0.008)	(0.007)	(0.034)	(0.057)	(0.016)
Age-square	-0.001***	-0.000**	-0.000**	-0.000***	-0.000	-0.000***	-0.000***	-0.000	-0.002**	0.000
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Number of children	-0.058***	0.010	-0.027**	0.005	0.005	-0.013	0.010	-0.031	-0.106	0.003
	(0.022)	(0.007)	(0.013)	(0.011)	(0.016)	(0.012)	(0.009)	(0.029)	(0.066)	(0.019)
Married no spouse	0.257	-0.014	-0.189***	-0.127**	-0.181**	0.051	-0.035	-0.310*	0.530	0.009
	(0.296)	(0.049)	(0.063)	(0.056)	(0.079)	(0.076)	(0.042)	(0.185)	(0.495)	(0.091)
Separated	-0.047	-0.011	-0.046	0.026	-0.037	-0.062	-0.051	-0.131	-0.260	-0.297***
	(0.138)	(0.040)	(0.054)	(0.052)	(0.073)	(0.069)	(0.063)	(0.131)	(0.336)	(0.108)
Divorced	0.010	0.036	-0.045	-0.001	0.004	0.023	-0.017	0.159	0.438**	-0.071
	(0.063)	(0.042)	(0.054)	(0.040)	(0.060)	(0.038)	(0.045)	(0.142)	(0.209)	(0.097)
Widowed	-0.066	0.038	-0.050	-0.100	0.019	0.037	0.085	-0.456	1.043	-0.155
	(0.131)	(0.056)	(0.083)	(0.079)	(0.115)	(0.062)	(0.061)	(0.387)	(0.715)	(0.146)
Never Married	0.056	-0.043*	-0.126***	-0.067*	-0.034	0.068*	0.017	-0.056	-0.060	-0.050
	(0.070)	(0.026)	(0.036)	(0.035)	(0.046)	(0.037)	(0.027)	(0.096)	(0.207)	(0.063)
6-10 years in US	-0.111	0.062**	0.142***	0.048	0.150***	0.101***	0.146***	0.044	0.033	-0.012
	(0.081)	(0.028)	(0.034)	(0.035)	(0.043)	(0.037)	(0.023)	(0.081)	(0.206)	(0.060)
11-15 years in US	0.124	0.123***	0.245***	0.185***	0.280***	0.170***	0.258***	0.075	0.163	0.091
	(0.083)	(0.029)	(0.043)	(0.043)	(0.055)	(0.041)	(0.029)	(0.109)	(0.207)	(0.072)
16-20 years in US	0.044	0.195***	0.392***	0.202***	0.297***	0.155***	0.268***	-0.022	-0.091	0.042
	(0.084)	(0.032)	(0.055)	(0.042)	(0.058)	(0.040)	(0.038)	(0.124)	(0.191)	(0.083)
21+ years in US	-0.041	0.232***	0.442***	0.173***	0.210***	0.175***	0.362***	0.150	0.178	0.091
	(0.067)	(0.034)	(0.061)	(0.042)	(0.056)	(0.034)	(0.046)	(0.165)	(0.212)	(0.079)
Middle School	0.052	-0.012	-0.041	-0.072	0.125	-0.014	-0.043	-0.143		-0.066
	(0.411)	(0.034)	(0.059)	(0.077)	(0.127)	(0.097)	(0.057)	(0.700)		(0.106)
High School Drop	-0.046	0.077*	-0.005	0.026	0.153	0.095	0.021	-0.024	0.124	0.025
	(0.396)	(0.040)	(0.066)	(0.079)	(0.129)	(0.104)	(0.062)	(0.670)	(0.717)	(0.114)
High School Degree	0.124	0.159***	0.112*	0.174**	0.230*	0.128	0.127**	0.599	0.029	0.136
	(0.391)	(0.038)	(0.060)	(0.074)	(0.120)	(0.093)	(0.052)	(0.645)	(0.668)	(0.102)
Some College	0.346	0.271***	0.203***	0.355***	0.332***	0.279***	0.298***	0.622	0.292	0.319***
	(0.391)	(0.042)	(0.063)	(0.076)	(0.120)	(0.094)	(0.053)	(0.643)	(0.676)	(0.104)
Graduate Degree	0.499	0.499***	0.415***	0.580***	0.530***	0.504***	0.569***	0.801	0.369	0.619***
	(0.393)	(0.074)	(0.087)	(0.085)	(0.126)	(0.097)	(0.052)	(0.644)	(0.675)	(0.115)
Master's Degree	0.692*	0.984***	0.377***	0.665***	0.667***	0.558***	0.639***	0.784	0.466	0.792***
	(0.400)	(0.161)	(0.139)	(0.120)	(0.146)	(0.103)	(0.059)	(0.651)	(0.710)	(0.162)
Professional or PhD	0.614	0.001	0.324**	0.665***	0.709***	0.711***	0.789***	0.661	0.434	0.723***
	(0.407)	(0.122)	(0.152)	(0.124)	(0.156)	(0.109)	(0.071)	(0.664)	(0.736)	(0.194)
Constant	0.587	1.134***	1.280***	0.988***	1.494***	0.974***	0.904***	0.697	-0.542	1.697***
	(0.492)	(0.131)	(0.190)	(0.185)	(0.251)	(0.180)	(0.140)	(0.831)	(1.186)	(0.318)
Observations	990	5,205	1,817	2,366	1,634	3,413	5,073	368	114	937
R-squared	0.116	0.056	0.109	0.134	0.080	0.092	0.154	0.130	0.245	0.123

Standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 2.13 Regression estimates by birthplace for male immigrants, 2000

