

ESSAYS ON THE LABOR MARKET OF THE UNITED ARAB EMIRATES

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ABSTRACT

The United Arab Emirates (UAE) labor market consists largely of expatriates rather than nationals, the vast majority of which are employed in the private sector. On the other hand, nationals are mostly employed in the public sector and face growing unemployment pressures. This dissertation investigates labor market and demographic policies in the UAE.

Chapter 1 builds a two-sector search and matching labor market model to analyze government policies in an economy with a significant public sector. It proves the existence of a unique steady state equilibrium with on the job search in the private sector. It then studies the impact of raising government wages and employment on job creation in the private and public sectors and on unemployment. The paper shows that under some conditions, increasing public sector employment can aggravate the unemployment problem.

Chapter 2 examines government policies in a labor market where expatriates constitute a sizeable majority of the labor force. It develops a large firm version of the matching model with intrafirm bargaining. In the model, the firm's hiring decisions are driven by the increasing costs of employing expatriates relative to nationals rather than workers' productivities. This approach contrasts with the prior literature which has captured the employment effect on wages based on assumptions on productivity rather than the firm's cost structure. The model is calibrated to UAE data. It finds that beyond a certain cost level of employing expatriates, the firm would decrease overall employment and unemployment for nationals rises.

Chapter 3, co-authored with M. Al Awad, explores certain factors that have contributed to the decline in fertility in the UAE. Employing data from the 2008 UAE Household Expenditure Survey, the paper analyzes the determinants of fertility using a Poisson fertility count model. The results show that economic factors, in terms of the costs and benefits that families derive from children in the UAE are not important determinants of fertility. The primary cause for the decline in fertility is the higher levels of female education. Other contributors to drops in fertility are marriages between national males and foreign females and polygamous marriages.

To my husband, Halim Kanaan,
my parents, Antoine & Antoinette Chartouni, and my sisters, Carine & Christine Chartouni,
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INTRODUCTION

The United Arab Emirates (UAE), like many of the oil producing countries of the Arabian Gulf, has developed at a rapid pace since the discovery and exploitation of oil. Nonetheless, despite the increased prosperity, unemployment among UAE nationals remains high, and the fertility rates appear to be declining. In 2005, the unemployment rate among UAE nationals was 13.4% compared 6.3% in 1995. Average fertility rates in the UAE declined from 6.4 children per female during the period 1970-1975 to 2.5 children during 2000-2005. As a result, the UAE's growth was driven largely by expatriate workers.

The UAE's development had necessitated an enormous influx of foreign workers and families. Despite the massive investment in local development programs and infrastructure, the UAE is becoming increasingly dependent on the expatriate work force to drive economic growth. This presents an interesting dilemma for UAE government policy makers as it seeks to expand the role of UAE nationals in the work force.

The UAE government, concerned about the unemployment problem, instituted a number of policies to promote the employment of nationals, especially in the private sector. They ranged from varying government fees for certain activities based on the proportion of nationals employed within a particular firm to specifying certain types of jobs which should be reserved for UAE nationals.

Nonetheless UAE nationals continue to be reluctant to work in the private sector and instead gravitate towards public sector jobs. This is largely due to the salary and benefit differentials between the two sectors. While nationals are mostly employed in the public sector, the vast majority of expatriates work in the private sector. Even as unemployment pressure increased, the

private sector employment of UAE nationals remained stubbornly low. UAE national employment remains largely dependent on direct hiring in the public sector.

The large presence of foreigners in the UAE also impacted the social and cultural norms of its citizens, and influenced their consumption patterns. For many females, obtaining an acceptable educational degree became increasingly advantageous, both socially and economically. As a result, their participation in the labor market steadily increased. Moreover, the availability of foreign labor provided additional impetus for UAE nationals to pursue higher levels of education to enable them to better compete in the labor market. As a result, youth married at progressively older ages which in turn contributed to the declining fertility rates. The lower fertility rates decreased the labor supply growth rate which further compounded the UAE's reliance on foreign nationals.

This dissertation examines the factors which contributed to the high levels of unemployment and decreasing fertility among UAE nationals as it seeks to understand the effect of government intervention on the UAE national labor supply and demand. The first two chapters develop a theoretical framework to assess the impact of government policies on the labor market outcomes of UAE nationals. The third chapter looks at the factors that have contributed to the decline of fertility in the UAE, thereby decreasing the growth rate of the local labor supply.

Chapter 1 studies the employment of nationals in the public sector by focusing on the queuing of nationals for government jobs. It develops a two-sector search model in a labor market with a significant public sector to study government policies which have used public employment as a tool to combat unemployment. The search framework has rarely been used to explain unemployment and the public-private segmentation, especially as it exists in the UAE labor

market characterized by frictions. It builds a search model whereby nationals randomly search for public and private sector jobs. Moreover, due to the attractiveness of the public sector to UAE nationals, workers engage in on-the-job search whilst employed in the private sector so that there exists a direct transition from the private sector to the public sector but not in the opposite direction.

The first chapter uses the model to analyze various policies such as raising public sector wages and employment, and the indirect effect of increasing the bargaining power of nationals vis-à-vis the private sector. It finds that the public sector is crowding out employment in the private sector. Moreover, based on the specification of the private sector matching function, a reduction in public sector employment can reduce unemployment.

Chapter 1 forms the basis of chapter 2. Chapter 1 models the dominant role of the public sector in the UAE while accounting for frictions in the labor market. Chapter 2 builds upon the model in chapter 1 to explicitly model the hiring of expatriates in the private sector while also accounting for the queuing of nationals to the public sector. Chapter 2 approaches the unemployment problem from a perspective, by assessing the effect of the added cost of a firm's decision to hire expatriates rather than nationals.

In particular, Chapter 2 examines the Emiratization policies instituted by the UAE government in order to encourage national employment in the private sector. The Emiratization policies, through fees and levies, cause a firm's costs to increase as the number of expatriates increase in proportion to nationals. Chapter 2 develops a large firm version of the search model which explicitly accounts for the employment of nationals and expatriates since it allows for multiple vacancies within one firm. As in chapter 1, nationals engage in random search for

public and private sector jobs. However, the expatriate labor force is frictionless because it is assumed that firms have an unlimited supply of labor.

In order to determine the private sector wages of nationals, the paper uses the intra-firm bargaining process developed by Stole and Zwiebel. The intra-firm bargaining process is derived from the assumption of decreasing returns to labor. That is, wages are dependent on the number of workers already employed in the firm, and therefore a firm will tend to overemploy workers in order to depress the wages. In the model, Emiratization policies also generate this employment effect on wages, because as the number of nationals employed in the firm increases, the benefit derived from employing an additional national decrease.

It finds that the increase in the cost of hiring expatriates may decrease national employment in the private sector. The intuition is based on the existence of two countervailing effects. On one hand, the employment effect on national wages causes a firm to overemploy nationals to depress their wages. However, the increase in the cost of employing expatriates also leads a firm to decrease its intake of expatriates. As fewer expatriates are hired, there is less need to employ nationals and the employment effect on wages is weakened. Therefore, if the second effect is greater than the first effect there will be an increase in national unemployment.

Chapter 2 then calibrates the model using 2008 Household Expenditure data for the UAE to study the magnitude of the effect of the Emiratization policies on employment. It deduces from the calibration the cost level of hiring expatriates for which private sector employment is maximized given the baseline parameters of the model.

Chapter 3, which is a joint work with Mouawiya Al Awad, analyzes the factors that have led to the decline of fertility in the UAE using the 2008 Household expenditure data of the UAE. It

attempts to examine the factors that affect fertility rates, in essence, the long term labor supply of UAE nationals. It is the first paper to use such a dataset to address fertility issues. The paper estimates a Poisson count model where the dependent variable is the number of children ever born to a spouse.

The paper finds that economic factors do not impact fertility thereby showing that Becker's theory does not apply to the UAE. Becker suggested that children are like consumer durables, as income increases families demand more but also better quality children. However, the results show that in the UAE fertility rates are not driven by the costs of children or the benefits that families derive from them. The two primary causes for the decline in fertility are late marriages and higher female education. Moreover, the paper finds that the incidence of marriages to foreign females has also contributed to the decline in fertility.

Although the dissertation focuses on national employment and fertility in the UAE, many of these issues are common through the Arabian Gulf. Throughout the Gulf Cooperation Council countries, governments instituted a number of policies designed to encourage private sector companies to employ nationals and make such job opportunities more attractive to them. Nonetheless, nationals in these countries remain highly dependent on the public sector to provide employment. In Qatar around 89% of Qataris were employed in the public sector in 2007.

With respect to fertility, by 2005, fertility rates in the GCC were less than half those witnessed in the seventies. The largest drops took place in Kuwait where average fertility rates decreased from 6.9 children per female during 1970 to 1975 to 2.3 children per female during 2000 to 2005.

In short, this dissertation contributes not only to the literature on the UAE, but to the whole GCC region. Even though the analysis in the dissertation pertains to the UAE, the models developed in the three chapters can be used as a framework to study other GCC labor markets.

Chapter 1

Labor Market Policies in the UAE:

Promoting National Employment in the Private Sector

1.1 Introduction

Employment in the Middle East and North Africa (“MENA”) is heavily dependent on the public sector. In the early 1990’s, the MENA region had the highest share of public sector employment relative to total employment¹ (Amitabha, De Tommaso, and Schiavo-Campo 1997). Further, during that period, the MENA region also had the highest government wages, being approximately one-third higher than comparable private compensation (Amitabha, De Tommaso, and Schiavo-Campo 1997). In the MENA re-

¹The MENA region public sector employment constituted on average 17.5% of total employment as compared to an average of 11% worldwide.

gion, the public sector is a key institutional feature driving labor market outcomes.

The high rates of public sector employment are in large part due to government policies which use public employment as a policy tool to absorb new labor market entrants and to combat unemployment in the Arab economies. In Egypt starting from the early 1960's and up until the early 1990's the government guaranteed employment in the public sector for all university graduates and intermediate school diploma holders (Bulmer 2000). By 1998, public employment in Egypt reached approximately 39% of total employment. (Assaad 2007). In Qatar, the government guarantees employment for Qataris upon graduation from secondary school or university, and in the event that they lose their job, the government will continue to pay their salary until they find another job (Eide, Martorell, and Stasz 2007). In 2007, around 89% of Qataris were employed in the public sector². In Syria, public sector wages were increased substantially from 2000, 20% in 2004 alone (Kabbani 2008). Accordingly, the 2003 unemployment survey showed that over 80% of the unemployed youth were looking for public sector jobs and 60% were looking exclusively at those jobs (Kabbani 2008).

However, as the public sector in many MENA countries became overstuffed and the number of new entrants to the labor force increased, the public sector could no longer provide enough job opportunities, and unemployment increased significantly. Nonetheless, workers were queuing for public sector jobs as they were reluctant to work in the private sector. They gravitated towards public sector employment due to salary and

²Labor Force Survey of 2007 for Qatar.

benefit differentials such as job security, lower work effort and less working hours.

In the oil rich Gulf Cooperation Council (“GCC”)³ countries, the private sector firms compounded the queuing phenomenon because of their preference to employ expatriates, whom they regard as cheaper and more productive (Fasano and Goyal 2004). This is evidenced by the growing unemployment pressures among the nationals of the GCC countries⁴. To counter this effect, GCC governments instituted a number of policies designed to encourage private sector companies to employ nationals and make such job opportunities more attractive to them⁵. Nonetheless, unemployment pressures in the GCC remain unabated. Egypt, however, slowed its hiring and reduced the workers’ incentives to remain unemployed while queuing for public sector jobs (Assaad 2007). Many of the new male entrants started finding jobs in the informal private sector, whilst many females simply dropped out of the labor force (Assaad 2007). In Egypt unemployment declined in the 1998-2006 period when compared to the 1988-1998 period⁶.

This paper attempts to analyze the impact of government policies on unemployment in a labor market with a dominant public sector. It builds an equilibrium search and matching model which extends the Pissarides (2000) model by developing a two sector model with on the job search. The analysis relates to the United Arab Emirates (“UAE”);

³The GCC countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

⁴Unemployment rates among Saudi nationals reached around 9.8% in 2008 (Labor Force Survey), and unemployment rates among United Arab Emirates nationals reached 19% in 2005.

⁵In the United Arab Emirates, Saudi Arabia, Qatar and Oman their respective governments initiated various programs by which companies working in certain industries must ensure that a minimum percentage of their workforce are nationals. They are respectively referred to as ‘Emiratization,’ ‘Saudization,’ ‘Qatarization’ and ‘Omanization’ programs.

⁶Unemployment fell from 11.7 percent in 1998 to 8.3 percent in 2006. (Assaad 2006).

however, such analysis could be used as a framework to analyze labor markets of other MENA countries with significant public sectors. There is extensive literature using two-sector models to explain migratory flows between the urban/rural or formal/informal sectors. Harris and Todaro (1970) initiated the literature by developing a two sector model of rural-urban migration with large wage differentials between the two. They assumed that unemployment only existed in the urban sector and did not account for frictions in the labor market. The authors showed that government policies such as wage subsidies aimed at promoting urban employment might in fact aggravate the unemployment problem because migration will continue due to the high wage differentials between the urban and rural sectors.

Zenou (2008) applied the search-matching approach to the Harris-Todaro model to analyze the impact of different government policies in a dual market with labor market frictions in the formal sector. He assumed as Harris and Todaro (1970), that the informal sector is perfectly competitive and fully accessible to everyone, whereas workers are queuing for formal sector jobs. Zenou (2008) showed that under certain conditions, a Todaro paradox might exist, whereby a change in labor policies can increase both formal employment and unemployment. Albrecht, Navarro, and Vroman (2008) also built a two sector search and matching model in a labor market with a significant informal sector to analyze policies such as the payroll and severance taxes. However, unlike Zenou (2008), they do not assume that workers queue for formal sector jobs, but that there exists an imperfect sorting of workers between the two sectors because of workers' heterogeneity

and labor market policies. Albrecht, Navarro, and Vroman (2008) show that tax increases decrease the number of workers who reject jobs in the informal sector and increase those who refuse formal sector jobs. Further, they were able to show that severance taxes decrease unemployment while payroll taxes raises it. Zenou (2008) and Albrecht, Navarro, and Vroman (2008) both demonstrate the effect of government policies on labour market outcomes in a dual market where there exists a significant informal sector in the economy.

The search literature modelling public sector employment is limited, however, especially in the MENA region. Alfonso and Gomes (2008) use a general labor market equilibrium model with search in order to understand the interaction between public and private sector wages in the OECD market. They show that within the OECD, an increase in 1% of public wages produces a 0.1% rise in private sector wages. Qudarini and Trigari (2007) analyze the impact of business cycles on employment in the presence of a public sector in the United States. They show that this presence amplifies the impact of the aggregate shocks, because during a recession, public sector employment becomes more attractive as private sector wages fall, thus reducing the creation of jobs in the private sector and increasing employment volatility. Burdett (2008) accounts for the presence of a public sector using the Burdett and Mortensen (1998) model. He assumes that private sector wages are posted by firms whilst wages and vacancies in the public sector are determined by the government's objective to minimize its cost. He shows that government actions impact the equilibrium number of private and public sector vacancies and firms differently depending on the wage differentials between the private and

public sector wages. For instance, if all private sector firms offer wages less than the government wage, then an increase in public sector wages does not affect the equilibrium values at all. These papers were able to show the varying effects of government policies on private sector wages and job creation, however, none discussed the queuing of workers for government jobs which may result if governments offers higher wages and benefits.

In order to fill this gap and study the public sector in the context of the MENA region, this paper models the preferences of workers with respect to employment in the public sector. To the best of my knowledge, this has not been done before. The paper considers a continuous time model which segments the labor market into two sectors: private and public sectors, and models the UAE national workers'⁷ decisions in the labor force. In contrast to the other papers that model the queuing of workers for formal sector jobs such as Zenou (2008), this paper assumes that the private sector is not fully accessible and that unemployment also exists in the private sector. Private sector firms in the GCC have access to cheaper foreign labor that can act as substitutes to national workers. Further, this paper assumes that public sector wages are exogenous and determined by the governments' human resources law, while private sector wages are endogenously determined by a Nash bargaining process.

The model allows for on the job ("OTJ") search whilst employed in the private sector. This paper introduces OTJ search, using a similar approach to Dolado, Jansen and Jimeno (2009), by assuming that the ratio between the arrival rates of offers to workers

⁷National workers are defined to be the citizens of the country as opposed to expatriates who are on a temporary residency visa that is renewable every few years.

employed in the private sector and the unemployed lies between 0 and 1. Dolado, Jansen, and Jimeno (2009) showed that OTJ search makes it more probable that high skilled workers match with low skilled jobs because it decreases the opportunity cost of working there. Similarly, this paper finds that introducing OTJ search lowers private sector wages and increases the probability of a private sector match occurring. The model shows that there exists unique steady state equilibrium with OTJ search.

This paper then considers different government policies such as increasing public sector wages, job creation in the public sector, and changing the bargaining power of workers by imposing employment quotas on firms. It finds that increasing government wages and the bargaining power of workers raises unemployment. Moreover, increasing employment in the public sector has an ambiguous effect on unemployment, and if certain conditions are met, it might actually increase it.

The matching model as applied in this paper has rarely been used in the GCC countries to explain the segmentation and unemployment that exists in the labor market. However, there is a paper by Fasano and Goyal (2004) which analyzes the unemployment problem prevalent among GCC nationals using the search and matching model. They too study the labor market policies that can reduce unemployment and expand the employment of nationals in the private sector. However, Fasano and Goyal do not incorporate the public sector in their model, but define unemployment to include employment in the public sector.

The remainder of the chapter is organized as follows. The next section describes some

of the labor market features of the UAE. Section 1.3 describes the model and framework. Section 1.4 determines the wages and proves the existence and uniqueness of a steady state equilibrium with on the job search when matches occur in both sectors. Section 1.5 discusses the policy implications of the model. Section 1.6 calibrates the model to UAE data. Finally, section 1.7 concludes.

1.2 UAE Stylized Facts

To motivate the discussion, some facts for the UAE labor market will be presented in this section. However, as discussed in the introduction, this model is not built exclusively for a UAE labor market but could pertain to other labor markets in the region.

Figure 1.1 shows the employment distribution of UAE nationals by sector. Around 90% of UAE nationals were employed in the public sector in the year 2005⁸. This clear preference for public sector jobs has led to an increase of wait or frictional unemployment as evidenced by figure 1.2 which depicts the increase in unemployment rates from 6.3% in 1995 to 13.4% in 2005.

The public sector in the UAE typically offers higher wages and more benefits to Emiratis than the private sector. Based on the household budget survey of 2008 data⁹, the

⁸The last census was conducted in 2005.

⁹Because the last census was conducted in 2005, the data for 2008 is taken from the UAE household budget survey which contains information on 13,992 national and expatriate households. The information includes the socio-economic characteristics of all the individuals in the household such as their education levels and labor market status. This paper restricts the sample to the male heads of households who are UAE nationals. The sample size is thus 4092 individuals.

difference in means between public sector wages¹⁰ and private sector wages is significant¹¹ amounting to approximately 3600 AED or 980 USD per month for semi-professionals, clerks, service workers, craftsmen and workers of elementary occupations¹². However, the opposite holds true for the highest skilled. Private sector companies may be willing to pay high wages to the highest skilled UAE nationals because of their relatively higher productivity levels which gives them further opportunity to leverage their bargaining power vis-à-vis private sector firms. Nonetheless, other non wage benefits such as the relatively lower number of work hours could also offset this negative difference and attract workers to the public sector. For example official working hours for Dubai government jobs are 35-45 hours per week¹³ while the maximum hours per week in the private sector is 48 hours¹⁴. In practice, professionals are expected to work even longer hours in the private sector. Additional factors that can enter into the non-wage compensation include the low effort exertion in government jobs and cultural preferences to work with other UAE nationals.

¹⁰Wages include the income from the main job, the in-kind non-cash benefits from work, and salary deductible towards housing/rent paid by the employer.

¹¹The p-value for the differences in means is 0.01 with a 90% confidence interval.

¹²The classification is according to the third version of the International Standard Classification of Occupations ("ISCO-88").

¹³Chapter III, Article (19) of the Dubai Government Human Resources Management Law No. (27) 2006.

¹⁴UAE Federal Labor Law No. 8 of 1980 , Article (65).

1.3 The Model

The matching model introduced in the paper allows for the existence of a significant and dominant public sector in the labor market. It considers a continuous time model in which there is a continuum of homogeneous workers (the model considers medium-skilled workers), the UAE nationals, to be normalized to one. All workers are risk neutral, infinitely-lived and discount the future at the common rate r . The model segments the labor market into two sectors: the public and private sector with OTJ search in the private sector, i.e. there is a direct transition from the private sector to the public sector but not in the opposite direction. The index $i \in \{g, p\}$ denotes the public and private sector variables respectively. Expatriates are not explicitly modeled in this paper, but their impact can be captured indirectly. Their supply (assumed to be a certain number X) can affect the negotiations between private sector firms and UAE nationals.

1.3.1 Matching

Workers match with either sector through a constant returns to scale matching technology which depends on the number of vacancies posted and the number of individuals looking for jobs. The model allows for two different matching functions, one for each type of vacancy: a) public sector vacancies; and b) private sector vacancies:

$$m_g(\theta_g), \quad \text{where } \theta_g = \frac{v_g}{(\lambda e_p + u)}$$

$$m_p(\theta_p), \quad \text{where } \theta_p = \frac{v_p}{u}$$

where v_g and v_p are the masses of vacancies in the public and private sector respectively, and $\lambda \in (0, 1)$ is an exogenous search intensity of individuals who are working in the private sector and looking for a job in the public sector. The two matching functions are characterized by the following properties:

$$m'_i(\theta_i) > 0 \quad \frac{d(m_i(\theta_i)/\theta_i)}{d\theta_i} < 0 \quad \lim_{\theta_i \rightarrow \infty} m_i(\theta_i) = \infty \quad \lim_{\theta_i \rightarrow 0} m_i(\theta_i) = 0$$

The arrival rate of jobs for the unemployed in either sector is thus $m_i(\theta_i)$ while the effective arrival rate of public sector jobs for the workers employed in the private sector is $\lambda m_g(\theta_g)$. The model assumes that an unemployed individual has a higher chance of matching with a public sector job than an employed private sector worker because of the time constraint the latter faces and because the government may prefer to employ those who are out of work ($m_g(\theta_g) > \lambda m_g(\theta_g)$). Vacancies meet workers at the rate of $m_i(\theta_i)/\theta_i$. Matches between workers and public and private sector jobs break up at exogenous rates of δ_g and δ_p respectively. The public sector in the MENA region offers more job security than the private sector, thus the model assumes that $\delta_g < \delta_p$.

1.3.2 Workers

UAE national workers engage in random search. They can be: a) unemployed and searching for either a public or private sector job; b) employed in the private sector whilst

searching for a public sector job; or c) employed in the public sector. That is,

$$e_g + e_p + u = 1 \tag{1.1}$$

where u is the fraction of unemployed workers, e_g is the fraction of workers employed in the public sector assumed to be exogenous in the model, and e_p is the fraction of workers employed in the private sector. Figure 1.3 depicts the flow of workers between the different labor market states.

Unemployed workers receive an unemployment benefit (or the value for leisure) b^f , and at the rate $m_g(\theta_g)$ they match with a public sector job and obtain a gain of $N^g - U$; while at the rate $m_p(\theta_p)$ they receive an offer from the private sector, and if accepted, they gain $N^p - U$. Employed workers in the public sector receive the exogenous wage w_g and they lose their jobs and flow back into unemployment at the rate of δ_g . On the other hand, a match in the private sector generates a wage w_p , and is dissolved in one of the two cases: a) the worker quits because he finds a public sector job; or b) at the rate δ_p a shock arrives. Thus the value functions for the unemployed and the employed are:

$$rU = b^f + m_g(\theta_g)(N^g - U) + m_p(\theta_p)Max[(N^p - U), 0] \tag{1.2}$$

$$rN^g = w_g + \delta_g(U - N^g) \tag{1.3}$$

$$rN^p = w^p + \delta_p(U - N^p) + \lambda m_g(\theta_g) \text{Max}[(N^g - N^p), 0] \quad (1.4)$$

1.3.3 Private Sector Firms

Private sector firms post vacancies and incur a cost c for searching for the appropriate match. When a worker is hired, they receive a constant flow of Y units of output less the cost of search and the wage. The job ends if either a shock arrives or the worker quits. The value functions of private sector firms from posting a vacancy or filling a job are denoted below:

$$rV^p = -c + \frac{m_p(\theta_p)}{\theta_p}(J^p - V^p) \quad (1.5)$$

$$rJ^p = Y - c - w_p + \delta_p(V^p - J^p) + \lambda m_g(\theta_g)(V^p - J^p) \quad (1.6)$$

1.3.4 Government

Different methods and assumptions have been used to formulate a government's objective function. Burdett (2008) uses a function that minimizes the costs of employing a certain steady state number of employees. However, since the purpose is not to find the optimal level of employment in the public sector, the model assumes, similar to Alfonso and Gomes (2008), that the Government's objective is to maintain a certain level of employment e_g . Thus, every period during which public sector jobs are destroyed, the

government posts a certain number of vacancies needed to maintain employment level e_g . Thus, in the steady state the government posts vacancies such that

$$\delta_g e_g = m_g(\theta_g)(\lambda e_p + u) \tag{1.7}$$

1.4 Equilibrium

1.4.1 Wage determination

Public sector wages are exogenous and determined by government policies, while private sector wages are endogenously determined according to a surplus splitting rule where the workers' bargaining power is an exogenous parameter $\beta \in (0, 1)$. The presence of expatriates is assumed to have a strong impact on the bargaining power of UAE nationals vis-a-vis the private sector.

The model assumes that public sector wages are higher than private sector wages and the public sector offers more benefits such as less working hours per week and more leaves: $w_g > w_p$. The public sector is so attractive that the model assumes that firms will not be able to pay a higher wage to keep workers from searching in the public sector. Thus, arguments that find surplus splitting as suboptimal because employers might match the offer of their rivals would not apply in this context (Shimer 2006). Hence, the private sector wage satisfies the following Nash bargaining solution given that $V^p = 0$:

$$N^p - U = \beta(N^p + J^p - U)$$

Using expressions (1.3), (1.4) and (1.6) yields the following expression for the wage in the private sector:

$$w_p = \beta(Y - c) + (1 - \beta)rU - (1 - \beta)\frac{\lambda m_g(\theta_g)}{(r + \delta_g)}(w_g - rU) \quad (1.8)$$

The opportunity cost of accepting a private sector job is lower when OTJ search is allowed (Dolado et al. 2008). According to equation (1.8), workers are willing to agree to a reduction of $(1 - \beta)\frac{\lambda m_g(\theta_g)}{(r + \delta_g)}(w_g - rU)$ in their wage when OTJ search is allowed, and as λ increases, this cut increases.

Private sector matches will occur provided that the surplus of filling a private sector job is non negative. If that is not the case, then there will be a corner solution where there is only public sector employment which is trivial and not interesting for the purpose of this paper. Thus, the model will only focus on interior solutions where:

$$N^p + J^p \geq U$$

Substituting in for the appropriate values, a private sector match will be formed if and only if:

$$(Y - c)(r + \delta_g) + \lambda m_g(\theta_g)w_g \geq (r + \delta_g + \lambda m_g(\theta_g))rU \quad (1.9)$$

If $\lambda = 0$, then condition (1.9) becomes harder to satisfy. Without OTJ search, it is less likely that private sector matches occur because workers would be foregoing their chances of finding public sector jobs for good (condition (1.9) is expressed in terms of exogenous parameters in section 1.8).

Substituting equation (1.8) into (1.2), the value of unemployment becomes:

$$rU = \frac{b^f(r+\delta_g)(r+\delta_p+\lambda m_g(\theta_g))+m_g(\theta_g)w_g(r+\delta_p+\lambda m_g(\theta_g))+\beta m_p(\theta_p)((r+\delta_g)(Y-c)+\lambda m_g(\theta_g)w_g)}{(r+\delta_p+\lambda m_g(\theta_g))(r+\delta_g+m_g(\theta_g))+\beta m_p(\theta_p)(r+\delta_g+\lambda m_g(\theta_g))} \quad (1.10)$$

1.4.2 Steady State Equilibrium with OTJ

Definition 1.1 *A Steady State Equilibrium with on the job search is the triple $\{\theta_g, \theta_p, u\}$ where the following conditions hold:*

1- *The flow of workers into unemployment is equal to the flow out of unemployment:*

$$(m_g(\theta_g) + m_p(\theta_p))u = \delta_p e_p + \delta_g e_g$$

$$(m_g(\theta_g) + m_p(\theta_p))u = \delta_p(1 - e_g - u) + \delta_g e_g \quad (1.11)$$

2- *The steady State Condition of the Government's law of motion:*

$$m_g(\theta_g) = \frac{\delta_g e_g}{\lambda(1 - e_g) + u(1 - \lambda)} \quad (1.12)$$

3- Free Entry and Exit Condition: $V^p = 0$

$$\frac{m_p(\theta_p)}{\theta_p} J^p = c \quad (1.13)$$

Replacing with the appropriate values, equation (1.13) becomes:

$$\frac{m_p(\theta_p^*)}{\theta_p^*} (1 - \beta) \frac{((r + \delta_g)(Y - c) + \lambda m_g(\theta_g^*) w_g - rU(r + \delta_g + \lambda m_g(\theta_g^*)))}{(r + \delta_g)(r + \delta_p + \lambda m_g(\theta_g^*))} = c \quad (1.14)$$

Proposition 1.1 *Assuming that $m_i(\theta_i)$ is continuous, monotonically increasing and concave, and that condition (1.9) holds, there exists a Unique Steady State Equilibrium with private sector matching.*

(See section 1.8 for the proof.)

1.5 Policy Implications

Comparative statics are explored in this section to illustrate how labor market policies may impact unemployment levels. We assume for simplicity that $\delta_g = \delta_p$. This assumption does not alter the results and only facilitates the calculations.

Corollary 1.1 *An increase in the public sector wage leads to*

1. a decrease in the labor market tightness in the public sector: $\frac{d\theta_g}{dw_g} < 0$
2. a decrease in the labor market tightness in the private sector: $\frac{d\theta_p}{dw_g} < 0$
3. an increase in unemployment: $\frac{du}{dw_g} > 0$

An increase in public sector wages allow workers to become more demanding when bargaining for private sector wages thus inducing firms to post less vacancies. Unemployment then increases and employment in the private sector decreases which negatively affects the labor market tightness in the public sector as $\lambda < 1$. This result is similar to the Harris-Todaro model where the high urban wage relative to the rural wage leads to an increase in the unemployment in the urban sector.

Corollary 1.2 *An increase in the government employment level leads to:*

1. an increase in the labor market tightness in the public sector: $\frac{d\theta_g}{de_g} > 0$
2. a decrease in the labor market tightness in the private sector: $\frac{d\theta_p}{de_g} < 0$
3. an ambiguous effect on unemployment

When the government creates more jobs in the public sector, it does not necessarily solve the unemployment problem. Indeed, under certain conditions, unemployment might increase. There are two opposing effects taking place. As e_g increases, there is a direct positive effect on θ_g , causing unemployment to decrease. However, there is also a negative effect on θ_p since workers become more demanding in the private sector as their job

prospects in the public sector ameliorate. Which effect dominates depends on how much θ_g and θ_p negatively affect the long run zero profit condition of firms (eq. (1.14)). The second effect dominates if the effect of θ_g on eq. (1.14) is more than θ_p . This occurs if the following two sufficient conditions hold¹⁵:

1. $S_g(r + \delta + \lambda m_g(\theta_g)) \geq S_p$

where $S_g = w_g - rU$ is the surplus from filling a public sector job, and S_p is the surplus from filling a private sector job (eq. (1.9)).

2. $\frac{d(m_p(\theta_p)/\theta_p)}{d\theta_p} m'_p(\theta_p) m'_g(\theta_g) (r + \delta + \beta m_p(\theta_p) + m_g(\theta_g)) \geq -(1 - \beta) \frac{m_p(\theta_p)}{\theta_p} m'_g(\theta_g) m'_p(\theta_p)$

The above conditions pertain to the nature of the matching function and the surpluses from matching with the private and public sectors. Moreover, the lower is the value of β , the more probable that the second effect dominates and thus that unemployment increases. The intuition is as follows. If β is low and the public sector wage is relatively high, then firms' profitability is relatively large. This implies that employment in the private sector decreases by more than the increase in government employment, thus increasing unemployment ($e_g + e_p + u = 1$). (See section 1.9 for the proof). Unlike corollary (1.1), this result differs from that of a Harris-Todaro model, where the increase in the creation of urban jobs would have led to a decrease in unemployment. However,

¹⁵From equation (1.14), conditions (1) and (2) can be expressed in terms of exogenous parameters.

in this model, because of the interaction between the public and private sector and the existence of OTJ search, the effect on unemployment depends on the parameters of the model.

Corollary 1.3 *An increase in the bargaining power of workers vis-a-vis the private sector leads to:*

1. *a decrease in the labor market tightness in the public sector: $\frac{d\theta_g}{d\beta} < 0$*
2. *a decrease in the labor market tightness in the private sector: $\frac{d\theta_p}{d\beta} < 0$*
3. *an increase in unemployment: $\frac{du}{d\beta} > 0$*

Regulations such as the Emiratization programs that force private sector firms to hire a certain number of UAE nationals increase the bargaining power of workers when negotiating for their wages. Consequently, these policies decrease the profitability of firms and increase unemployment.

1.6 Calibration

This section calibrates the model using UAE labor market data and performs several policy simulations. In particular, it uses the model to conduct experiments by varying: i) public sector wages; ii) productivity; iii) the bargaining power of UAE nationals vis-a-vis the private sector; iv) exogenous on-the-job search intensity; and v) government

employment rates. The last simulation specifies two baseline cases, changing only the functional form of the matching function to depict the ambiguous effect of variations in government employment on unemployment rates.

1.6.1 Baseline Case

The parameters in Table 1.1 are either directly observed from the data, extracted from the literature, or calibrated from the model. According to the UAE Household Expenditure Survey of 2008¹⁶, 73.8% of UAE nationals are employed in the public sector, 18.8% are unemployed, and the remainder are employed in the private sector¹⁷. Average annual public and private sector wages are 190,801 AED and 140,194 AED respectively. The flow value of unemployment b^f is assumed to be the log of the lowest wage earned by private sector workers and is 9.86.