VARIABLES	(1) Canada	(2) Mexico	(3) C America	(4) Caribbean	(5) S America	(6) Europe	(7) Asia	(8) Africa	(9) Aus & NZ	(10) Others
Age	0.125***	0.030***	0.033***	0.037***	0.034***	0.058***	0.056***	0.026*	0.061	0.068*
	(0.016)	(0.003)	(0.008)	(0.008)	(0.010)	(0.008)	(0.006)	(0.015)	(0.058)	(0.035)
Age-square	-0.001***	-0.000***	-0.000***	-0.000***	-0.000***	-0.001***	-0.001***	-0.000	-0.001	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.000)
Number of children	-0.008	0.018***	0.011	0.019*	0.036***	-0.009	0.002	-0.006	0.115*	-0.042
	(0.022)	(0.004)	(0.010)	(0.011)	(0.014)	(0.011)	(0.008)	(0.020)	(0.069)	(0.038)
Married no spouse	-0.085	-0.161***	-0.158***	-0.152***	-0.169***	-0.216***	-0.167***	-0.208***	-0.878*	-0.239
	(0.133)	(0.015)	(0.038)	(0.045)	(0.049)	(0.054)	(0.030)	(0.068)	(0.485)	(0.247)
Separated	-0.262	-0.114***	-0.156***	-0.029	-0.062	-0.090	0.036	-0.175	1.452**	-0.591**
	(0.189)	(0.026)	(0.054)	(0.054)	(0.074)	(0.072)	(0.070)	(0.109)	(0.673)	(0.280)
Divorced	-0.319***	-0.042	-0.098*	-0.057	-0.116**	-0.164***	-0.109**	-0.097	-0.518	-0.260
	(0.082)	(0.026)	(0.054)	(0.043)	(0.057)	(0.043)	(0.044)	(0.082)	(0.364)	(0.197)
Widowed	0.505	-0.113**	-0.118	0.069	0.378**	-0.179	-0.167	-0.171		0.942
	(0.430)	(0.056)	(0.134)	(0.144)	(0.183)	(0.155)	(0.136)	(0.263)		(0.657)
Never Married	-0.069	-0.128***	-0.137***	-0.097***	-0.132***	-0.113***	-0.115***	-0.218***	0.007	-0.314**
	(0.065)	(0.012)	(0.027)	(0.034)	(0.038)	(0.031)	(0.023)	(0.055)	(0.186)	(0.150)
6-10 years in US	0.021	0.078***	0.127***	0.092***	0.104***	0.081***	0.011	0.116**	-0.336*	0.114
	(0.062)	(0.012)	(0.029)	(0.032)	(0.035)	(0.027)	(0.019)	(0.047)	(0.202)	(0.140)
11-15 years in US	-0.105	0.120***	0.161***	0.141***	0.160***	0.207***	0.103***	0.164***	-0.212	0.260*
	(0.077)	(0.013)	(0.030)	(0.035)	(0.038)	(0.034)	(0.023)	(0.061)	(0.221)	(0.149)
16-20 years in US	-0.154*	0.156***	0.190***	0.148***	0.259***	0.206***	0.092***	0.165**	-0.088	0.072
	(0.093)	(0.015)	(0.034)	(0.036)	(0.048)	(0.040)	(0.027)	(0.074)	(0.305)	(0.158)
21+ years in US	-0.167***	0.234***	0.243***	0.289***	0.272***	0.251***	0.183***	0.252***	-0.519**	0.496***
	(0.061)	(0.015)	(0.044)	(0.038)	(0.049)	(0.032)	(0.030)	(0.080)	(0.204)	(0.163)
Middle School	0.735	-0.022	0.013	-0.093	0.131	-0.033	-0.058	0.274	-0.559	-0.106
	(0.569)	(0.015)	(0.036)	(0.070)	(0.100)	(0.106)	(0.061)	(0.192)	(1.303)	(0.368)
High School Drop	0.715	0.027	0.043	0.010	0.221**	-0.073	0.039	0.235	-0.156	-0.095
	(0.535)	(0.017)	(0.040)	(0.069)	(0.104)	(0.105)	(0.059)	(0.205)	(0.981)	(0.358)
High School Degree	0.851	0.100***	0.163***	0.024	0.181*	0.044	0.096*	0.423***	-0.035	-0.081
	(0.527)	(0.016)	(0.037)	(0.065)	(0.094)	(0.096)	(0.052)	(0.147)	(0.938)	(0.334)
Some College	1.022*	0.176***	0.232***	0.159**	0.280***	0.214**	0.304***	0.419***	0.339	-0.093
	(0.526)	(0.020)	(0.042)	(0.067)	(0.095)	(0.097)	(0.052)	(0.145)	(0.940)	(0.339)
Graduate Degree	1.262**	0.346***	0.382***	0.324***	0.609***	0.548***	0.720***	0.617***	0.435	0.262
	(0.526)	(0.034)	(0.060)	(0.076)	(0.099)	(0.097)	(0.051)	(0.145)	(0.932)	(0.367)
Master's Degree	1.287**	0.445***	0.572***	0.438***	0.935***	0.627***	0.925***	0.747***	0.404	1.123
	(0.529)	(0.061)	(0.107)	(0.106)	(0.108)	(0.098)	(0.053)	(0.152)	(0.947)	(0.709)
Professional or PhD	1.327**	0.243***	0.476***	0.313***	0.627***	0.584***	0.874***	0.866***	0.635	-0.524
	(0.530)	(0.051)	(0.099)	(0.090)	(0.107)	(0.099)	(0.055)	(0.156)	(0.942)	(0.551)
Constant	-0.737	1.550***	1.490***	1.516***	1.433***	1.219***	1.167***	1.578***	1.237	1.344*
	(0.623)	(0.060)	(0.141)	(0.171)	(0.203)	(0.179)	(0.126)	(0.328)	(1.481)	(0.788)
Observations	1,180	23,697	4,598	3,720	3,062	5,620	9,890	1,527	190	180
R-squared	0.169	0.069	0.082	0.071	0.136	0.143	0.213	0.120	0.200	0.206