The public and private sector separation rates are calculated from the Dubai Labor Force Survey of 2008¹⁸, and as expected $\delta_g < \delta_p$. The discount rate r represents the

¹⁶It worth noting that we have restricted the population to UAE nationals who are or ever have been working and are of skill levels 1,2 or 3 according to ISCO-88 classification. We exclude skill level 4 because section 2 of this paper finds the difference in means between public sector wages and private sector wages to be significantly large for low and medium skill occupations but not for high-skilled occupations.

¹⁷Some individuals are employed in sectors defined as 'foreign' or 'without establishment' in the HES 2008 data such as foreign diplomats and embassy staff. These individuals are not employed in either the public or private sector and only constitute 1.84% of all employed workers. Thus, we exclude them from our analysis.

¹⁸Due to data limitations in the UAE, we have used data on Dubai to calculate the separation rates. Dubai is one of the seven emirates which make up the UAE. The seven emirates are fairly homogeneous when it comes to duration data on UAE nationals, and thus, it is reasonable to assume that we can compute the separation rates using Dubai data only.

The Dubai labor force survey asks individuals the duration of their employment in their job. The data thus provides elapsed durations as opposed to completed durations. However, as is typically assumed in

average interest rate on inter-bank deposits for 2008 in the UAE. The time period in the calibration is one year.

Pursuant to the search and matching literature, the private sector matching function is assumed to be Cobb Douglas with $m_p(\theta_p) = \theta_p^{1/2}$. On the other hand, in line with Quadrini and Trigari (2007), we set the matching function in the public sector to be $m_g(\theta_g) = \theta_g$. This choice is consistent with the queuing phenomenon modeled in this paper, whereby the number of individuals searching for public sector jobs is always greater than the number of posted vacancies because of the relatively high wage and benefits premium of working with the government. Further, as in the standard literature, the bargaining power β is set to 0.5. The exogenous search intensity λ is also set to 0.5.

The parameters Y and c can be inferred from the model using equations (1.11), (1.12), and (1.13).

1.6.2 Results

We conduct policy experiments that are based on steady state comparisons given the above baseline specification¹⁹.

such models, we assume that there is no duration dependence. The separation rates are then equal to 1/elapsed duration.

The mean elapsed durations in the public and private sectors are 9.8 years and 6.4 years respectively.

¹⁹Dynamic effects are ignored in this paper.

Variation in Public Sector Wages

Table 1.2 evaluates the impact of a change in public sector wages on the equilibrium values of private sector wages, labor market tightness in the public and private sectors, employment composition, and vacancy rates . A 10% increase in government wages increases private sector wages by only 1%. In addition, labor market tightness in the private sector decreases by 3.27% largely because of the 3.4% decrease in posted private sector vacancies. Therefore, the effects on employment composition do not appear to be strong. The unemployment rate among UAE nationals increases by 0.07 percentage points (p.p.) relative to its baseline value, and since e_g is exogenous and fixed, private sector employment decreases by an equivalent amount. Unemployment appears therefore not to be sensitive to changes in public sector wages.

Variation in Productivity

Thus far we have assumed a certain level of productivity among UAE nationals. However, an increase in productivity can lower unemployment. Table 1.3 shows that if productivity increases by 10%, the unemployment rate among UAE nationals would decrease by 0.21 p.p.. Private sector wages increase by 5% from 11.85 to 11.9 because of productivity increase. Output per worker is now bigger and thus private sector firms would want to post more vacancies. Thus, 6.9 % more vacancies are posted in the private sector and consequently unemployment decreases.

The simulations above indicate that unemployment rates are less sensitive to public

sector wages then they are to productivity. Further, increases in public sector wages have negative effects on unemployment; in contrast with the positive effect of productivity increases. Governments should focus on investments in UAE national human development due to their positive impact on labor market outcomes.

Variation in the Bargaining Power

We next consider the impact of increasing the bargaining power of UAE nationals vis-a-vis the private sector. The UAE government has implemented a number of Emiratization policies aimed at promoting UAE national employment in the private sector. These policies provide nationals with more bargaining power; i.e. they increase β substantially because of the restrictions put forth on the employment of skilled and semi-skilled expatriates.

As can be seen in Table 1.4, an increase of β from 0.5 to 0.9 increases private sector wages by 74%. The cost of hiring UAE nationals in the private sector is greatly increased and thus, private sector employment decreases by 5.14 p.p. while unemployment increases by an equivalent amount. Indeed, 93% less private sector vacancies are posted and labor market tightness in that sector is reduced by 95%. In addition, the labor market tightness in the public sector decreases by 10% because of the sharp increase in the number of searchers. These results are in line with what is occurring in the UAE labor market. UAE national workers have become more demanding when it comes to working with private sector firms, and as result, the pool of unemployed has substantially increased

over the last years (see figure 1.2)²⁰.

Further, Table 1.4, shows that decreasing β to 0.1 would increase private sector employment by 3.35 p.p. as 178% more private sector vacancies would be posted. It would appear, that in order to increase employment in the private sector, a more effective policy would be to decrease UAE nationals' bargaining power. One way of achieving that would be to maintain labor market flexibility²¹. However, a very low β pushes private sector wages to be too low therefore creating more inequality towards UAE nationals as more expatriates flow into the country.

Variation in On-The-Job Search Intensity

Table 1.5 shows that even if λ is set to 0, the chosen parameters generate a unique equilibrium where workers match with the private sector. Eliminating on-the-job search causes private sector wages to become higher than public sector wages. UAE nationals are now being compensated for foregoing the opportunity to work in the public sector. Further, because of the higher wages, more UAE nationals are willing to work in the private sector. In addition, employers are more willing to invest in UAE nationals because they are secure in the knowledge that their UAE national employees will not transfer to the public sector. Labor market tightness in the public sector increases as now only the unemployed search for government jobs. The overall effect is a decrease in unemployment

²⁰It is worth noting that to be able to fully assess the impact of Emiratization policies on private sector employment one should explicitly incorporate expatriates into the model. This is left for future work.

²¹One of the policy recommendations in Fasano and Goyal (2004) was to use market-based rather than quantity-based interventions in order to ease the labor market strains emerging in the GCC.

by 4.63 p.p. relative to its baseline value.

Variation in Public Sector Employment

An important policy implication of this model is the effect on unemployment levels arising from a change in the size of the public sector. In this following simulation, we will consider two baseline cases.

Case 1 Any shock to the economy can lead to a reduction in government employment²² and consequently have an adverse effect on unemployment especially if the right policy rules are not put into place. Table 1.6 depicts the impact of a change in public sector employment on the labor market outcomes of nationals. If $\beta=0.5$, a 10% decrease in e_g can increase unemployment by 3.2 p.p. relative to its baseline value. However, if $\beta=0.1$ then the shock in public sector employment could be absorbed by the private sector and the effect on unemployment is reduced (an overall increase in unemployment of just 1.77 p.p.). A high β negatively impacts labor market conditions if there is a decrease in government employment. A low e_g decreases the outside option of the worker, but a relatively high β increases the worker's surplus share thereby decreasing firms' profitability and reducing the effect on private sector employment.

²²The UAE is heavily dependent on oil to finance its government expenditures which include government wages, so any shock to oil prices for example can affect the size of government employment.

Case 2 More interestingly, the parameters set forth in this paper increase unemployment when public sector employment decreases; however, for a different specification of the matching function unemployment may decrease (as proven in the previous section). For example, we consider another baseline case where the private sector matching function is equal to $0.5 \theta_p$ ²³(see table 1.7 for the new parameter specification²⁴). This matching function suggests that the number of private sector searchers is greater than the posted vacancies. This seems a reasonable assumption since the private sector vacancy rate is already very low and unemployment is relatively high among UAE nationals. Moreover, the private sector matching function is half as efficient as the public sector one.

Table 1.8 shows that a 10% decrease in the size of public sector employment can cause private sector employment to more than double in size from 7.41% of the labor force to 16.62% of the labour force. Further, the unemployment rate among UAE nationals decreases by 1.83 percentage points. This exhibits the crowding out effect of the public sector on private sector employment. There are two opposing effects. The outside option, rU , decreases as less government jobs are available, but it also increases as it is easier to get private sector jobs as labor market tightness increases in the private sector. The overall effect is an increase in private sector wages and a decrease in unemployment. Thus, not only is the public sector crowding out the private one, but it is also contributing to the unemployment problem.

²³It is vital to estimate the matching functions in each sector for the UAE in order to correctly assess the impact of e_g on unemployment. Unfortunately, estimations of matching functions in the GCC region do not exist thus far due to lack of data.

²⁴We have set $\delta_g = \delta_p$ in order to be consistent with corollary (1.2) in the previous section and check whether conditions (1) and (2) of that corollary hold with the parameters specified in table 1.7.

These results are in line with corollary (1.2) in section 1.5. We showed then that it is sufficient for conditions (1) and (2) in corollary (1.2) to hold for a positive relationship between public sector employment and unemployment to occur. Given our parameters in the second baseline case, we can verify that condition (2) holds²⁵.

In short, this last simulation experiment has shown that the government, by acting as a main employer to UAE national workers, is crowding out the private sector. Further, depending on the nature of the matching function, a large government sector is aggravating the unemployment problem. A decrease in e_g promotes private sector employment in both baseline cases. In the first case, e_g and u are inversely related; whereas in the second case positively related. In addition, in the first case lowering the bargaining power β can reduce the negative impact to unemployment. In the second case, even if bargaining power is maintained at 0.5, a decrease in government employment alone may ease unemployment pressures.

1.7 Conclusions

In this paper, we develop a two-sector search and matching labor market model to analyze government policies in an economy with a significant and dominant public sector. Such a model applies to many countries of the MENA region where governments use

²⁵Given baseline case 2:

$$\frac{d(m_p(\theta_p)/\theta_p)}{d\theta_p} m'_p(\theta_p) m'_g(\theta_g) (r + \delta + \beta m_p(\theta_p) + m_g(\theta_g)) = 0 \text{ and } -(1 - \beta) \frac{m_p(\theta_p)}{\theta_p} m'_g(\theta_g) m'_p(\theta_p) = -0.125$$

public employment as a policy tool to absorb new labor market entrants and to combat unemployment.

We model a labor market where workers are queuing for public sector jobs due to the wage premium between the public and private sectors. We also allow private sector workers to engage in on-the-job search such that there exists a direct transition from the private sector to the public sector but not in the opposite direction. The matching model as applied in this paper has rarely been used in the MENA region to explain the segmentation and unemployment that exists in the labor market.

We prove the existence of a unique steady state equilibrium with on-the-job search in the private sector. We then consider different labor market policies. We show that increases in public wages have negative effects on unemployment. Moreover, regulations that increase workers' bargaining power when negotiating for their private sector wages decrease firms' profitability, induce lower job creation in the private sector, and increase unemployment. Finally, we show that under some conditions, increasing public sector employment can aggravate the unemployment problem because of the negative indirect effect it has on the private sector. Thus, any policy implemented in the MENA countries, should consider the interactions between the public and private sectors and account for both direct and indirect effects of those sectors.

The paper then calibrates the model using data from the UAE and performs several policy simulations. The UAE economy has a large public sector and relatively high unemployment rates. The simulation results suggest that the large size of the public sector

is crowding out employment in the private sector. Further, we demonstrate numerically that under certain specifications of the matching function, a decrease in government employment can reduce unemployment rates. Finally, the results in this paper highlight the importance of investing in UAE national human development and increasing their labor productivity rather than instigating regulations that increase their bargaining power vis-a-vis the private sector or provide higher salaries and better benefits in the public sector.

1.8 Appendix A: Equilibrium

Proof of Proposition 1.1

Equation (1.11) and (1.12) determine θ_g and u as a function of θ_p .

$$u^* = \frac{(\delta_p(1-e_g)+\delta_g e_g)2\lambda(1-e_g)}{(\lambda m_p(\theta_p)(1-e_g)+\delta_p(1-e_g)(2\lambda-1)-\lambda\delta_g e_g)+\sqrt{(\lambda m_p(\theta_p)(1-e_g)+\delta_p(1-e_g)-\lambda\delta_g e_g)^2+4\delta_g e_g\lambda(1-e_g)(m_p(\theta_p)+\delta_p)}}$$

$$m_g(\theta_g^*) = \frac{-(\lambda m_p(\theta_p)(1-e_g)+\delta_p(1-e_g)-\lambda\delta_g e_g)+\sqrt{(\lambda m_p(\theta_p)(1-e_g)+\delta_p(1-e_g)-\lambda\delta_g e_g)^2+4\delta_g e_g\lambda(1-e_g)(m_p(\theta_p)+\delta_p)}}{2\lambda(1-e_g)}$$

Thus, the uniqueness and existence of an equilibrium depends ultimately on equation (1.14).

$$\frac{m_p(\theta_p^*)}{\theta_p^*}(1-\beta)\frac{((r+\delta_g)(Y-c)+\lambda m_g(\theta_g^*)w_g-rU(r+\delta_g+\lambda m_g(\theta_g^*)))}{(r+\delta_g)(r+\delta_p+\lambda m_g(\theta_g^*))} = c$$

To prove the existence of a unique equilibrium, it is sufficient to prove that the long run profit condition (eq. (1.14)) is monotonically decreasing in θ_p (see figure 1.4). It can

be shown, using the assumptions on the matching functions described above (concavity and monotonicity), that equation (1.14) is monotonically decreasing in θ_p if condition (1.9) holds. Moreover, the left hand side of equation (1.14) approaches ∞ as $\theta_p \rightarrow 0$ and 0 as $\theta_p \rightarrow \infty$.

Using the Chain Rule:

$$\frac{\partial rV^P}{\partial \theta_p} = \frac{\partial rV^P}{\partial m_p(\theta_p)} \frac{dm_p(\theta_p)}{d\theta_p} + \frac{\partial rV^P}{\partial m_g(\theta_g)} \frac{dm_g(\theta_g)}{d\theta_g} \frac{d\theta_g}{d\theta_p}$$

where

$$rV^P = \frac{m_p(\theta_p)}{\theta_p} \frac{(1-\beta)}{(r+\delta_g)} \frac{((r+\delta_g)(r+\delta_g+m_g(\theta_g))(Y-c) - (1-\lambda)m_g(\theta_g)(r+\delta_g)w_g - b^f(r+\delta_g)(r+\delta_g+\lambda m_g(\theta_g)))}{(r+\delta_p+\lambda m_g(\theta_g))(r+\delta_g+m_g(\theta_g))+\beta m_p(\theta_p)(r+\delta_g+\lambda m_g(\theta_g))} - c$$

Define $S_g = w_g - rU > 0$ as the surplus from filling a public sector job which is non negative.

Substituting the appropriate values we get:

$$S_g = (r+\delta_g)[(r+\delta_p+\lambda m_g(\theta_g)+\beta m_p(\theta_p))w_g - b^f(r+\delta_p+\lambda m_g(\theta_g))+\beta m_p(\theta_p)(Y-c)] > 0$$

The surplus from matching with a private sector job, S_p , from eq. (1.9) is:

$$S_p = (r+\delta_g)(r+\delta_p+\lambda m_g(\theta_g))[(Y-c)(r+\delta_g+m_g(\theta_g)) - (1-\lambda)m_g(\theta_g)w_g - b^f(r+\delta_g+\lambda m_g(\theta_g))] > 0$$

After differentiation, substitution and some mathematical manipulations we get:

$$\frac{\partial rV^P}{\partial m_p(\theta_p)} \frac{dm_p(\theta_p)}{d\theta_p} = \frac{(1-\beta)d(\frac{m_p(\theta_p)}{\theta_p})m'_p(\theta_p)S_p}{(r+\delta_g)(r+\delta_p+\lambda m_g(\theta_g))[(r+\delta_p+\lambda m_g(\theta_g))(r+\delta_g+m_g(\theta_g))+\beta m_p(\theta_p)(r+\delta_g+\lambda m_g(\theta_g))]}$$

$$-\frac{(1-\beta)\beta\frac{m_p(\theta_p)}{\theta_p}m'_p(\theta_p)(r+\delta_g+\lambda m_g(\theta_g))S_p}{(r+\delta_g)(r+\delta_p+\lambda m_g(\theta_g))[(r+\delta_p+\lambda m_g(\theta_g))(r+\delta_g+m_g(\theta_g))+\beta m_p(\theta_p)(r+\delta_g+\lambda m_g(\theta_g))]^2} < 0$$

$$\frac{\partial rV^P}{\partial m_g(\theta_g)} \frac{dm_g(\theta_g)}{d\theta_g} = \frac{(1-\beta)\frac{m_p(\theta_p)}{\theta_p}m'_g(\theta_g)(-\lambda S_p(r+\delta_g+m_g(\theta_g))-(1-\lambda)S_g(r+\delta_g)((r+\delta_p+\lambda m_g(\theta_g))))}{(r+\delta_g)(r+\delta_p+\lambda m_g(\theta_g))[(r+\delta_p+\lambda m_g(\theta_g))(r+\delta_g+m_g(\theta_g))+\beta m_p(\theta_p)(r+\delta_g+\lambda m_g(\theta_g))]^2} < 0$$

$$\frac{d\theta_g}{d\theta_p} = \left[\frac{m'_p(\theta_p)}{m'_g(\theta_g)} \right] \left[-\frac{1}{2} + \frac{1}{2} \frac{(\lambda m_p(\theta_p)(1-e_g)+\delta_p(1-e_g)-\lambda\delta_g e_g+2e_g)}{\sqrt{(\lambda m_p(\theta_p)(1-e_g)+\delta_p(1-e_g)-\lambda\delta_g e_g)^2+4\delta_g e_g \lambda(1-e_g)(m_p(\theta_p)+\delta_p)}} \right] > 0$$