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Table 2.14 Regression estimates by birthplace for female immigrants, 2000

VARIABLES	(1) Canada	(2) Mexico	(3) C America	(4) Caribbean	(5) S America	(6) Europe	(7) Asia	(8) Africa	(9) Aus & NZ	(10) Others
Age	0.070***	0.017***	0.003	0.018**	0.044***	0.059***	0.029***	0.040**	0.122**	0.097**
	(0.015)	(0.005)	(0.010)	(0.009)	(0.011)	(0.007)	(0.006)	(0.017)	(0.048)	(0.049)
Age-square	-0.001***	-0.000***	-0.000	-0.000*	-0.001***	-0.001***	-0.000***	-0.000*	-0.001**	-0.001**
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)	(0.001)
Number of children	-0.063***	0.001	0.001	0.014	-0.016	-0.047***	-0.021***	0.025	-0.159**	-0.015
	(0.021)	(0.005)	(0.011)	(0.011)	(0.016)	(0.011)	(0.008)	(0.018)	(0.075)	(0.050)
Married no spouse	-0.135	-0.001	-0.007	-0.018	0.031	-0.074	-0.006	0.030	-0.229	0.150
	(0.178)	(0.031)	(0.062)	(0.048)	(0.070)	(0.058)	(0.036)	(0.078)	(0.388)	(0.266)
Separated	-0.046	-0.005	-0.029	-0.076	-0.069	-0.043	-0.005	0.004	0.161	0.661**
	(0.137)	(0.027)	(0.048)	(0.047)	(0.065)	(0.062)	(0.058)	(0.094)	(0.547)	(0.304)
Divorced	0.114*	0.026	-0.050	-0.017	-0.018	0.042	0.081**	-0.043	0.094	0.430
	(0.062)	(0.030)	(0.049)	(0.040)	(0.056)	(0.033)	(0.036)	(0.078)	(0.179)	(0.262)
Widowed	0.112	-0.047	-0.153*	-0.028	0.096	0.082	0.004	-0.045	-0.098	-0.323
	(0.182)	(0.049)	(0.088)	(0.079)	(0.112)	(0.064)	(0.055)	(0.162)	(0.577)	(0.567)
Never Married	-0.021	-0.032*	-0.050	-0.010	0.005	0.056*	-0.054**	0.037	-0.365**	0.128
	(0.061)	(0.018)	(0.033)	(0.034)	(0.041)	(0.031)	(0.023)	(0.056)	(0.183)	(0.175)
6-10 years in US	-0.003	0.040**	0.024	0.119***	0.123***	0.120***	0.143***	0.161***	0.166	0.510***
	(0.062)	(0.019)	(0.040)	(0.034)	(0.039)	(0.028)	(0.020)	(0.050)	(0.173)	(0.187)
11-15 years in US	-0.055	0.074***	0.149***	0.186***	0.145***	0.225***	0.209***	0.057	0.128	0.112
	(0.072)	(0.020)	(0.040)	(0.038)	(0.044)	(0.035)	(0.025)	(0.065)	(0.191)	(0.209)
16-20 years in US	-0.058	0.094***	0.095**	0.261***	0.234***	0.173***	0.173***	0.050	-0.071	0.239
	(0.085)	(0.024)	(0.045)	(0.041)	(0.055)	(0.039)	(0.029)	(0.080)	(0.234)	(0.214)
21+ years in US	-0.128**	0.149***	0.181***	0.296***	0.274***	0.256***	0.260***	0.095	-0.128	0.710***
	(0.061)	(0.022)	(0.055)	(0.042)	(0.058)	(0.031)	(0.032)	(0.087)	(0.222)	(0.195)
Middle School	-0.292	-0.042*	-0.026	-0.002	-0.511***	0.037	0.013	-0.031		0.024
	(0.693)	(0.024)	(0.050)	(0.080)	(0.117)	(0.121)	(0.056)	(0.227)		(0.503)
High School Drop	-0.187	-0.009	0.033	-0.013	-0.359***	0.123	0.010	0.057	0.529	0.003
	(0.667)	(0.027)	(0.055)	(0.080)	(0.123)	(0.124)	(0.058)	(0.214)	(0.624)	(0.481)
High School Degree	-0.118	0.071***	0.053	0.123*	-0.265**	0.164	0.115**	0.103	0.619	0.376
	(0.659)	(0.026)	(0.050)	(0.075)	(0.108)	(0.111)	(0.048)	(0.182)	(0.551)	(0.457)
Some College	0.136	0.247***	0.213***	0.271***	-0.141	0.328***	0.279***	0.280	0.436	0.162
	(0.658)	(0.030)	(0.055)	(0.077)	(0.109)	(0.112)	(0.049)	(0.182)	(0.544)	(0.466)
Graduate Degree	0.314	0.392***	0.339***	0.502***	0.133	0.647***	0.612***	0.523***	0.826	0.694
	(0.658)	(0.046)	(0.074)	(0.084)	(0.112)	(0.113)	(0.048)	(0.184)	(0.550)	(0.506)
Master's Degree	0.462	0.610***	0.484***	0.660***	0.422***	0.639***	0.803***	0.471**	1.104*	1.256**
	(0.660)	(0.093)	(0.129)	(0.111)	(0.126)	(0.114)	(0.052)	(0.190)	(0.582)	(0.620)
Professional or PhD	0.488	0.258***	0.441***	0.343***	0.132	0.614***	0.803***	0.580***	0.787	
	(0.662)	(0.067)	(0.124)	(0.110)	(0.125)	(0.117)	(0.057)	(0.202)	(0.577)	
Constant	1.081	1.569***	1.888***	1.540***	1.516***	0.860***	1.487***	1.160***	-0.227	0.129
	(0.721)	(0.094)	(0.181)	(0.186)	(0.241)	(0.182)	(0.125)	(0.349)	(1.019)	(1.016)
Observations	1,049	10,318	2,795	3,127	2,284	4,728	7,600	1,006	154	147
R-squared	0.121	0.039	0.042	0.081	0.113	0.119	0.162	0.117	0.228	0.264

Standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Chapter 3 - Rural Road Closure: Tale of Three Counties

Introduction

It is well known fact that the road network is a backbone of transportation in the United States. Roads became an important part of the transportation system at the beginning of 20th century. Development of the automobile sector played a very important role in this shift from railroad and water transport to roads as a main mode of transportation. The United States has the highest road miles in the world and has maintained continued focus on the development of the highway infrastructure.

Roads generate obvious benefits like new markets, and lower transportation costs but it also has major socio-economic impacts. Roads have helped in reducing the mobility gap, made the human and livestock migration possible and easy. There is also increased competition and goods and services have become cheaper and above all more accessible. Focus on the rural road network started in the early 20th century, with the cry of "get the farmers out of mud." Finally, congress passed the Federal-aid Road Act of 1916. Since then, rural roads received greater attention and eventually one of the greatest road networks was built.

However, the lack of funds for maintenance of the existing road network has taken its toll on rural roads. The majority of the existing rural road network was designed and built in the early 1900s with focus on the conditions present at that time. At that time, the road usage was very heavy as farmers and rural residents needed roads to get access to their farms, schools, worship places, community centers, and markets. Now, the demographics and usage of these roads have changed significantly. When the Kansas county road grid system was conceptualized,

the users were large in number operating small vehicles. However, today the average size of Kansas farms is more than 700 acres compared to around 300 acres and 375 acres in 1940 and 1950 respectively (Kansas Statistical Abstract 2010). Similarly, the size of vehicles used in farming has changed dramatically. Now, more and more farms have semi and tandem axle trucks using the rural roads and farmers use these heavy vehicles on a regular basis. Also, grain elevators have increased in these highly agriculturally productive rural counties and thus traffic on rural roads to and from the elevators has also increased. Cattle feedlots are another major contributor of heavy vehicles on the county roads. There are about 200 cattle feedlots in Kansas of which roughly 30% have capacity of 16000 or more (Kansas Farm Facts 2010). These factors have put a lot of pressure on the rural roads that were not designed for such heavy vehicles and have resulted in broken road surfaces, making the road dangerous for users. Also, since the design of the road system is very old, most of the county roads have narrow lanes and narrow road widths. Large farm vehicles using these roads not only create safety problems but also create overall rideability problems.

Another big issue is declining rural county population. Rural county population has steadily declined in the last several decades and future projections also indicate negative growth. Declining population affects maintenance of the rural roads in two ways. First, less population means shrinking tax base and secondly, government will not give priority to the counties with fewer people. Combining all of the above factors, there is a huge rural road network with unsustainable level of usage and no or less than required money to invest in maintenance.

Kansas has the third largest public road network in the entire nation (KDOT 2012 quick facts) with more than 90% of the roads classified as rural. About one-fourth of the total bridges are functionally obsolete or structurally deficient. Many of the rural road miles are not in good

condition. Kansas has about 20 people per public road mile (KDOT 2012 quick facts). The rural road system allows Kansas to provide high accessibility for the residents. However, this is also a burden as Kansas's population is not large enough to support infrastructure maintenances via taxes or other measures. Also, the declining rural population adds to the problem of raising capital for road maintenance. Many of the rural counties are not able to undertake the maintenance and rebuilding projects that are required on an urgent basis due to financial constraints. A recent recession has increased financial problems of the counties and the priorities of federal and state government does not include investment in the rural road network. President Obama in his 2012 state of union address acknowledged this problem and said, "We've got crumbling roads and bridges…", which needs immediate attention. However, the six priority goals of the administration do not include investing in the rural road network. There is no relief in sight from the state government as state governments are stressed and reducing their budgets. In the given scenario, reducing the road network might be a viable option for counties.

This paper evaluates the cost and benefit of reducing the rural road network by closing the chosen low volume road segments in three selected Kansas counties. This essay draws data from the primary data collected for the Kansas Department of Transportation funded project, "The Economics of Potential Reduction of the Rural Road System in Kansas". Three Kansas counties were chosen for this project, Brown County (northeast Kansas), Pratt County (south central Kansas), and Thomas County (northwest Kansas). The selection of counties is based on many factors, such as agricultural output, geographic variation, and variations in county size and population density. The three selected counties are different from each other in geographical location, area, and population density but are leading counties in terms of agricultural production in their respective region. Brown County has about 570 square miles and has population density

of 17.5 people per mile. Pratt County has 735 square miles with population density of 13.1 people per square mile. Thomas County is the biggest county among the three with total area of 1075 square miles and population density of 7.4 people per square mile (2010 projections, Kansas Statistical Abstract 2010).