Thus,

$$\frac{\partial rV^P}{\partial \theta_p} = \frac{\partial rV^P}{\partial m_p(\theta_p)} \frac{dm_p(\theta_p)}{d\theta_p} + \frac{\partial rV^P}{\partial m_g(\theta_g)} \frac{dm_g(\theta_g)}{d\theta_g} \frac{d\theta_g}{d\theta_p} < 0$$

1.9 Appendix B: Comparative Statics

Assuming that $\delta_g = \delta_p$, equations (1.12), (1.11), and (1.14) become:

$$\frac{m_p(\theta_p)}{\theta_p} \frac{(1-\beta)}{(r+\delta)} \frac{((r+\delta)(r+\delta+m_g(\theta_g))(Y-c)-(1-\lambda)m_g(\theta_g)(r+\delta)w_g-b^f(r+\delta)(r+\delta+\lambda m_g(\theta_g)))}{(r+\delta+\lambda m_g(\theta_g))(r+\delta+m_g(\theta_g))+\beta m_p(\theta_p)} - c = 0 \quad (1.15)$$

$$(m_g(\theta_g) + m_p(\theta_p))u - \delta(1-u) = 0 \quad (1.16)$$

$$m_g(\theta_g)(\lambda(1-e_g) + u(1-\lambda)) - \delta e_g = 0 \quad (1.17)$$

The Jacobian determinant for the system above is given by:

$$A = \frac{\partial F1}{\partial \theta_g} \left(\frac{\partial F2}{\partial \theta_p} \frac{\partial F3}{\partial u} \right) - \frac{\partial F1}{\partial \theta_p} \left(\frac{\partial F2}{\partial \theta_g} \frac{\partial F3}{\partial u} - \frac{\partial F2}{\partial u} \frac{\partial F3}{\partial \theta_g} \right) < 0$$

$$\frac{\partial F1}{\partial \theta_g} < 0 \text{ (Section 1.8)}$$

$$\frac{\partial F1}{\partial \theta_p} < 0 \text{ (Section 1.8)}$$

$$\frac{\partial F1}{\partial u} = 0; \frac{\partial F3}{\partial \theta_p} = 0$$

$$\frac{\partial F2}{\partial \theta_g} = m'_g(\theta_g)u > 0; \frac{\partial F2}{\partial \theta_p} = m'_p(\theta_p)u > 0$$

$$\frac{\partial F2}{\partial u} = m_g(\theta_g) + m_p(\theta_p) + \delta > 0$$

$$\frac{\partial F3}{\partial \theta_g} = (\lambda(1 - e_g) + u(1 - \lambda))m'_g(\theta_g) > 0$$

$$\frac{\partial F3}{\partial u} = m_g(\theta_g)(1 - \lambda) > 0$$

Proof of Corollaries:

By the implicit function theorem.

1. Impact of w_g on θ_p, θ_g , and u .

$$\frac{d\theta_g}{dw_g} = -\frac{(\frac{\partial F1}{\partial w_g})(\frac{\partial F2}{\partial \theta_p})\frac{\partial F3}{\partial u}}{A} < 0$$

$$\frac{d\theta_p}{dw_g} = -\frac{-(\frac{\partial F1}{\partial w_g})(\frac{\partial F2}{\partial \theta_g} \frac{\partial F3}{\partial u} - \frac{\partial F2}{\partial u} \frac{\partial F3}{\partial \theta_g})}{A} < 0$$

$$\frac{du}{dw_g} = -\frac{-(\frac{\partial F1}{\partial w_g})(\frac{\partial F2}{\partial \theta_p})(\frac{\partial F3}{\partial \theta_g})}{A} > 0$$

$$\text{where } \frac{\partial F1}{\partial w_g} = -\frac{m_p(\theta_p)}{\theta_p} \frac{(1 - \beta)}{(r + \delta)} \frac{(1 - \lambda)m_g(\theta_g)(r + \delta)}{(r + \delta + \lambda m_g(\theta_g))(r + \delta + m_g(\theta_g) + \beta m_p(\theta_p))} < 0$$

$$\frac{\partial F2}{\partial w_g} = 0; \frac{\partial F3}{\partial w_g} = 0$$

2. Impact of e_g on θ_p, θ_g , and u .

$$\frac{d\theta_g}{de_g} = -\frac{-(\frac{\partial F1}{\partial \theta_p})(\frac{\partial F2}{\partial e_g} \frac{\partial F3}{\partial u} - \frac{\partial F2}{\partial u} \frac{\partial F3}{\partial e_g})}{A} > 0$$

$$\frac{d\theta_p}{de_g} = -\frac{(\frac{\partial F1}{\partial \theta_g})(\frac{\partial F2}{\partial e_g} \frac{\partial F3}{\partial u} - \frac{\partial F2}{\partial u} \frac{\partial F3}{\partial e_g})}{A} < 0$$

$$\frac{du}{de_g} = -\frac{(\frac{\partial F1}{\partial \theta_g} \frac{\partial F2}{\partial \theta_p} \frac{\partial F3}{\partial e_g} - \frac{\partial F1}{\partial \theta_p} \frac{\partial F2}{\partial \theta_g} \frac{\partial F3}{\partial e_g})}{A} \text{ ambiguous}$$

$$\text{where } \frac{\partial F1}{\partial e_g} = 0; \frac{\partial F2}{\partial e_g} = 0; \frac{\partial F3}{\partial e_g} = -\lambda m_g(\theta_g) - \delta < 0$$

$$\frac{du}{de_g} > 0 \text{ if } \frac{\partial F2}{\partial \theta_p} \frac{\partial F1}{\partial \theta_g} < \frac{\partial F1}{\partial \theta_p} \frac{\partial F2}{\partial \theta_g}$$

$$\frac{\partial F1}{\partial \theta_g} = m'_g(\theta_g) \frac{m_p(\theta_p)}{\theta_p} \frac{(1-\beta)}{(r+\delta)} \frac{-\lambda(r+\delta+m_g(\theta_g))S_p - (1-\lambda)(r+\delta)S_g}{(r+\delta+\lambda m_g(\theta_g))^2 (r+\delta+\beta m_p(\theta_p)+m_g(\theta_g))^2}$$

$$\frac{\partial F1}{\partial \theta_p} = \frac{[d(\frac{m_p(\theta_p)}{\theta_p})m'_p(\theta_p)(r+\delta+m_g(\theta_g)+\beta m_p(\theta_p))-\beta \frac{m_p(\theta_p)}{\theta_p} m'_p(\theta_p)]}{(r+\delta+\lambda m_g(\theta_g))^2 (r+\delta+\beta m_p(\theta_p)+m_g(\theta_g))^2} \frac{(1-\beta)}{(r+\delta)} S_p$$

Comparing $\frac{\partial F2}{\partial \theta_p} \frac{\partial F1}{\partial \theta_g}$ and $\frac{\partial F1}{\partial \theta_g} \frac{\partial F2}{\partial \theta_p}$, we deduce the below sufficient conditions for $\frac{du}{de_g} > 0$

1. $S_g(r + \delta + \lambda m_g(\theta_g)) \geq S_p$
2. $\frac{d(m_p(\theta_p)/\theta_p)}{d\theta_p} m'_p(\theta_p) m'_g(\theta_g) (r+\delta+\beta m_p(\theta_p)+m_g(\theta_g)) \geq -(1-\beta) \frac{m_p(\theta_p)}{\theta_p} m'_g(\theta_g) m'_p(\theta_p)$

3. Impact of β on θ_p, θ_g , and u .

$$\frac{d\theta_g}{d\beta} = -\frac{(\frac{\partial F1}{\partial \beta})(\frac{\partial F2}{\partial \theta_p})(\frac{\partial F3}{\partial u})}{A} < 0$$

$$\frac{d\theta_p}{d\beta} = -\frac{-(\frac{\partial F1}{\partial \beta})(\frac{\partial F2}{\partial \theta_g} \frac{\partial F3}{\partial u} - \frac{\partial F2}{\partial u} \frac{\partial F3}{\partial \theta_g})}{A} < 0$$

$$\frac{du}{d\beta} = -\frac{-(\frac{\partial F1}{\partial \beta})(\frac{\partial F2}{\partial \theta_p})(\frac{\partial F3}{\partial \theta_g})}{A} > 0$$

$$\text{where } \frac{\partial F1}{\partial \beta} = \frac{m_p(\theta_p)}{\theta_p(r + \delta)} \frac{-S_p(r + \delta + m_g(\theta_g) + m_p(\theta_p))}{(r + \delta + \lambda m_g(\theta_g))^2 (r + \delta + m_g(\theta_g) + \beta m_p(\theta_p))^2} < 0$$

$$\frac{\partial F2}{\partial \beta} = 0; \frac{\partial F3}{\partial \beta} = 0$$

Chapter 2

Emiratization Policies in the UAE: An Intrafirm Bargaining and Matching Approach

2.1 Introduction

This paper uses the Stole and Zwiebel (1996) intrafirm bargaining methodology to study the United Arab Emirates (“UAE”) government policies aimed at reducing unemployment among UAE nationals. Stole and Zwiebel presented a novel bargaining methodology to analyze the equilibrium process within the firm. This paper applies the bargaining process to the large firm version of the search and matching model and incorporates government imposed job quotas for UAE nationals in the private sector. The job quotas form part of the UAE government’s initiative to increase the employment of

nationals in the private sector and are commonly referred to as Emiratization policies.

The Emiratization policies cause a firm's costs to increase as the number of expatriates increases in proportion to the number of nationals in a firm. These costs are perceived by the firms to constitute an implicit form of taxation on the hiring of expatriates. As a result, firms are incentivized to attract more nationals which in turn increases the bargaining power of nationals and thus impacts their wages. However, as the total number of employed nationals in a firm increases, the bargaining power of each additional national decreases. As such, there is an employment effect on the wages of nationals based on their proportion within the firm, even if the productivity of labor does not change. Therefore, we can relax the assumption of Stole and Zwiebel which requires that employment effects are solely contingent on changes in productivity and focus on the costs of hiring expatriate employees to model the firm's employment policies.

Although our model analyzes the UAE labor market, it has many characteristics common to the remaining Gulf Cooperation Council (GCC) countries.¹ In both the UAE and the remaining GCC countries, expatriates constitute a large proportion of the workforce. This is mainly due to government efforts to diversify their national economies away from natural resources following the 1970's oil boom (Winckler 1997). High-skilled and low-skilled labor were actively recruited from abroad as the required labor force could not be supplied locally. In 2005, 92% of the UAE workforce was expatriate and

¹The GCC countries are Bahrain, Kuwait, Oman, Qatar, Saudi Arabia, and the United Arab Emirates.

constituted more than 98% of those employed in the private sector.² Similarly, in Qatar, the proportion of expatriates participating in the labor force was 88% in 2004.³

As the size of the expatriate labor force expanded, so did the national labor force. The private sector perceived expatriates to be cheaper and more productive than nationals. In the UAE, for example, this is underscored by the difference in means between private sector wages of UAE nationals and expatriates, which according to the household budget survey of 2008,⁴ was highly significant and amounted to 8400 AED or 2283 USD per month for all skill levels.⁵ In Saudi Arabia, the difference between average monthly wages of Saudi nationals and expatriates in 2000 amounted to 3566 SAR or 951 USD.⁶ The public sector, which had acted as an employer of first and last resort, could no longer absorb all the new national labor market entrants (Fasano and Goyal 2004).⁷ This resulted in the emergence of significant unemployment among GCC nationals.⁸

GCC countries were faced with a dilemma between alleviating unemployment among GCC nationals or importing foreign workers essential for economic growth (Winckler 1997). In response to the unemployment problem, GCC governments embarked on a

²UAE Census of 2005.

³Qatar Census of 2004.

⁴The survey contains information on 13,992 national and expatriate households. The sample is restricted to heads of households who are employees in order to obtain independent and identically distributed data. The sample size is 10,513 individuals.

⁵The skill level classification is the International Standard Classification of Occupations "ISCO-88". The difference in means between monthly private sector wages of nationals and expatriates is UAE Dirhams (AED) 2665, 7009, 3790, and 13,636 for skill levels 1, 2, 3 and 4 respectively, 4 being the highest skilled workers.

⁶Saudi Arabia Employment and Wages Survey of 2000.

⁷In the UAE, for example, employment of nationals in the public sector grew at an average annual rate of 5% during the period 1995 to 2005, while the UAE labor force grew at a rate of 6% (UAE 1995 and 2005 census).

⁸Unemployment rates in the UAE reached 19% in 2005, and 9.8% in Saudi Arabia in 2008.

process of nationalizing the workforce.⁹ A quota system was imposed on private sector companies to increase their intake of national labor despite its potential impact on growth.

The literature is very limited in measuring the impact and effectiveness of the nationalization policies in the GCC countries. Chemingu and Roes (2008) assess these policies and their impact on employment in Kuwait using a dynamic computable general equilibrium (“CGE”) model. They showed that a reduction in the supply of skilled expatriates in Kuwait would not increase the employment of Kuwaiti nationals significantly but instead increases the labor costs of the firm and adversely impacts the economy. They also examined other policies to stimulate private sector employment such as increasing the investment share in key sectors with high national labor and imposing a production subsidy of 20% for these sectors. For the period of 2001 to 2015, they concluded that these policies are not sufficient as they will not absorb all the nationals looking for employment.

Toledo (2006) extends the Ramsey theorem¹⁰ to explain the problems associated with the Emiratization policies. Assuming the same productivity levels between UAE nationals and migrants, he concluded that if Emiratization were to succeed, then it must be implemented in the imperfectly competitive sector. Firms would have to be ready to give up their rents in exchange for providing jobs to nationals. In a perfectly competitive input and output market, firms would not want to hire UAE nationals. Toledo also concludes that allowing greater mobility of expatriates would increase their productivity,

⁹The nationalization programs are referred to as “Emiratization” , “Qatarization”, “Saudization”, “Omanization”, “Kuwaitization”, “Bahrainization” in the UAE, Qatar, Saudi Arabia, Oman, Kuwait and Bahrain respectively.

¹⁰The Ramsey theorem provides a condition with regards to the price that a monopolist should set so as to maximize social welfare. The primary source of inefficiency in this case is monopoly.

thereby raising their wages and tightening the wage gap between migrants and nationals. However, neither Toledo (2006) nor Chemingu and Roes (2008) model the labor market decisions of national workers, but assume that all nationals are employable. Toledo (2006) only analyzed the firm's demand for employment, while Chemingu and Roes's (2008) projections are based on the performance of the general macroeconomic factors of Kuwait.

On the other hand, Fasano and Goyal (2004) analyze both the firms and GCC workers' labor market decisions in the presence of the nationalization policies. They use the standard search and matching model to account for labor market frictions. The "single-worker" matching model used in Fasano and Goyal (2004) assumes each vacancy represents one firm, without modeling the strategic interactions within a firm, especially as it relates to the hiring of expatriates and nationals. As a result, their paper does not explicitly model the hiring of expatriates, but simply acknowledges that their presence affects the bargaining power of GCC nationals. A model which allows for multiple vacancies within a firm would be required to explicitly account for the interaction between nationals and expatriates in the firm.

This paper applies the large firm version of the search and matching model to allow for multiple vacancies within one firm. It also incorporates the Stole and Zwiebel (1996) intrafirm bargaining methodology to enable the analysis of strategic interactions within a firm. Stole and Zwiebel (1996) model the firm's internal wage bargaining process by assuming that workers are irreplaceable, thereby providing them with bargaining

power vis-à-vis the firm. Moreover, wages are renegotiated continuously such that neither party can commit to future wages and employment decisions which may have resulted otherwise due to contract incompleteness. Stole and Zwiebel (1996) show that, due to the diminishing returns of labor, firms can depress wages by expanding employment. Thus, bargained wages are driven down to workers' reservation values.

De Fontenay and Gans (2003) extend Stole and Zwiebel's theory by assuming that workers are not irreplaceable, and as long as there is a substitutable exogenously fixed finite pool of labor outside the firm, firms tend to under-hire because wages will exceed the reservation wages. Employees exert power over the firm; thereby, allowing them to capture some rents. However, if there is a cost to hiring outsiders, or if the pool of outsiders is endogenously determined by the firms' employment decisions, then there will be over-hiring. Stole and Zwiebel (2003) responded by stating that only low skilled can make up a perfectly substitutable pool of labor for which wage bargaining does not apply, and as such their results still hold.

Both Stole and Zwiebel (1996) and De Fontenay and Gans (2003) are partial equilibrium models. To extend the analysis from a partial equilibrium framework to a general equilibrium framework, the literature combined the Stole and Zwiebel intrafirm bargaining approach with the dynamic approach of Pissarides (2000).¹¹

Cahuc and Wasmer (2001) combine both the Pissarides and the Stole and Zwiebel approaches. They then compare the combined model with the Pissarides standard "single-

¹¹Pissarides developed a dynamic model which explained unemployment and the flows between workers and jobs using a matching function that allowed for labor market frictions.

worker” firm model. Cahuc and Wasmer find that the two models are equivalent, if there are constant returns to scale in all factors and zero adjustment cost for capital. In such circumstances, they find that firms are no longer able to exploit the diminishing marginal productivity of workers and manipulate wages by over-employing workers. Cahuc and Wasmer also compare the combined model to that of Stole and Zwiebel and show that due to the existence of labor market frictions, employees are likely to receive rents even if the firms over-employ.

Cahuc and Wasmer (2008) extend their model to analyze wage and employment decisions when workers are heterogeneous and have different bargaining powers. Cahuc and Wasmer not only model the interactions between a firm and its workers, but also among workers themselves. They show that introducing multi-labor inputs to the model alters the results such that firms may under-employ workers when some of the labor inputs complement one another. They find that workers with low bargaining power can be under-employed whilst those with high bargaining power can be over-employed.

Bertola and Garibaldi (2001) also combines the Pissarides “large firm” model with the Stole and Zwiebel intrafirm bargaining process in order to study the relationship between wages and firm size. This relationship cannot be captured in a world of constant returns or under the “single worker” model. Bertola and Garibaldi assume that there are hiring costs and decreasing returns to scale in the recruitment technology. Moreover, in their model, they assume that productivity is not constant across firms, but depends on a stochastic idiosyncratic labor demand shock and employment levels. Bertola and Garibaldi’s results

verify the empirical evidence of a positive relationship between wages and firm size. They find two opposing effects. On one hand, wages decrease with employment levels as in Stole and Zwiebel (1996), and on the other hand, wages increase with an increase in the labor demand shifter. Bertola and Garibaldi find that high wages may be associated with high employment levels because higher productivity levels, driven by increases in the idiosyncratic labor demand shock, cause firms to post more vacancies.

Mortensen (2009) uses the combined model to study the relationship between wages and productivity. He concludes that a second equilibrium of wage dispersion exists in addition to the single wage equilibrium if on-the-job search is allowed and firms are heterogeneous with respect to productivity. Beugnot and Tidball (2010) also proves the existence of multiple equilibria, but unlike Mortensen (2009), this is generated by assuming increasing returns to scale in the aggregate production function. They show through numerical simulations that there will always be two equilibria: a Pareto inferior equilibrium with a low employment rate and wage, and a Pareto superior equilibrium with a high employment rate and wage. They conclude that the “low” equilibrium may be reached only if the bargaining power of workers is lower than the matching elasticity. Therefore, government intervention may be required to achieve the Pareto superior equilibrium.

All the papers which use the combined model assume either decreasing or increasing marginal returns to labor to capture the impact of a firm’s employment choices on wages. In effect, the results vary based on the productivity of workers. This paper is innovative

because it modifies the combined model such that a firm's employment choices are driven by its cost structure rather than its workers' productivity levels. This enables us to measure the impact of the increasing marginal costs of hiring expatriates in the UAE caused by government intervention on the firm's internal bargaining process. Consequently, this paper also takes a first step in explicitly modeling the impact of the labor market nationalization policies on the bargaining process within the firm and ultimately on private sector employment.

The paper segments the labor market into two types of workers, nationals and expatriates, and two sectors, public and private. It models the labor market decisions of nationals and the queuing effect for public sector jobs brought about by the many financial and cultural advantages that sector offers. The model also allows for on the job ("OTJ") search for nationals employed in the private sector. In addition, it models the private sector hiring decisions of both expatriates and nationals in the context of Emiratization policies.

In the model, the private sector is represented by one firm which maximizes profits by hiring both nationals and expatriates. The internal bargaining process as described by Stole and Zwiebel (1996) is conducted solely between nationals and the firm. We assume that the labor market for expatriates is frictionless because the private sector firm has access to an unlimited supply of foreign labor (Fasano and Goyal 2004) and that expatriate workers have negligible bargaining power. Unlike Cahuc and Wasmer (2001), the model assumes constant returns to labor and captures the impact of hiring

an additional national worker on the wages through the Emiratization policies. We model these policies as a form of taxation for hiring expatriates, with no benefits to the firm (Forstenlechner 2008). Thus, the cost incurred by the firm increases with the proportion of expatriates hired within that firm.

The paper then studies the impact of the Emiratization policies on private sector employment of nationals. It finds that increasing the cost of hiring expatriates may in fact decrease the private sector employment of nationals and subsequently increase unemployment.

The remainder of the chapter is organized as follows. The next section provides an overview of the Emiratization policies in the UAE. Section 2.3 describes the model and framework. Section 2.4 determines the intrafirm wage bargaining between nationals and the firm and proves the existence of an equilibrium. Section 2.5 explores the comparative statics. Section 2.6 calibrates the model to UAE data. Finally, section 2.7 concludes.

2.2 Overview of the Emiratization Policies

The Emiratization policies imposed job quotas on organizations engaged in certain economic activities such as banking, insurance, and trade which required certain levels of UAE national employment. The first resolution was passed in 1998 and targeted the banking system¹². It obliged all the banks operating in the UAE to increase their intake

¹²Ministerial Resolution No. 10 for 1998.

of national employees at the rate of 4% annually. In 2003, another resolution¹³ was passed requiring all insurance companies operating in the UAE to raise their intake of national employees at an annual rate of 5%. In 2004, a resolution¹⁴ was approved obliging all trading firms employing 50 or more workers to raise their intake of national employees at the annual rate of 2%. Finally, in 2006, secretarial and human resources occupations were also nationalized¹⁵. The National Human Resource Development & Employment Authority TANMIA was assigned the task of monitoring the compliance of firms to the Emiratization policies.

Subsequently, firms were classified according to three categories: A, B, or C depending on whether they fulfilled the Emiratization requirements. Non-compliance demoted the firms to categories B or C. The costs and fees associated with recruiting expatriates depended on the category a firm is classified in¹⁶. For instance, the renewal of a labor card¹⁷ costs category A firms approximately 136 USD; whereas, it costs category B and C firms 408 USD and 680 USD respectively.

¹³Ministerial Resolution No. 202/2 for 2003.

¹⁴Ministerial Resolution No. 259/1 for 2004.

¹⁵Ministerial Resolutions No. 442 and 443 for 2006.

¹⁶Ministerial Resolution No. 19 for 2005.

¹⁷A card issued by the Ministry of Labor for all foreign employees working in the private sector.

2.3 The Model

2.3.1 Population

We consider a continuous time economy with two types of workers, nationals and expatriates, and two sectors, public and private. Nationals can be: a) unemployed and searching for either a public or private sector job; b) employed in the private sector whilst searching for a public sector job; or c) employed in the public sector. Nationals when changing jobs across sectors can only move from the private sector to the public sector. The index $i \in \{g, p\}$ denotes the public and private sector respectively. Expatriates, on the other hand, are always employed in the private sector and cannot be both unemployed and residing in the UAE due to immigration policies. The population is thus distributed as follows:

N : measure of nationals employed in the private sector

U : measure of unemployed nationals

E_g : measure of nationals employed in the public sector

X : measure of expatriates

where the national population is normalized to 1: $N + U + E_g = 1$. All workers are risk neutral, infinitely-lived and discount the future at the common rate r .

2.3.2 Search and Matching

The model assumes that only nationals engage in random search. The labor market for expatriates is frictionless, as in Fasano and Goyal (2004), since the private sector has an unlimited supply of foreign labor.

National workers match with either sector through a constant returns to scale matching function which depends on the number of vacancies posted and the number of individuals looking for jobs. The matching functions for each sector are denoted as $M^g(U + \lambda N, V^g)$ and $M^p(U, V^p)$ where V^g and V^p each represent the total vacancies in the public and private sector respectively, and $\lambda \in (0, 1)$ is an exogenous search intensity of individuals working in the private sector and searching for a job in the public sector.

The probability that the public sector fills its vacancy with a national is:

$$\frac{M^g(U + \lambda N, V^g)}{V^g} = \frac{m_g(\theta_g)}{\theta_g}$$

The probability that the private sector fills its vacancy with a national is:

$$\frac{M^p(U, V^p)}{V^p} = \frac{m_p(\theta_p)}{\theta_p}$$

In the model, $\theta_g = \frac{V^g}{(\lambda N + U)}$ and $\theta_p = \frac{V^p}{U}$ denote the labor market tightness in the public and private sector respectively. Similarly, unemployed nationals find jobs at the rate of $m_i(\theta_i)$, $i \in \{g, p\}$ and employed private sector nationals obtain work in the public sector at the rate of $\lambda m_g(\theta_g)$. The matching functions have the following

properties: $\frac{d(m_i(\theta_i))}{d\theta_i} > 0$ and $\frac{d(\frac{m_i(\theta_i)}{\theta_i})}{d\theta_i} < 0, i \in \{g, p\}$. Matches break up at an exogenous rate δ .

2.3.3 Labor Demand

Public Sector

The model assumes, as in Alfonso and Gomes (2008), that the government's objective is to preserve a particular level of employment E_g given that it is not our intention to determine the optimal level of employment in the public sector. Therefore, in the steady state, the public sector posts vacancies to maintain E_g such that:

$$\delta E_g = m_g(\theta_g)(\lambda N + U)$$

Private Sector

The private sector consists of a large representative firm which hires both nationals and expatriates. Production from both types of labor input is constant and denoted by Y^N and Y^X . The firm incurs a search cost, γ , for each vacancy posted to nationals, but can hire expatriates instantaneously without incurring any search costs. However, due to labor market policies, the firm is penalized for hiring expatriates at the expense of nationals, and thus incurs a cost $cf(N, X)$ which is dependent on the employment levels of nationals and expatriates in the firm and on an exogenous cost parameter c , where c

> 0 . The cost function is characterized by the following properties:

$$f(N, 0) = 0 \quad f_N(N, X) < 0 \quad f_{NN}(N, X) > 0 \quad f_X(N, X) > 0$$

The cost decreases with the employment of nationals and increases with the employment of expatriates. The firm also pays wages w^X and $w^N(N)$ when it hires an expatriate and a national respectively. The expatriate's wage is assumed to be exogenous since it depends mainly on the labor market of foreign countries, which is considered fixed in this paper. The national's wage is endogenous and determined by intrafirm bargaining. The intrafirm bargaining mechanism was first introduced by Stole and Zwiebel (1996) and later incorporated into the search and matching model. This mechanism assumes that wages are a function of the employment level because they are continuously renegotiated. Therefore, in this paper, the national's bargaining position is affected by the number of national workers already employed in the firm. Finally, national workers leave the firm either because they find a job in the public sector or because a shock occurs.

Subject to the law of motion of jobs, the firm maximizes the discounted value of profit as follows:

$$\max \pi(N, X) = \int_0^{\infty} e^{-rt} [Y^N N + Y^X X - w^X X - N w^N(N) - c f(N, X) - \gamma V^p] dt$$

$$s.t. \quad \frac{dN}{dt} = \frac{m_p(\theta_p)}{\theta_p} V^p - (\delta + \lambda m_g(\theta_g)) N$$

All the analysis in this paper will be conducted at the steady state, i.e., where $\frac{dN}{dt} = 0$. The first order conditions in the steady state for an optimal level of N and X are given by:

$$J^p = \frac{\theta_p \gamma}{m_p(\theta_p)} \quad (2.1)$$

$$Y^X - w^X = cf_X(N, X) + r \quad (2.2)$$

where J^p , the marginal profit of employing a national, depends on the productivity of nationals and their wages, on the cost of hiring expatriates, and on the impact of hiring an additional national on the wages of all other nationals.

$$J^p = \frac{Y^N - N \frac{dw^N(N)}{dN} - w^N(N) - cf_N(N, X)}{(\delta + r + \lambda m_g(\theta_g))} \quad (2.3)$$

The first order condition for nationals (2.1) equates the marginal profit of hiring nationals to the expected cost of searching for them. On the other hand, the first order condition of expatriates (2.2) equates the marginal profit of employing expatriates to the discount factor and the marginal cost of hiring expatriates which in turn depends on the employment level of nationals in the firm. Expression (2.2) does not account for the effect of expatriates on national private sector wages since the employment of expatriates

can be instantaneously changed¹⁸.

2.3.4 Workers

This paper only solves for the value functions of national workers since the expatriate labor market is frictionless. The discounted value of an unemployed national worker, denoted by U^N , solves:

$$rU^N = b + m_g(\theta_g)Max[(N^g - U^N), 0] + m_p(\theta_p)Max[(N^p - U^N), 0] \quad (2.4)$$

All national unemployed workers receive an unemployment benefit (or the value for leisure) b , but face a sector dependent probability $m_i(\theta_i)$, $i \in \{g, p\}$ of receiving a job offer from the public and private sector. Similarly, the discounted value functions of an employed national in the public and private sectors are:

$$rN^g = w_g + \delta(U^N - N^g) \quad (2.5)$$

$$rN^p = w^N(N) + \delta(U^N - N^p) + \lambda m_g(\theta_g)Max[(N^g - N^p), 0] \quad (2.6)$$

Employed workers in the public sector receive the exogenous wage w_g until they lose their jobs and become unemployed at the rate of δ . The public sector wage w_g is assumed

¹⁸We assume that the employment level of expatriates is not a predetermined variable. Cahuc and Wasmer (2001) imposed the same assumption for capital.

to be exogenous and determined by government policies. In the private sector, workers receive the bargained wage $w^N(N)$ until the match is dissolved because either the worker finds a public sector job or a shock occurs at the rate δ .

2.4 Labor Market Equilibrium

2.4.1 Intrafirm Wage Bargaining

As in Stole and Zwiebel (1996), this paper assumes that instantaneous and continuous wage renegotiation occurs between nationals and the firm, which means that all wages are renegotiated if an employee leaves the firm. Moreover, government jobs are so attractive that it is assumed that the firm will not be able to offer a higher wage to keep workers from searching in the public sector. Private sector wages for UAE nationals are determined according to the surplus sharing rule based on the amount of nationals already employed in the firm:

$$\beta J^p = (1 - \beta)(N^p - U^N) \tag{2.7}$$

where $\beta \in (0, 1)$ is an exogenous parameter representing the bargaining power of workers. Expressions (2.3), (2.5) and (2.6) yield the following differential equation for the steady state wage of UAE nationals in the private sector:

$$w^N(N) = \beta[Y^N - N \frac{dw^N(N)}{dN} - cf_N(N, X)] + (1 - \beta)rU^N - (1 - \beta) \frac{\lambda m_g(\theta_g)}{(r + \delta)}(w_g - rU^N) \quad (2.8)$$

Therefore, contrary to Cahuc and Wasmer (2001), the wage function stays different from that obtained in the Pissarides standard matching model even with the assumption of constant productivity. The $N \frac{dw^N(N)}{dN}$ term remains because of the firm's cost structure which depends of the employment levels of expatriates and nationals within the firm. As the number of nationals employed in the firm increases, the cost savings derived from employing an additional national on the hiring of expatriates diminishes¹⁹. As a result, the firm exploits the diminishing marginal benefit to depress the wages of nationals. This effect is referred to as the Stole and Zwiebel effect since it results from the intrafirm bargaining mechanism of wages developed in Stole and Zwiebel (1996).

The solution to the differential equation yields²⁰:

$$w^N(N) = \beta Y^N + (1 - \beta)rU^N - (1 - \beta) \frac{\lambda m_g(\theta_g)}{(r + \delta)}(w_g - rU^N) - cN^{-\frac{1}{\beta}} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du \quad (2.9)$$

The first two terms in the wage function are similar to the Pissarides standard search and matching model, the third term reflects the willingness of workers to agree to a

¹⁹This is due to the cost function being convex in N , i.e., $f_{NN}(N, X) < 0$.

²⁰The method for solving the differential equation follows that of Bertola and Garibaldi (2001).

reduction in their wages when OTJ search is allowed, and finally, the last term denotes the employment effect on wages. The employment effect is positive because the cost function decreases with the employment of nationals ($f_N(N, X) < 0$). Moreover, the wage function decreases with the employment level of nationals, $\frac{\partial w^N(N)}{\partial N} < 0$ (Stole and Zwiebel effect).

The model focuses only on interior solutions, where there are no negative surpluses resulting from filling private sector job vacancies with nationals. Condition (2.10) can be expressed in terms of the exogenous parameters of the model (see section 2.8).

$$N^p + J^p \geq U^N$$

$$\beta[(r + \delta)Y^N + \lambda m_g(\theta_g)w_g] - (r + \delta)cN^{-\frac{1}{\beta}} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du \geq \beta r U^N (r + \delta + \lambda m_g(\theta_g)) \quad (2.10)$$

2.4.2 Existence

Definition 2.1 *A Steady State Equilibrium with on the job search is defined by $\{N, X, U, \theta_g, \theta_p\}$*

such that the following conditions hold:

1- The first order condition for an optimal choice of UAE nationals within the firm:

$$\frac{m_p(\theta_p)}{\theta_p} \frac{(1-\beta)}{\beta} \frac{[\beta(Y^N(r+\delta+m_g(\theta_g))-\beta(1-\lambda)m_g(\theta_g)w_g-\beta b(r+\delta+\lambda m_g(\theta_g))-(r+\delta+m_g(\theta_g))cN^{-\frac{1}{\beta}} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u,X)du]}{(\delta+r+\lambda m_g(\theta_g))(r+\delta+m_g(\theta_g)+\frac{1}{2}m_p(\theta_p))} = \gamma \quad (2.11)$$

2- The first order condition for an optimal choice of expatriates within the firm:

$$Y^X - w^X = cf_X(N, X) + r \quad (2.12)$$

3- The flow of UAE nationals into unemployment is equal to the flow out of unemployment:

$$(m_g(\theta_g) + m_p(\theta_p))U = \delta(N + E_g) \quad (2.13)$$

4- The steady state condition of the government's law of motion:

$$\delta E_g = m_g(\theta_g)(\lambda N + U) \quad (2.14)$$

5- The normalization of the UAE national population:

$$E_g + N + U = 1 \quad (2.15)$$

Proposition 2.1 *If condition (2.10) holds and the cost parameter, c , is sufficiently large, then there exists at least one Steady State Equilibrium where both types of workers are hired by the firm.*

The existence of at least one equilibrium is established from the continuity of the first order conditions of the firm. The values of $N, U, X,$ and θ_g can all be expressed in terms of θ_p from equations (2.12), (2.13), (2.14), and (2.15). Therefore, the existence of the equilibrium ultimately depends on the manner in which the first order condition of nationals changes when θ_p varies (see section 2.8 for the proof). Moreover, if c is sufficiently large, then the Emiratization policies bind leading to an interior solution.