As mentioned earlier, Kansas has a large rural road network, however, Kansas doesn't have the best quality of roads. About 70% of total public road miles in Kansas, which is about 100,000 miles, are not even paved (Kansas Department of Transportation, January 2012). Previous research has focused a lot on rural road network issues. However, we do not find many papers on rural Kansas. Also, the majority of the previous research has focused on the technical aspects rather than socio-economic aspects and impact of closure of rural roads. A study by the South Dakota Department of Transportation compared the cost of different types of road surface to decide which type is more economical. The study took into account various factors such as local traffic conditions, and availability of raw materials in the area to name few. Using life cycle cost analysis, the study aimed to provide simple decision making tools to engineers about when to maintain, upgrade, or downgrade road surface (Babcock et. al. 2011).

Providing maintenance on low volume roads is not optimal from the welfare point of view if as a result not all high volume roads are adequately maintained. Consolidation of the road system is one of the cost saving and efficient options that has been discussed in the literature. The total maintenance cost can be minimized by as much as 50% if consolidation is considered (Deller, et. al 1988). Their findings suggest presence of economics of scope in the provision of rural roads as there is a similarity in outputs. They went on to make bigger policy suggestions such as local government reorganization and other consolidation arrangements. However, the authors refrain from making comments on the administrative problems associated with the

broader consolidation. (Bish, 1977) also recommends consolidation and points to gains because of greater efficiency as a motivation to do so. However, it is not practically feasible to consolidate administrative jurisdictions.

Rural road abandonment is certainly not a new topic in policy debate, however, given the political sensitivity of this topic, this is not often discussed. One of the seminal papers on this topic is Hamlett and Baumel (1990). The authors have done empirical analysis to suggest how abandonment could translate into greater savings for counties. Their model is comprehensive but uses the old and outdated Dijkstra's algorithm to determine the shortest route from one destination to other. Another shortcoming of the study is the way the authors have identified the candidates for abandonment. They identified the abandonment process with the input from the County engineers. This could be a good starting point but without having the actual ADT on the roads the selection is likely to be biased. Similarly, (Hartwig, 1982) suggests abandonment is a viable technique for cost saving but his study also suffers from the problems explained above.

This paper with the help of primary data analysis attempts to fill the existing gap in the literature of rural road abandonment. The main purpose of this study is to provide a rule of thumb for county decisions to close rural roads. I estimate the economic impact of closing the selected county roads through cost-benefit analysis using the dynamic simulation technique of TransCAD (www.caliper.com/tcovu.htm).

The rest of the paper is organized as follows. The introduction is followed by description of the data and methodology used in this research followed by results. The final section of the paper concludes.

Data and Methodology

For the current study we have made extensive use of transportation planning software TransCAD. TransCAD is Geographic Information System (GIS) software widely used in academia to analyze transportation data. TransCAD also has very good map creating and analyzing abilities and it was very much required in our study as we are using network distance and travel time models. TransCAD is also used widely for rerouting the traffic. Maps created with the help of TransCAD were used primarily for selecting the segments of roads to delete and to reroute the traffic on to an alternative road.

In every county we have selected 10 roads as a potential candidate for closure. Selection of roads for closure is based on many factors but the most important criteria was volume of traffic on these roads. We chose low volume roads i.e. roads with less ADT for simulated closure. Road segments providing the only access to any property are not considered for simulated closure.

We divided this process into 3 stages, in first stage we identified roads that were low volume and were not single access roads to any destination. Secondly, we identified roads that will have impact because of the road closure so we assumed that by closing a road, in most cases traffic on parallel roads increases. Finally, we rerouted the traffic of the closed segment to see the impact on other roads after the candidate road is deleted from the network.

We have chosen 3 counties in Kansas as our study area. These counties are different from each other in various aspects and at the same time are very typical of Kansas rural counties. Primary data has been collected through the mail in survey method from the rural residents in each county.

We also gathered data on the volume of grain received, and fertilizer delivered from grain elevators operating in the study area. Grain elevators play a very important role in the county, as

the volume of vehicles operating in and out of the facility is large thus putting pressure on roads. Data from grain elevator mangers are obtained with questionnaires along with a short personal interview.

We also interviewed road supervisors and they filled out two detailed questionnaires in which we sought information on the cost to maintain and construct various types of roads e.g. gravel, chip seal, dirt etc. Surveys for road supervisors were divided into four parts seeking information on the maintenance activities undertaken in the county, information on construction and reconstruction costs, and the specific types of treatment given to gravel or paved roads. In the second survey we ask questions specifically about the county roads such as how many miles of roads the supervisor is responsible for. We also ask supervisors to rank the roads from being very good to very poor. Though the ranking is very subjective in nature it reflects the supervisor's perception of general roads condition. We used these rankings with the data on construction/maintenance done in the county to infer the need and availability of funds. In the survey we asked about the intervals of the construction/reconstruction work undertaken, and what factors make supervisors decide whether roads need any sort of maintenance.

The information on the travel pattern of rural residents comes from the rural resident survey. Rural resident's survey is a three and half page survey covering a broad range of questions. Through this survey we are able to gather information on residents travel patterns and vehicle ownership. In order to maintain the confidentiality of the respondents we used section, range, and township as the household identifying variable or the trip origin. Apart from the basic information about the kind of vehicle(s) residents operate on the county roads and the level of use of these county roads we are also able to gather data on the destinations of these trips. Then we manually converted those destinations into section, range, and township in order to match

them with origins. Also, combining this destination information, level of use of county roads, kinds of vehicles used and information on origins we are able to generate an Origin & Destination (O&D) matrix. To create the O&D matrix we used origin and destination information along with the number of average daily trips. The most important variable in the O&D matrix is the travel time or the total time the trip takes from origin to destination. Since we had information about the length of the trip so in order determine the travel time we use free flow speed.