Lemma 2.1 *If the cost function is concave in X , i.e., $f_{XX} < 0$, then the equilibrium is unique²¹.*

Please refer to section 2.8 for the proof.

2.5 Comparative Statics

This section explores the impact of labor market policies on the employment of nationals and expatriates in the private sector using comparative statics. The comparative statics depend on the curvature of the cost function $f(N, X)$. Therefore, four possibilities arise:

1. $f_{XX}(N, X) < 0$ and $f_{NX}(N, X) < 0$
2. $f_{XX}(N, X) < 0$ and $f_{NX}(N, X) > 0$

²¹ *This condition is sufficient but not necessary. Even if the cost function were convex in X , i.e., $f_{XX} > 0$, then the equilibrium could be unique. This occurs if the impact of the search frictions on the first order condition of nationals is larger than that of the penalty. In this case, the uniqueness depends on the specification of the matching function. Moreover, the calibration of the model to the UAE labor market generates a unique equilibrium even by assuming $f_{XX} > 0$ (see section 2.6 of the paper).*

3. $f_{XX}(N, X) > 0$ and $f_{NX}(N, X) < 0$

4. $f_{XX}(N, X) > 0$ and $f_{NX}(N, X) > 0$

The first two cases generate a unique equilibrium, while the last two may produce multiple equilibria. Henceforth, all policy analysis will be conducted for the stable interior equilibria of the model where the first order condition of nationals is decreasing in θ_p . Moreover, the paper will focus on the third case where $f_{XX}(N, X) > 0$ and $f_{NX}(N, X) < 0$, as this specification of the cost function is in line with the Emiratization policies. These policies cause a firm's costs to rise as the number of expatriates increase in proportion of the number of nationals within the firm. An example of such a function is $f(N, X) = \frac{X^2}{N+1}$. In the next section, the model is calibrated to UAE data in order to determine the magnitude of the impact of the cost parameter, c , and public sector employment, E_g , on private sector employment and labor market tightness in the private and public sector. During the calibration, the cost function will be specified as $f(N, X) = \frac{X^2}{N+1}$.

Corollary 2.1 *An increase in the cost parameter, c , when $f_{XX}(N, X) > 0$ and $f_{NX}(N, X) < 0$ leads to²²:*

1. *an ambiguous effect on the labor market tightness in the public sector*
2. *an ambiguous effect on the labor market tightness in the private sector*
3. *an ambiguous effect on the employment levels of UAE nationals in the private sector*

²²The proof is available upon request.

4. *an ambiguous effect on the employment levels of expatriates in the private sector*

An increase in the cost parameter c has two countervailing effects on the employment of nationals and expatriates. On one hand, an increase in the cost parameter c leads to an increase in the national wages because nationals will have greater bargaining power. This causes firms to overemploy nationals in order to moderate their wage increases (Stole and Zwiebel effect). The increase in the employment levels of nationals in turn has an effect on the first order condition of expatriates thus allowing the firm to increase its intake of expatriates. On the other hand, an increase in c also has a direct effect on the first order condition of expatriates. It increases the costs of a firm which in turn lowers the employment level of expatriates. As fewer expatriates are hired, there is less need to employ nationals, and as a result, the firm decreases its intake of nationals.

The specification of the cost function determines which effect dominates. The second effect of decreases in the employment levels of both nationals and expatriates is always dominant if the following two sufficient conditions hold:

1. $f_X \int_0^N u^{\frac{1-\beta}{\beta}} f_{uX}(u, X) du < f_{XX} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du$
2. $f_{XN} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du < f_X \left[\frac{d}{dN} \left(\int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du \right) - \frac{1}{\beta} N^{-1} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du \right]$

The two sufficient conditions above pertain to the nature of the cost function which determines whether the change in the cost parameter c influences the first order condition of expatriates more than the first order condition of nationals. The two conditions are

always satisfied in the example of the cost function illustrated above ($f(N, X) = \frac{X^2}{N+1}$). With such a function, the Stole and Zwiebel effect is weakened by the decrease in the employment levels of expatriates. Indeed, the Stole and Zwiebel effect exists because there are diminishing marginal benefits from employing each additional national. However, the firm relies less on exploiting this diminishing marginal benefit as fewer expatriates are employed in the firm. The overall effect of an increase in the cost parameter c is a decrease in the employment levels of nationals and expatriates. It follows that the labor market tightness in both sectors decreases as fewer nationals are hired in the private sector.

Corollary 2.2 *An increase in the government employment level when $f_{XX}(N, X) > 0$ and $f_{NX}(N, X) < 0$ leads to²³:*

1. *an increase in the labor market tightness in the public sector: $\frac{d\theta_g}{dE_g} > 0$*
2. *a decrease in the labor market tightness in the private sector: $\frac{d\theta_p}{dE_g} < 0$*
3. *a decrease in the employment levels of UAE nationals in the private sector: $\frac{dN}{dE_g} < 0$*
4. *a decrease in the employment levels of expatriates in the private sector: $\frac{dX}{dE_g} < 0$*

The rise in government employment causes an increase in the labor market tightness in the public sector. As a result, national workers move from the private to the public sector thus decreasing private sector employment. The firm is also forced to decrease

²³ *The proof is available upon request.*

its intake of expatriates because the penalty for employing them increases when fewer nationals are hired in the firm.

2.6 Calibration

The model is calibrated using the UAE labor market data to determine the magnitude of the effect of an increase in the cost parameter, c , on the hiring choices of the private sector and ultimately on the the unemployment rate of nationals. This data has never been used to numerically evaluate the impact of Emiratization policies on the labor market outcomes of nationals and expatriates.

In this section, the cost function will be specified as $f(N, X) = \frac{X^2}{N+1}$ consistent with the Emiratization policies which increase the cost of hiring expatriates in proportion to nationals. Even though the cost function is not concave in X (Lemma 2.1), the calibration still generates a unique interior steady state equilibrium. The calibration also yields a corner solution in which the firm does not hire any nationals. The level of the cost parameter, c , determines which solution generates a higher profit for the firm. If $c < 0.021$, then it is more profitable for the firm not to hire any nationals given the baseline parameters specified in Table 2.1. This section also analyzes numerically the consequences of a variation in the exogenous level of government employment on the private sector hiring of nationals and expatriates.

2.6.1 Baseline Parameters

The data is extracted from the UAE Household Expenditure survey of 2008, where 73.8% of nationals are employed in the public sector and only 7.4% are working in the private sector²⁴. Expatriates working in the private sector constitute almost five times the population of nationals²⁵. Average annual private sector wages for nationals and expatriates are AED 140,000 and AED 63,000 respectively. Nationals employed in the private sector earn on average more than twice as much as expatriates. Average annual public sector wages reach AED 191,000. The flow value of unemployment for nationals is taken to be the log of the lowest wage earned by private national workers²⁶. The average separation rate for nationals working in either sector, δ , is calculated from the Dubai Labor Force Survey of 2008²⁷. The interest rate, r , represents the interest rate on inter-bank deposits for 2008. The time period in the calibration is one year.

The bargaining power, β , and the search intensity, λ , are set respectively to 0.5 and 0.2²⁸. Further, the private sector matching function for nationals is assumed to take a

²⁴We have restricted the population of nationals to those who are working or unemployed and are of skill levels 1,2 or 3 according to the International Standard Classification of Occupations "ISCO-88". We exclude skill level 4 because it is not a credible assumption that the labor market for expatriates is frictionless for that particular skill level.

²⁵The population of nationals is normalized to one.

²⁶We take the log of wages when we calibrate the model. Therefore, the productivity and search cost which are inferred from the model will be in logs too.

²⁷In reality, the separation rate is larger in the private sector; however, for mathematical simplicity, the separation rate is assumed to be the same for both sectors. This does not alter our results. Moreover, the Dubai labor force data provides elapsed durations as opposed to completed durations. However, in such models, we typically assume that there is no duration dependence.

We have used data on Dubai to calculate the separation rate. Dubai is one of the seven emirates which make up the UAE. It is reasonable to calculate the separation rates using data from Dubai because the seven emirates are fairly homogeneous in the regard.

²⁸If the search intensity is higher than 0.2, then the only way that firms will hire 7.4% of the nationals is if nationals' productivity exceeds that of expatriates.

Cobb-Douglas form of $m_p(\theta_p) = \theta_p^{1/2}$, while the public sector matching function is set to be $m_g(\theta_g) = \theta_g$ (as in Quadrini and Trigari 2007). The choice of the public sector matching function is consistent with the queuing of nationals for government jobs because the number of individuals searching for such jobs is larger than the posted vacancies.

It now remains to identify the nationals' and expatriates' productivity, the cost parameter, c , and the search cost, γ . The cost parameter cannot be extracted easily from the government regulations; and therefore, the model will be used to infer both c and γ . Moreover, we assume the productivity of nationals to be the same as expatriates because we are interested mainly in analyzing the effect of the Emiratization policies on the hiring of nationals irrespective of their productivity²⁹. Based on this assumption, productivity is also deduced from the model.

2.6.2 Results

We conduct policy experiments using the baseline specification above by varying: i) the cost parameter; and ii) public sector employment³⁰.

Variation in the cost parameter c

Table 2.2 looks at the impact of varying the cost parameter c on labor market outcomes in the UAE. A 1% increase in c decreases national employment in the private

²⁹The productivity of expatriates is in reality believed to be higher than that of nationals. However, by assuming similar productivity, we do not alter our results with respect to the effect of the cost parameter on the hiring decisions of the firm.

³⁰Dynamic effects are ignored in this paper.

sector by 0.71 percentage points (p.p.) relative to its baseline value, and subsequently, the unemployment rate increases by an equivalent amount since government employment level is fixed. Moreover, as a response to the increase in c , the firm also reduces expatriate employment by 21%. As fewer expatriates are employed, there is less need to hire nationals which affects their bargaining position vis-à-vis the private sector and weakens the Stole and Zwiebel effect. As a result, nationals' reservation value falls and they are willing to accept a 14% cut in their wages.

Alternatively, if the government decreases c by 1%, overall private sector employment rises and unemployment among nationals decreases by 1.1 p.p. However, if c becomes too low, then it becomes more profitable for the firm not to hire any nationals. Therefore, the level of c that maximizes national employment in the private sector is attained when the firm is indifferent between hiring both types of workers and employing only expatriates.

Given the parameters specified in Table 2.1, the optimal cost parameter, c , is calculated to be 2.077%. At this level, national employment in the private sector reaches its maximum value of 9.54%. Thus, even if the Emiratization policies are set in such a way as to achieve the optimal c , they are not sufficient in promoting national employment in the private sector.

Variation in Public Sector Employment

Table 2.3 evaluates the impact of a change in public sector employment on the equilibrium values of private sector wages and employment composition. A 10% increase in

E_g lowers private sector employment of nationals by 3.54 p.p. since nationals would move from the private to the public sector as more government jobs are made available. As a result, the firm has to reduce its intake of expatriates as fewer nationals are employed within the firm.

National private sector wages decrease by 2% despite the increase in the nationals' outside option. This is due to the reduction in expatriate employment which weakens the bargaining position of nationals.

2.7 Conclusion

In this paper, we develop a two-sector search model with intrafirm bargaining in the private sector to analyze Emiratization policies in the UAE. The Emiratization policies aim to encourage national employment in the private sector by penalizing the firm for hiring expatriates at the expense of nationals. Therefore, we model the policies as a form of cost incurred by the firm which depends on the employment levels of both nationals and expatriates and on an exogenous cost parameter set by the government.

The contribution of our paper is twofold. First, departing from prior literature, we base our assumptions on cost rather than productivity to analyze the employment effect on wages set forth by Stole and Zwiebel. Second, we explicitly model the impact of the Emiratization policies on the bargaining process within the firm and on private sector employment.

We first determine the private sector wage of nationals and find that the wage value is different from the one obtained in the standard matching model even with constant productivity. This is due to the Emiratization policies which generate an employment effect on wages.

In addition, if the Emiratization policies bind, i.e., so long as c is sufficiently large, we prove the existence of an interior equilibrium where both nationals and expatriates are hired by the firm. Further, we show that the uniqueness of the equilibrium depends on the curvature of the cost function.

We also consider the implication of Emiratization policies on labor market outcomes. We find that under certain conditions pertaining to the specification of the cost function, an increase in the penalty for employing expatriates can decrease private sector employment of nationals and expatriates. Moreover, we find that an increase in public sector employment also lowers the employment levels of nationals and expatriates within the firm.

Finally, we deduce from the calibration the cost level for which private sector employment is maximized given the baseline parameters of the model. We find that an increase in the cost level lowers national employment in the private sector; however, if the cost level becomes too low, then it becomes more profitable for the firm not to hire any nationals.

Many extensions arise from our paper. We have assumed throughout our analysis that the firm has an unlimited access to expatriates. However, this assumption does

not hold for the highest skilled workers. It would be therefore interesting to account for frictions in the expatriate labor market and apply the intrafirm bargaining process to a model of international migration. In addition, we have also assumed a continuous cost function to model the Emiratization policies and capture the employment effect on wages. Removing the continuity assumption would alter the results of the paper in that the pivotal national would now have the highest bargaining position vis-à-vis the firm thereby affecting all wages and subsequently the firm's employment choices.

2.8 Appendix A: Existence

2.8.1 Proof of Proposition 2.1

Proposition 2.1 establishes the existence of at least one equilibrium where both types of workers are hired. The values of $N, U, X,$ and θ_g can all be expressed in terms of θ_p from equations (2.12), (2.13), (2.14) and (2.15). Therefore, the existence of at least one equilibrium depends on examining the first order condition of nationals when θ_p changes.

The first order condition can be expressed as $rV = \gamma$, where rV is expressed as:

$$rV = \frac{m_p(\theta_p)}{\theta_p} \frac{(1-\beta)}{\beta} \frac{[\beta(Y^N(r+\delta+m_g(\theta_g))-\beta(1-\lambda)m_g(\theta_g)w_g-\beta b(r+\delta+\lambda m_g(\theta_g))-(r+\delta+m_g(\theta_g))cN^{-\frac{1}{\beta}} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u,X) du]}{(\delta+r+\lambda m_g(\theta_g))(r+\delta+m_g(\theta_g)+\frac{1}{2}m_p(\theta_p))}$$

It can be shown that as $\theta_p \rightarrow 0$ then $rV \rightarrow \infty$, and as $\theta_p \rightarrow \infty$ then $rV \rightarrow 0$.

Therefore, rV crosses the search cost, γ , at least once.

2.8.2 Proof of Lemma 2.1

Lemma 2.1 determines the sufficient condition for which the equilibrium is unique.

The equilibrium is unique if rV is decreasing in θ_p .

Using the Chain Rule:

$$\frac{\partial rV}{\partial \theta_p} = \frac{\partial rV}{\partial \theta_p} + \frac{\partial rV}{\partial \theta_g} \frac{d\theta_g}{d\theta_p} + \frac{\partial rV}{\partial N} \frac{dN}{d\theta_g} \frac{d\theta_g}{d\theta_p} + \frac{\partial rV}{\partial X} \frac{\partial X}{\partial N} \frac{dN}{d\theta_g} \frac{d\theta_g}{d\theta_p}$$

It can be shown that $\frac{drV}{d\theta_p} + \frac{drV}{d\theta_g} \frac{d\theta_g}{d\theta_p} < 0$ without imposing any assumptions on f_{XX} .

Proof:

Define $S_g = w_g - rU^N \geq 0$ as the surplus from filling a public sector job, and $S_p = N^p + J^p - U^N \geq 0$ as the surplus from filling a private sector job with a UAE national. S_g and S_p must be non-negative for a match to occur.