Further, we reroute the traffic after closing the roads we have chosen. The closure impacts the travel time for some residents as now the traffic is directed to alternate roads. TransCAD runs the iterations for all selected closure candidates, 10 for each county in our case. We identified alternate routes for each of the closure candidates selected in all three counties.

We have made a few assumptions throughout the study based on our observations. We assume that any rural resident would use a car or small vehicle for pleasure or grocery trips and semis and tandem axle trucks will be primarily used for grain hauling. In the survey, rural residents are asked to indicate their destinations for various modes of transport. However, for computational purpose we have just selected the top destinations in the O&D matrix.

One of the most important parts of the study was the cost per mile for various vehicles on different types of roads. We use a report by AASHTO to get these estimates. AASHTO estimates provide cost per mile by vehicle type on various road surfaces.

Road supervisor's estimates of maintenance cost of roads varied by county and by year. This is understandable as some counties are close to road raw material sources and may incur lower cost. Also, a year with high snowfall leads to higher maintenance cost as road conditions deteriorate significantly more than in year with less snowfall. In order to maintain consistency in

maintenance cost per mile we use average figures from KDOT for comparison purpose across counties.

The study uses cost-benefit analysis as a primary tool to determine whether roads links selected for deletion should be removed from the county road system or not. The cost of road closure is calculated in terms of extra travel time rural residents have to travel due to closing the selected road links. The benefits are expressed in terms of the avoided maintenance costs of roads removed from the rural road network. Equation 1 measures the total cost of removing the selected links from the rural road network.

(1) Total Cost = ADT (on road segments considered for simulated closure) x Vehicle Operating Cost Per Mile x 365 days x Average Extra Miles Traveled / 100

Calculation of total benefits is more straightforward. Total benefit is number of miles closed multiplied by average maintenance cost per mile. To make the O&D matrix computationally manageable we combine all kinds of trucks into one category and keep 3 categories of vehicles - car, pickup, and truck in the final analysis. Also, travel data obtained from grain elevators is combined with household data and not treated separately.

Results

Brown County

Brown County is divided into 10 townships and each township is responsible for maintaining its designated township roads. Each of the 10 townships has their own budget for road construction/reconstruction. Brown County maintains designated county roads. The county road network is composed of 270.5 miles of asphalt road whereas the township road network consists of about 535 miles of gravel road and 228 miles of earth road. The total road system in

Brown County has about 1040 miles including county and townships roads. Brown County is divided into 3 districts and every district has a road supervisor.

As mentioned earlier, we have 10 candidate roads for closure or abandonment in Brown County. The shortest link we have selected for closure is about 2 miles long and the longest is about 7 miles. Table 3.1 reports the length of the selected 10 links for deletion. Also, we made sure that alternate routes selected for rerouting consist of either similar quality roads or better roads.

Simulations from the TransCAD suggest that in most of the cases, closing each of the links has a very limited effect on the alternate routes. Table 3.2 reports the changes in the ADT on alternate routes. Changes in the ADT of alternate routes provide a good crosscheck for whether these links should be deleted or not. We see that 2 of the links selected for deletion cause a huge increase in the alternate route traffic. Thus, link 2 and 6 should not be deleted as removing these links will create congestion on alternate routes. It was decided that after deleting the link, if ADT of alternate routes experience an increase of more than 15 percent then the link should not be removed from the system. Also, we added another level of analysis by adopting a 60 ADT rule. It was decided that if removing the road links from the system cause an increase of 60 ADT or more on alternate routes then links should not be removed from the road network. Due to the 60 ADT rule, we keep links 8 and 9 in the road system. Thus, we have a total of 6 links to be deleted from the Brown County road network.

Table 3.3 reports total benefit of removing the links from the road network. We calculate the benefit of removing links using 2 conservative figures of maintenance cost per mile. We use $3000 and $4000 as cost per mile maintenance. These figures are very conservative and are derived from the literature on road maintenance. We resort to the road maintenance literature to

arrive at the maintenance figure as cost data provided by county engineers have large annual variation. Calculating benefits at $3000 per mile, Brown County is able to save $68,760 every year and the benefit rises to $91,680 for maintenance cost per mile of $4000. Table 3 provides the benefits at $3000 and $4000 per mile maintenance for each of the links removed from the system.

Table 3.4 shows the extra miles users have to travel when the selected road links are deleted. On an average, residents are travelling about 2 extra miles for each link deleted from the network. Table 3.5 provides the cost incurred by rural residents due to extra miles travelled. These costs are calculated for each vehicle type i.e. cars, pickup trucks, and trucks. Vehicle operating cost per mile on different surfaces is used to calculate the cost figures. The total extra cost incurred by rural road users is $226,147 when the six links from the network are deleted. As we see this is much higher than the benefits of $68,760 and $91,680 calculated at $3000 per mile and at $4000 per mile respectively. The benefit-cost ratio is 0.30 assuming $3000 per mile maintenance cost and 0.41 assuming $4000 per mile maintenance cost. This clearly suggests that there is no room for removing the road links from the Brown County road network.

Pratt County

We selected 10 road links in Pratt County for deletion from the road network. Table 3.1 lists the length of the links selected. The minimum length selected is 2.1 miles and the maximum length of the closure candidates is 7 miles with total of 34.3 miles. Table 3.6 provides the change in ADT after the closure candidates are deleted from the road network. We followed the same assumption of not deleting the links if the change in ADT is more than 15 percent or the actual ADT is more than 60. Only one link out of 10 has an ADT change greater than 15 percent. Finally, we keep 9 links as closure candidates. We followed the same methodology of calculating

cost and benefits. Table 3.7 reports the benefits of $93,810 assuming $3000 maintenance cost per mile and $125,080 assuming $4000 maintenance cost per mile for total of 31.27 miles deleted from the road network of Pratt County. Length of extra miles travelled due to road closure is reported in Table 3.8. Residents are travelling 17.13 miles extra due to closure of 31.27 miles of the network. Table 3.9 presents the cost of travelling these extra miles by type of vehicle. The total cost of travelling these extra miles is $94,236. The benefit-cost ratio assuming $3000 per mile maintenance cost is 0.995 and 1.33 assuming $4000 per mile maintenance cost. Thus, assuming $3000 as annual per mile maintenance cost, links should not be removed from the road network. However, if we assume $4000 per mile maintenance cost than links should be removed from the road network.

Thomas County

We repeat the same exercise for Thomas County and select 10 links as closure candidates. Thomas County has the largest area and least extensive road network. Table 3.1 lists the length of links selected in Thomas County as closure candidates. The biggest selected link is 4.05 miles long and the smallest is 1.95 miles. Change in ADT of alternate routes is reported in Table 3.10. A total of 9 links remain as the closure candidates after applying the 15 percent change in ADT rule or the actual ADT count greater than 60. The benefit of closing down the links due to avoided maintenance cost is reported in Table 3.11. The benefit of closing 9 links assuming $3000 cost per mile maintenance cost is $84,300 and assuming $4000 per mile maintenance cost, the benefit is $112,400. Table 3.12 reports the additional miles residents have to travel due to closing the proposed links. When all 9 links are closed 17.72 additional miles are travelled. The cost of operating the vehicle in the event of road closure is calculated in similar fashion as calculated for the previous two counties and is $46,385. The benefit-cost ratio is 1.82

if $3000 per mile maintenance cost is taken into consideration and it goes up to 2.42 if $4000 per mile maintenance cost is assumed. The benefit-cost ratio clearly indicates that even at $3000 per mile maintenance cost it is not economically efficient to keep these roads in the network.

Conclusion

Kansas has the third largest public road miles in the country and one of the highest miles per person. However, Kansas rural counties lack the tax base and fiscal health to support its large ailing road infrastructure. In the last few decades the structure of agriculture has changed dramatically. The average farm size is increasing and so is the size of vehicles using the rural roads. Most of the rural roads and bridges are not capable of handling the heavy vehicles and farm equipment. Further, declining rural population adds to the problem of eroding financial base and deteriorating road infrastructure. Counties are not able to find money to maintain existing roads and build new segments. Therefore, reducing the road network is one option, to deal with the declining condition of rural county roads.

This paper uses benefit-cost analysis to determine whether some selected links could be deleted from the road network. We chose 3 counties as the study area differing in geographical location and population densities but similar in agricultural production.

We report that those rural counties will be able to save money by closing the low volume roads. In our analysis, we find that Thomas County will be better off by closing the roads and Brown County will be worse off. We also find that counties with an extensive road network and relatively higher population density will not be likely to save money from road closure. On the other hand, counties with a less extensive road network and less population density will be able to realize some savings from road closure. We suggest that the savings realized should be utilized to maintain the remaining infrastructure in good condition.

Tables

Table 3.1 Deleted Links in Counties

Miles	**Brown**	**Pratt**	**Thomas**
Link 1	3.37	7.01	1.95
Link 2	3.96	3.03	3.02
Link 3	2.04	4.08	4.05
Link 4	4	2.11	4.02
Link 5	4	3	3.04
Link 6	4.44	3.01	2
Link 7	3	2.98	3.03
Link 8	2	3.02	2.99
Link 9	4.95	3.03	3.01
Link 10	6.51	3.02	4
Total	**38.27**	**34.29**	**31.11**

Table 3.2 Brown County Traffic Variation on the Alternate Routes (ADT)

	Traffic Range Before Deletion (ADT)	**Traffic Range After Deletion (ADT)**	**ADT Percentage Change**
Alternate 1	>100 & <200	>100 & <200	3.47
Alternate 2	>300 & <400	>300 & <400	19.06
Alternate 3	>100 & <200	>100 & <200	8.47
Alternate 4	>400	>400	3.12
Alternate 5	>300 & <400	>300 & <400	3.25
Alternate 6	>300 & <400	>400	123.58
Alternate 7	>400	>400	1.94
Alternate 8	>400	>400	-1.07
Alternate 9	>400	>400	-0.77
Alternate 10	>400	>400	2.95
ADT is Average Daily Traffic			

Table 3.3 Benefits from the Deletion of Selected Links From Brown County

Link	Miles	Benefits @ $3000 per mile	Benefits @ $4000 per mile
Link 1	3.37	$10,110	$13,480
Link 2	**0**	**0**	**0**
Link 3	2.04	6120	8160
Link 4	4	12000	16000
Link 5	4	12000	16000
Link 6	**0**	**0**	**0**
Link 7	3	9000	12000
Link 8	**0**	**0**	**0**
Link 9	**0**	**0**	**0**
Link 10	6.51	19530	26040
Total	**22.92**	**$68,760**	**$91,680**

Table 3.4 Extra Miles Traveled Due to Road Closure in Brown County

	Distance Traveled Before Link is Deleted	Distance Traveled After Link is Deleted	Extra Miles Traveled Due to Road Closure
Link 1	3.37	5.46	2.09
Link 2	0	0	0
Link 3	2.04	4	1.96
Link 4	4	6.02	2.02
Link 5	4	5.99	1.99
Link 6	0	0	0
Link 7	3	5	2
Link 8	0	0	0
Link 9	0	0	0
Link 10	6.51	8.6	2.09
Total	**22.92**	**35.07**	**12.15**

Table 3.5 Annual Cost of Operating Vehicles in Brown County After Simulated Road Closure

Vehicle Type	ADT	Operating Cost Per Mile	Number of Days	Average Extra Miles Traveled*	Total Cost
Cars	100	76.5¢	365	2.025	$56,543
Pickup Trucks	105	92.3¢	365	2.025	71,632
Trucks	83	159.7¢	365	2.025	97,972
Total Cost					$226,147
*The sum of extra miles traveled due to simulated closure for links 1, 3, 4, 5, 7, and 10 which is 12.15 divided by 6.					