Substituting the appropriate values yields:

$$S_g = w_g(r + \delta)(r + \delta + \lambda m_g(\theta_g) + \beta m_p(\theta_p)) - b(r + \delta)(r + \delta + \lambda m_g(\theta_g)) \\ - (r + \delta)m_p(\theta_p)[\beta Y^N - cN^{-\frac{1}{\beta}} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du] \geq 0$$

$$S_p = (r + \delta)(r + \delta + m_g(\theta_g))[\beta Y^N - cN^{-\frac{1}{\beta}} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du] - \beta(r + \delta)(1 - \lambda)m_g(\theta_g)w_g \\ - \beta b(r + \delta)(r + \delta + \lambda m_g(\theta_g)) \geq 0$$

After differentiation, substitution and some mathematical manipulations we get:

$$\frac{\partial rV}{\partial \theta_p} = \frac{(1 - \beta) \left[\frac{d(m_p(\theta_p))}{d\theta_p} (r + \delta + m_g(\theta_g) + \beta m_p(\theta_p)) - \beta \frac{m_p(\theta_p)}{\theta_p} \frac{d(m_p(\theta_p))}{d\theta_p} \right] S_p}{(\delta + r + \lambda m_g(\theta_g))(r + \delta + m_g(\theta_g) + \beta m_p(\theta_p))^2} < 0$$

$$\frac{\partial rV}{\partial \theta_g} = - \frac{(1-\beta) \frac{m_p(\theta_p)}{\theta_p} \frac{d(m_g(\theta_g))}{d\theta_g} [\lambda S_p((r+\delta+m_g(\theta_g)) + S_g(1-\lambda))]}{(\delta+r+\lambda m_g(\theta_g))(r+\delta+m_g(\theta_g) + \frac{1}{2}m_p(\theta_p))^2} < 0$$

$$m_g(\theta_g^*) = \frac{-(\lambda m_p(\theta_p)(1-E_g) + \delta(1-E_g) - \lambda \delta E_g) + \sqrt{(\lambda m_p(\theta_p)(1-E_g) + \delta(1-E_g) - \lambda \delta E_g)^2 + 4\delta E_g \lambda (1-E_g)(m_p(\theta_p) + \delta)}}{2\lambda(1-E_g)}$$

$$\frac{d\theta_g}{d\theta_p} = \left[\frac{\frac{d(m_p(\theta_p))}{d\theta_p}}{\frac{d(m_g(\theta_g))}{d\theta_g}} \right] \left[-\frac{1}{2} + \frac{1}{2} \frac{(\lambda m_p(\theta_p)(1-E_g) + \delta(1-E_g) - \lambda \delta E_g + 2E_g)}{\sqrt{(\lambda m_p(\theta_p)(1-E_g) + \delta(1-E_g) - \lambda \delta E_g)^2 + 4\delta E_g \lambda (1-E_g)(m_p(\theta_p) + \delta)}} \right] > 0$$

For uniqueness, it is sufficient to show that $\frac{\partial rV}{\partial N} \frac{dN}{d\theta_g} \frac{d\theta_g}{d\theta_p} + \frac{\partial rV}{\partial X} \frac{\partial X}{\partial N} \frac{dN}{d\theta_g} \frac{d\theta_g}{d\theta_p} < 0$

Proof:

$$\frac{\partial rV}{\partial N} = \frac{(1-\beta) \frac{m_p(\theta_p)}{\theta_p}}{\beta} \frac{(\delta+r+m_g(\theta_g)) c N^{-\frac{1}{\beta}} (\frac{1}{\beta} N^{-1} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du - \frac{d}{dN} (\int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du))}{(\delta+r+\lambda m_g(\theta_g))(r+\delta+m_g(\theta_g) + \beta m_p(\theta_p))}$$

$$\frac{\partial rV}{\partial X} = - \frac{(1-\beta) \frac{m_p(\theta_p)}{\theta_p}}{\beta} \frac{(\delta+r+m_g(\theta_g)) c N^{-\frac{1}{\beta}} (\int_0^N u^{\frac{1-\beta}{\beta}} f_{uX}(u, X) du)}{(\delta+r+\lambda m_g(\theta_g))(r+\delta+m_g(\theta_g) + \frac{1}{2}m_p(\theta_p))}$$

$\frac{\partial rV}{\partial N} < 0$ because $\int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du < \beta N \frac{d}{dN} (\int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du)$ due to the convexity of $f(N, X)$ with respect to N (Stole and Zwiebel effect).

Moreover, the first order condition of expatriates $\frac{(Y^X - w^X - r)}{c} = f_X(N, X)$ is used to determine $\frac{\partial X}{\partial N}$.

$$\frac{\partial X}{\partial N} = - \frac{f_{XN}(N, X)}{f_{XX}(N, X)}$$

Replacing $\left(\frac{\partial rV}{\partial N} + \frac{\partial rV}{\partial X} \frac{dX}{dN}\right) \frac{dN}{d\theta_g} \frac{d\theta_g}{d\theta_p}$ by the appropriate values yields the following sufficient condition for the existence of a unique equilibrium.

$$\frac{f_{XN}(N, X)}{f_{XX}(N, X)} \int_0^N u^{\frac{1-\beta}{\beta}} f_{uX}(u, X) du - \frac{d}{dN} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du + \frac{1}{\beta} N^{-1} \int_0^N u^{\frac{1-\beta}{\beta}} f_u(u, X) du \leq 0$$

A sufficient condition for the expression above to be negative is $f_{XX}(N, X) < 0$.

Chapter 3

Explaining the Decline in Fertility among Citizens of the GCC

Countries: The Case of the UAE

3.1 Introduction

The Gulf Cooperation Council “GCC” countries experienced a noticeable decline in fertility rates in recent years. From 1970 to 2005, total fertility rates in the GCC dropped from an average of 6.8 births per woman to less than 3 births per woman. The decrease in fertility rates led to many demographic consequences such as changes to the age structure of the population, reduction in population growth, and decrease in the proportion of nationals within the total population.

The decline in fertility accompanied other changes in the region. Oil revenues financed massive investments in infrastructure, health and education programs. As a result, literacy and educational levels among men and women increased dramatically and child mortality rates plunged¹.

There were also significant changes in the national character of the populations of the respective GCC countries. GCC development projects in the region necessitated an enormous influx of foreign workers and families, especially Asians and Arabs. The large presence of foreigners in the GCC countries impacted the social and cultural norms of its citizens, and influenced their consumption patterns. Moreover, the availability of cheap foreign labor provided an impetus for GCC nationals to pursue higher levels of education to enable them to better compete in the labor market. Obtaining an acceptable educational degree became socially, and to a certain degree economically, important for most females, and as a result, their participation in the labor market steadily increased². Growing wealth and changes in consumption patterns also drove the cost of living up, which in turn caused a delay in marriage among the youth.

With all of these changes, fertility rates in the GCC dropped rapidly (table 3.1). By 2005, fertility rates were less than half of those witnessed in the seventies. The largest drops took place in Kuwait where average fertility rates decreased from 6.9 children per female during 1970 to 1975 to 2.3 children per female during 2000 to 2005, and in the

¹Mortality rates for children under 5 declined from 15 to 8 deaths per 1000 between 1990 and 2006 (UN Stat data).

²UAE national females' participation rates increased from 2.6% in 1975 to 27% in 2005 (Al Awad and Chartouni 2009).

UAE from 6.4 to 2.5 for the same periods. Oman and Saudi Arabia still have higher fertility rates in comparison to other GCC countries.

With the exception of Oman, GCC countries implemented pro-growth policies which indirectly countered the declining proportion of nationals in the overall population and labor force. Governments started providing maternity benefits, children allowances and marriage funds to their citizens. However, these policies were aimed primarily at easing living expenses rather than directly targeting fertility rates among citizens (Alnuaimi and Poston 2009). On the other hand, Oman began in 1994 to promote birth-spacing among women of child-bearing age in an effort to increase the percentage of the economically active population relative to total population (Oman Population Committee 2009).

Little has been done in the literature to explain the fast drop in fertility in the GCC countries. This may be due to the limited availability of data in this region. There are a few exceptions such as Bean and Zohry (1994) that examined the relationship between marriage and fertility in the GCC countries using surveys that focused on child health rather than fertility. They concluded that variations in fertility rates mainly reflected variations in the age of marriage which in turn is affected by females' educational attainment and the degree of urbanization in the GCC. Alnuaimi and Poston (2009) examined the relationship between polygamy and fertility among married Emirati women in the UAE during the period of 1998-1999. They used logistic regression models and found that, contrary to other regions, fertility is positively related to polygamy in the oil-rich UAE. Abdal (1999) examined the determinants of fertility from a random sample of

birth registrations in Kuwait. Using path analysis, he showed that age at first marriage is the most relevant predictor of fertility in Kuwait while other variables, such as education, mother's working status, religion, place of residence and nationality influenced fertility through their effect on the age at first marriage. Al-Qudsi (1998) in his study of four Arab countries, two of which are GCC countries, used a two-step micro-econometric model that combined a Poisson count function with a Probit binary function to study the fertility-female labor force participation link. He showed that age at marriage, women's education, infant mortality and preferences for male off-spring are all important determinants of fertility in Arab countries. Moreover, he found that fertility negatively affects labor force participation of Arab females, while education is positively related to it. He also showed that the age of females is positively related to labor force participation up to a certain point after which it negatively affects it. Khraif (2002) studied the determinants of fertility in Saudi Arabia using the demographic survey of 1999. He found that the age at first marriage and female's education are the most important determinants of fertility. On the other hand, a female's participation in the labor force, the husband's educational level and birth control methods are not vital factors of fertility in Saudi Arabia.

All of the above described papers use relatively old data to study fertility in the Arab World. Moreover, the data used in their analyses does not allow them to assess the impact of income on fertility. This paper uses the UAE family budget survey conducted in 2008 to investigate the factors that have contributed to the decline of fertility in UAE households. To the best of our knowledge, it is the first paper that uses such a dataset

to study the effect of family income in an oil rich country such as the UAE.

The remainder of the chapter is organized as follows. Section 3.2 describes the econometric methodology and the variables used in the study, section 3.3 explains the data and the empirical findings, and finally section 3.4 concludes and suggests some policy implications.

3.2 Methodology and Variables Description

We use the Poisson regression model to study the determinants of fertility in the UAE. The dependent variable is a count variable denoting the number of children born to a wife which takes on non-negative integer values. The expected value of the count variable (y) conditional on a set of explanatory variables x is modeled as

$$E(y|x) = e^{(x'\beta)}$$

The specification above insures that $E(y|x) > 0$. Thus, the number of children born to a wife conditional on x has the Poisson distribution with the probability density of

$$P(y|x) = \frac{e^{-e^{(x'\beta)}} e^{(x'\beta)y}}{y!} \text{ where } y = 0, 1, 2, 3, \dots N$$

The log of the maximum likelihood Poisson fertility equation is then specified as

$$L(\beta) = \sum_{i=1} \{y_i x_i \beta - e^{x_i \beta}\}$$

The explanatory variables x_i 's in the fertility equation refer to demographic and economic variables describing household and parents' characteristics. The variables pertaining to the parents are age, years of education, labor market status, income of the father, and nationality of the mother.

The variable age is a control variable in the model. The two education variables are measured in years of schooling³. The mother's education captures the opportunity cost of having children, and both the father and mother's education impact fertility directly by enhancing their knowledge about the uses of contraceptive methods and the benefits of small-size families. Moreover, their education indirectly increases the demand for higher quality children which is associated with a higher spending on children, and as a consequence, with a reduction in the desired number of children in the family.

The income variable is the husband's annual gross income measured in 100,000 AED since he is the main breadwinner in a UAE local family. Income can be either positively or negatively related to fertility depending on whether the income or substitution effect dominates. The economic theory of Becker (1960, 1974) suggests that children are similar

³The years of education were imputed as follows: Illiterate: 0 years; Read & Write: 2 years; Primary: 7 years; Intermediate: 11 years; Secondary: 14 years; Diploma: 16 years; Bachelor: 18 years; Diploma further: 17 years; Master's degree: 20 years; PhD: 23 years. For the respondents who answered "Null", education years were computed as follows: those below 18 and above 7: education years=age- 7; for those below 36 (that was when primary schooling became mandatory: 7 years; for those above 36:0 years.

to consumer durables, like automobiles. As family income increases, parents demand more children but also better quality children.

We assign dummy variables to capture whether the mother or father is working or not. There is a tradeoff between spending time at home and at work especially for the mother. A non-working woman would have more time to bear children and conversely we would expect fertility to decrease with more time devoted by the female to work. We also include a dummy variable denoting whether the mother is a UAE national in order to examine the impact of marriage between UAE nationals and foreigners on fertility. Finally, we include a dummy indicating whether the female lives in a polygamous household⁴.

As for the household characteristics, they mainly reflect the social class of the family such as the number of domestic workers working in the household and the number of bedrooms in the house. They may impact fertility by impacting the space or the time available to raise and take care of the children.

3.3 Data and Empirical Results

The data used in this paper are from the Household Expenditure Survey (HES) conducted in the UAE in 2008. The survey contains information on 13,992 households relating to their income and spending patterns. The data were collected in all of the seven emirates of the UAE and included both UAE national and non-UAE national

⁴UAE males are allowed to marry up to four women. The household data allows us to capture whether the head of the household is married to more than one woman.

households. The survey also included information on the socioeconomic characteristics of all the individuals in the household such as their age, gender, educational level, labor market status, household size and occupation. Therefore, a comprehensive data set of 84,733 observations was generated containing information on children, parents, and other family members of the household. For the purpose of this study, we restrict the sample to females aged between 15 and 49 and who live in local households⁵ since we assume that the childbearing age in the UAE lies within this range. We are thus left with 10,305 individual observations⁶. The variable of interest in this paper is the number of children born to every female in the sample. Due to data limitations, we can only impute the number of children for females who were declared as⁷:

1. Heads of the households,
2. Wives,
3. Married daughters of the heads of households who live in a household where there are no daughter-in-laws living with them, and there are no other married, divorced, or widowed women in that household,
4. Daughter-in-law of the heads of households who live in a household where all daugh-

⁵A household is defined to be local if the head of the household is a UAE national.

⁶We have also excluded all females who were declared as employees of the households (domestic workers). Moreover, we have eliminated all households in which the difference between the mother's age and her eldest child is lower than 13 years. This is either a mistake in the reporting of the data or the wife in the household is not the biological mother of the child.

⁷We can only assign children to their respective mothers in households that contain one wife only. Therefore, in polygamous households, we have computed the average number of children living in that household.

ters of that household are single and they are the only daughter-in-laws in that household, and

5. Single Daughters of the head of households.

The sample then is reduced to 8018 observations and comprises around 78% of the original female sample.

3.3.1 Descriptive Results

This section provides some statistics on total and marital fertility rates in the UAE according to various factors such as females' age, education, labor market status, and family income.

Table 3.2 illustrates the substantial drop in fertility as the age cohort to which the female belongs to decreases. The total fertility rate declines from 5.8 for females in the 45-49 age cohort to 1.28 for females in the 25-29 age cohort. Fertility rates become close to zero for the youngest age cohort.

A female's education and participation in the labor force also impact her fertility by postponing the age of marriage, and enhancing the knowledge of contraceptive methods and the benefits of small-size families. It also forces females to adopt a form of birth-spacing strategy in order to cope with the work responsibilities. Indirectly, education increases the demand for higher quality children which with higher spending on children. This increase in the cost of having children reduces the desired number of children in the

family.

Table 3.3 shows the negative relationship between a female's education and fertility. The total fertility rate for women who have at most completed primary schooling is 4.81, while more educated females have fertility rates below 2. The marital fertility rate also declines from 6 to 2.82 as the years of education decrease. The fertility rates in this paper are less than those reported by Lee and Zohry (1994) for the late eighties who estimated total fertility rates of 8.1 and 4.6 for illiterate and literate UAE women respectively.

Table 3.4 estimates fertility rates according to female participation in the labor force. Total fertility rates in the UAE are estimated to be around 1.5 and 3.7 for working and non-working women respectively. There is a negative relationship between women's labor force participation and fertility. Females who participate in the labor force tend to have fewer children as they have less time to take care of their offspring.

The increase in females' educational attainment and labor force participation has induced women to postpone the age of marriage. Early marriages used to be very common in the UAE. However, as individual education, occupation, and wealth in the Gulf countries began to replace marriage as a method towards achieving a respected social membership (El-Haddad 2003), the age of marriage began to increase. During 1975, for example, the proportion of women aged between 15 and 19 years who were married was almost 57%; however, by the year 1995, this proportion decreased to 8% (Rashad et. al. 2005). Moreover, economic development and rapid urbanization began to impose costly consumption styles on families (Begader 1993) which forced young males to also postpone

marriage or marry foreign women. Using the HES 2008 dataset, we estimate the mean age of marriage for females in the UAE to be less than 20 years in 1988, 20.25 years in 1993, 22.8 in 2003, and finally 23.5 in 2008. This current phenomenon of postponing marriage has led to a decrease in fertility. We can see from table 3.5 that females who married at very early ages (13 to 15) have on average 7 children; whereas, females who married after the age of 25 have less than 3 children.

The negative impact of the increase in women's labor force participation on fertility can be partly mitigated by the presence of babysitters or domestic workers⁸. Therefore, one should expect fertility to rise as the number of domestic workers in the household increases. However, the employment of domestic workers is a common practice among UAE families, and is not restricted to households with working women. It is largely an urban culture that resulted from the sudden increased wealth in these societies (El-Haddad 2003). Indeed, table 3.6, shows that fertility rates do not seem to vary with the number of domestic workers.