Table 3.6 Pratt County Traffic Variation on the Alternate Routes (ADT)

Alternate Route	Traffic Range Before Deletion (ADT)	Traffic Range After Deletion (ADT)	ADT Percentage Change
1	>100 & <200	>200 & <300	3.86
2	<100	<100	1.35
3	>100 & <200	>100 & <200	1.69
4	>100 & <200	>100 & <200	0.35
5	>100 & <200	>100 & <200	0.23
6	<100	<100	4.72
7	<100	<100	11.76
8	>400	>400	0.55
9	>100 & <200	>100 & <200	1.96
10	<100	<100	40.47

Table 3.7 Benefits From the Deletion of Selected Links From Pratt County

Link	Miles	Benefits @ $3,000 per mile ($)	Benefits @ $4,000 per mile ($)
1	7.01	21,030	28,040
2	3.03	9,090	12,120
3	4.08	12,240	16,320
4	2.11	6,330	8,440
5	3	9,000	12,000
6	3.01	9,030	12,040
7	2.98	8,940	11,920
8	3.02	9,060	12,080
9	3.03	9,090	12,120
10	0	0	0
Total	31.27	93,810	125,080

Table 3.8 Extra Miles Traveled Due to Road Closure in Pratt County

Links	Distance Traveled Before Link is Deleted	Distance Traveled After Link is Deleted	Extra Miles Traveled Due to Road Closure
1	7.01	8.99	1.98
2	3.03	4.97	1.94
3	4.08	5.66	1.58
4	2.11	3.81	1.7
5	3	4.86	1.86
6	3.01	5.07	2.06
7	2.98	5	2.02
8	3.02	5.03	2.01
9	3.03	5.01	1.98
10	0	0	0
Total	31.27	48.4	17.13

Table 3.9 Annual Cost of Operating Vehicles in Pratt County After Simulated Road Closure

Vehicle Type	ADT	Operating Cost Per Mile, ¢	Number of Days	Average Extra Miles Traveled*	Total Cost ($)
Cars	120	76.5	365	1.90	63,663
Pickup Trucks	27	92.3	365	1.90	17,283
Trucks	12	159.7	365	1.90	13,290
Total Cost					94,236

*The sum of extra miles traveled due to simulated closure of links 1 through 9 which is 17.13 divided by 9.

Table 3.10 Thomas County Traffic Variation on the Alternate Routes (ADT)

Alternate Route	Traffic Range Before Deletion (ADT)	Traffic Range After Deletion (ADT)	ADT Percentage Change
1	<100	<100	2.88
2	<100	<100	10.72
3	<100	<100	3.05
4	>200 & <300	>200 & <300	3.87
5	>400	>400	0.65
6	>100 & <200	>100 & <200	0.26
7	>200 & <300	>200 & <300	2.47
8	<100	<100	3.7
9	>300 & <400	>300 & <400	-0.03
10	<100	<100	0.54

ADT: Average Daily Traffic

Table 3.11 Benefits From the Deletion of Selected Links From Thomas County

Link	Miles	Benefits @ $3,000 per mile ($)	Benefits @ $4,000 per mile ($)
1	1.95	5,850	7,800
2	3.02	9,060	12,080
3	4.05	12,150	16,200
4	4.02	12,060	16,080
5	3.04	9,120	12,160
6	2	6,000	8,000
7	3.03	9,090	12,120
8	2.99	8,970	11,960
9	0	0	0
10	4	12,000	16,000
Total	28.1	84,300	112,400

Table 3.12 Extra Miles Traveled Due to Road Closure in Thomas County

Link	Distance Traveled Before Link is Deleted	Distance Traveled After Link is Deleted	Extra Miles Traveled Due to Road Closure
1	1.95	3.95	2
2	3.02	5	1.98
3	4.05	5.98	1.93
4	4.02	6	1.98
5	3.04	4.98	1.94
6	2	4	2
7	3.03	4.93	1.9
8	2.99	5	2.01
9	0	0	0
10	4	5.98	1.98
Total	28.1	45.82	17.72

Table 3.13 Annual Cost of Operating Vehicles in Thomas County After Simulated Road Closure

Vehicle Type	ADT	Operating Cost Per Mile (¢)	Number of Days	Average Extra Miles Traveled*	Total Cost ($)
Cars	37	76.5	365	1.97	20,353
Pickup Trucks	15	92.3	365	1.97	9,955
Trucks	14	159.7	365	1.97	16,077
Total Cost					46,385

*The sum of extra miles traveled due to simulated closure of links 1 through 8 plus link 10 which is 17.72 divided by 9.

Table 3.14 Benefit-Cost Ratios of the Three Counties

Benefit-Cost Ratios Assuming Annual Maintenance Cost of $3000 Per Mile			
County	**Benefits**	**Costs**	**Benefit-Cost Ratio**
Brown	$68,760	$226,147	0.30
Pratt	$93,810	$94,236	1.00
Thomas	$84,300	$46,385	1.82
Benefit-Cost Ratios Assuming Annual Maintenance Cost of $4000 Per Mile			
County	**Benefits**	**Costs**	**Benefit-Cost Ratio**
Brown	$91,680	$226,147	0.41
Pratt	$125,080	$94,236	1.33
Thomas	$112,400	$46,385	2.42

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