Aside from the factors described above, income is usually an important determinant of fertility. According to Becker (1960), income increases both the quality (spending on children) and the quantity of children. He believes that there is a tradeoff between spending on children and consuming other goods and services. However, the idea that rich families demand relatively higher quality children than the poor is questionable. It

⁸Although we should take into consideration the cost of foreign household keepers as part of the cost of having children, their actual monetary cost percentage is not important in the UAE family budget and thus their cost is not expected to have direct negative effect on fertility.

is usually not the case that if income decreases, parents demand lower quality children in order to consume more goods.

Table 3.7 shows the variation in fertility by family income in the UAE. Contrary to international empirical evidence, there is no clear relationship between income and fertility rates in the UAE. Total fertility rates and marital fertility rates are approximately 2 and 4 children per female respectively for all income categories.

Table 3.8 depicts the fertility rates across the emirates in the UAE. Despite the differences in the degree of economic development and magnitude of wealth between the emirates, fertility rates do not seem to vary. Total fertility rates range from 1.7 in Umm Al Quwain to around 2.5 in Fujairah, while marital fertility rates range from around 3.9 in Dubai to 4.9 in Fujairah.

3.3.2 Multivariate Results:

This section estimates a Poisson model in order to assess the impact of each of the previously discussed factors on fertility among UAE households. The model includes parents' age, years of education, labor market status, income of the father, and nationality of the mother, in addition to the number of domestic workers working in the household, and the number of bedrooms in the house.

In the econometric model estimation, we further restrict our sample to married females aged between 15 and 49 years. Therefore, we attain a sample size of 3016 observations. Table 3.9 shows the distribution of households according to the number of children.

Around 50% of the UAE citizen families have 5 or more children and the most frequent number of children per wife is 3, 4, and 5⁹.

Table 3.10 depicts the summary statistics of the variables used in the empirical analysis. The sample shows that the average number of children per married females is 4.75. As for the income variable, the difference between the average annual gross income of the husband and wife is striking. Wives' average gross annual income is estimated at around 37,000 AED (10,000 USD), which is almost one-tenth of the average husbands' annual income (393,000 AED or 106,793 USD). Husbands are the primary breadwinners of the family and their income defines the economic well-being of the family¹⁰.

The sample also shows that average number of years of education years to be around 10.8 for the wife and 11.4 for the husband. The families on average have one domestic worker and large houses (between 4 to 5 bedrooms on average). Finally, 95% of the wives in the used sample are UAE citizens.

Table 3.11 presents the results of Poisson model. It depicts the coefficients, odds ratios, and the semi-standardized odds coefficients. The odds ratio is used to explain the change in odds for a unit increase or decrease in the explanatory variable. The semi-standardized odds coefficients express the odds ratios in terms of standard deviation units and therefore allow us to rank the influence each variable has on fertility.

We perform a goodness-of-fit test to the model. The test turns out to be insignificant

⁹The data is distributed in such a way that we do not suffer from the excess zeros' problem normally encountered in count data.

¹⁰We have included only the husband's income in the model as he is considered to be the main breadwinner in the family.

indicating that the Poisson model is the appropriate one. The overall goodness-of-fit of the model could also be seen via the Pseudo R2 and the log pseudo likelihood ratio. Moreover, to test for over-dispersion, we run the model using the negative binomial regression model and show that it is equivalent to the Poisson model.

The empirical results show that the husband's income is not significant. This result together with the descriptive results depicted in table 3.7, which point to the lack of association between fertility and family income, allow us to conclude that our findings do not support the quality-quantity theory of Becker. Therefore, it seems that economic constraints are not important in the decision to have children among UAE citizens.

The education of the wife, in contrast to the education of the husband, is significant and negatively related to fertility. Over the past few decades, female enrollment in education, especially in higher education has been increasing and is expected to continue rising in the future. This implies a further decrease in fertility due to the higher educational attainment of females. The total fertility rate is estimated at around 4.8 for females with primary education or less and it drops to 1.6 or lower for females that have completed more than 7 years of education (see table 3.3 above).

Women's labor market status is also significant. The number of children born to a wife who is not working is 19.2% higher than that for a wife who is working. Moreover, our results suggest that having more domestic workers seems to increase the incentive to have more children, although the descriptive results show only a slight increase in fertility rates when comparing households with domestic workers to those without domestic workers.

The number of bedrooms is positively related to fertility and highly significant. The living space available for the family acts as a constraint to have more kids. It is less likely to be interpreted as a wealth variable because UAE nationals are entitled to government housing assistance if their income is below a certain level. Moreover, a sizable number of UAE families still live in traditional houses which are relatively cheap but very large in size. Therefore, we may expect a decrease in fertility to some degree as UAE couples move to smaller houses over the years.

Only the emirate of Dubai is significantly different from the reference emirate (Abu Dhabi) in terms of fertility while other emirates are not different. In Dubai, women seem to have 8.9% fewer children than Abu Dhabi and other emirates. This result is consistent with the previous finding in table 3.8.

The nationality of the wife is significant and positively related to fertility. The results demonstrate that a UAE nationality wife is expected to have on average 47.4% more children than a foreign wife living in a UAE household. Therefore, fertility is expected to decline as the incidence of marriages between UAE males and foreign females increases.

Finally, our findings show that polygamy is inversely related to fertility. A polygamous wife is estimated to have 11.4% fewer children than a monogamous wife. This result contrasts with Alnuaimi and Poston (2009) who found a positive relationship between polygamy and fertility among UAE nationals. He argued that in the UAE, polygamous males tend to have less education and more income than their monogamous counterparts which can positively affect fertility. However, our results show that both variables do not

affect fertility in the UAE.

The negative association between fertility and polygamy has also been found in many African countries. Two possible arguments that have been put forward to explain this phenomenon are: 1) the reduction in the frequency of sexual intercourse between the wife and husband; 2) the male's preference to be with one particular wife.

3.4 Conclusion and Policy Implications

Fertility levels in the GCC have been declining rapidly at a time when the majority of the population is made up of foreigners in most of the countries. This decline could change the age structure of the population and decrease the population growth of nationals escalating their minority status within the country.

In this paper, we analyze the determinants of fertility in the UAE using the Household Expenditure Survey (HES) 2008 dataset. To the best of our knowledge, the HES data has never been used to study fertility in the GCC region or the UAE specifically. We estimate a Poisson count model and conclude that income factors do not impact fertility in the UAE. This could be due to the presence of sizeable government social insurance programs UAE at easing the cost of living of UAE national households. The results show that Becker's theory does not apply to the UAE because present fertility rates are not driven by the costs of children and the benefits that families derive from their

children. According to our results, policies that provide financial incentives to conceive children such as the marriage fund, the generous housing allowances and the salary benefits associated with the number of children a national employee has are not effective in increasing fertility in the UAE

We also conclude in the paper that the higher female educational attainment is an important determinant of fertility and has contributed to its decline. The increase in the incidence of marriages to foreign females and the decrease in the size of the residence for UAE families have also contributed to the recent drops in fertility. Finally, polygamy negatively affects fertility in the UAE as monogamous wives tend to have more children.

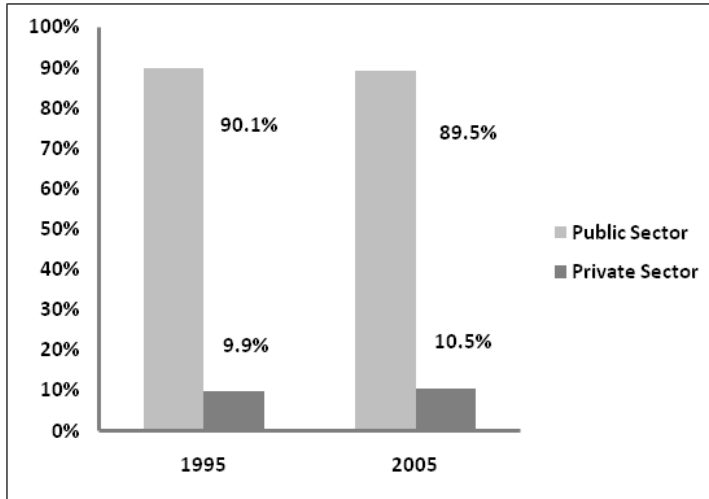
Effective policies aimed at increasing fertility should be directed at encouraging marriages among UAE nationals and reducing the obstacles that affect working women from having children. Encouraging earlier marriages among female and male citizens can be very successful in raising fertility by increasing the number of years available to conceive children. However, early marriages may obstruct young citizens from pursuing their higher education. Promoting marriages among UAE nationals in contrast to mixed marriages with foreigners may also help at increasing fertility levels, as UAE females tend to have more children than foreign females.

Policies that encourage females to conceive more children while also participating in the labor force should be implemented. These policies could be directed towards increasing the maternity benefits, offering part time jobs in both the private and public sector, and providing suitable nursing facilities in large working centers.

Future work entails examining the economic and demographic implications of a reduction in fertility in the GCC countries. Another extension to this paper would be to use the 2008 UAE Household Expenditure Survey to study variations in fertility rates across immigrant groups living in the UAE. We can thus distinguish between culture and environment by looking at individuals who are culturally different but live in a common economic environment.

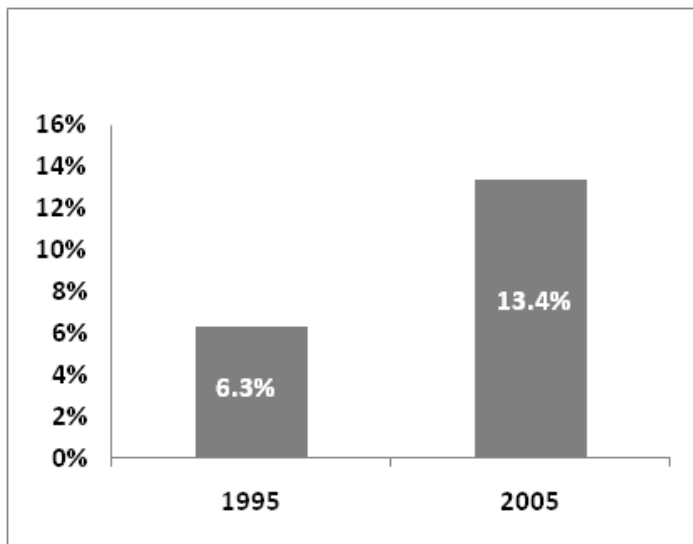
Appendix A: Figures and Tables

Figure 1.1: Employment Distribution of UAE Nationals by Sector



Source: UAE Census 1995, 2005

Figure 1.2: Unemployment Rates among UAE Nationals



Source: UAE Census 1995, 2005

Figure 1.3: The Flow of Workers between Employment States

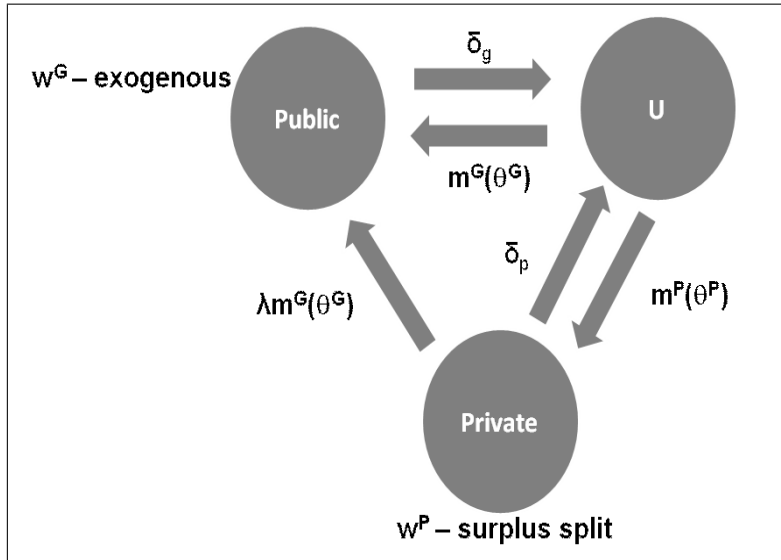


Figure 1.4: Uniqueness of the Equilibrium

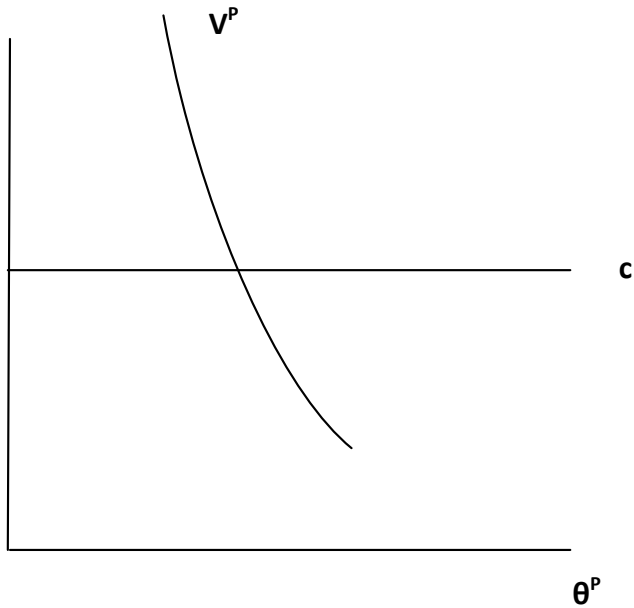


Table 1.1: Baseline Case

Observed	Values	Source
e_g	0.7381	UAE Household Expenditure Survey - 2008
u	0.188	UAE Household Expenditure Survey - 2008
w_g	12.16	UAE Household Expenditure Survey - 2008
w_p	11.85	UAE Household Expenditure Survey -2008
b^f	9.86	UAE Household Expenditure Survey - 2008
δ_g	0.1	Dubai Labor Force - 2008
δ_p	0.15	Dubai Labor Force - 2008
$r(\%)$	3	UAE Central Bank
Assumptions	Values	
λ	0.5	
β	0.5	
$m_p(\theta_p)$	$\theta_p^{1/2}$	
$m_g(\theta_g)$	θ_g	
Calibrated	Values	
Y	35	Parameters
c	22.21	Parameters
θ_p	0.0153	Endogenous
θ_g	0.3282	Endogenous
v_g	0.0738	Endogenous
v_p	0.0029	Endogenous

Table 1.2: Variation in Public sector Wages

Variation in w_g	$w_g = 12.16^*$	$w_g = 12.26$
u	0.1880	0.1887 (+0.07 <i>p.p.</i>)
e_p	0.0739	0.0732 (-0.07 <i>p.p.</i>)
w_p	11.85	11.86 (+1%)
θ_p	0.0153	0.0148 (-3.27%)
θ_g	0.3282	0.3276 (-0.18%)
v_p	0.0029	0.0028 (-3.4%)
v_g	0.0738	0.0738 (0%)

Table 1.3: Variation in Productivity

Variation in Y	$Y = 35$	$Y = 35.1$
u	0.1880	0.1859 (-0.21 <i>p.p.</i>)
e_p	0.0739	0.076 (-0.21 <i>p.p.</i>)
w_p	11.85	11.9 (+5%)
θ_p	0.0153	0.0165 (+7.84%)
θ_g	0.3282	0.3296 (+0.43%)
v_p	0.0029	0.0031 (+6.9%)
v_g	0.0738	0.0738 (0%)

Table 1.4: Variation in the bargaining power of nationals

Variation in β	$\beta = 0.9$	$\beta = 0.5^*$	$\beta = 0.1$
u	0.2394 (+5.14 <i>p.p.</i>)	0.188	0.1545 (-3.35 <i>p.p.</i>)
e_p	0.0225 (-5.14 <i>p.p.</i>)	0.0739	0.1074 (+3.35 <i>p.p.</i>)
w_p	12.59 (+74%)	11.85	10.98 (-87%)
θ_p	0.0008 (-94.89%)	0.0153	0.0518 (+239.48%)
θ_g	0.2945 (-10.26%)	0.3282	0.3546 (+8.05%)
v_p	0.0002 (-93.34%)	0.0029	0.008 (+178.38%)
v_g	0.0738 (0%)	0.0738	0.0738 (0%)

Table 1.5: Variation in the intensity of OTJ search

Variation in λ	$\lambda = 0$	$\lambda = 0.5^*$	$\lambda = 1$
u	0.1417 (-4.63 <i>p.p.</i>)	0.188	0.2028 (+1.48 <i>p.p.</i>)
e_p	0.1202 (+4.63 <i>p.p.</i>)	0.0739	0.0591 (-1.48 <i>p.p.</i>)
w_p	12.28 (+43%)	11.85	11.50 (-35%)
θ_p	0.0162 (+6.06%)	0.0153	0.0158 (+3.5%)
θ_g	0.5209 (+58.74%)	0.3282	0.2818 (-14.12%)
v_p	0.0023 (-20.15%)	0.0029	0.0032 (+11.46%)
v_g	0.0738 (0%)	0.0738	0.0738 (0%)

Table 1.6: Variation in public sector employment - Case1

Change in e_g	$e_g = 73.81$	$e_g = 66.43$	$e_g = 73.81$	$e_g = 66.43$
Change in β	$\beta = 0.5$	$\beta = 0.5$	$\beta = 0.1$	$\beta = 0.1$
u	0.188	0.220 (+3.2 p.p)	0.1545	0.1722 (+1.77 p.p)
e_p	0.0739	0.1156 (+4.17 p.p)	0.1074	0.1635 (+5.61 p.p)
w_p	11.846	11.848	10.98	10.95
θ_p	0.0153	0.0201	0.0518	0.0711
θ_g	0.3282	0.2391	0.3546	0.2616

Table 1.7: Baseline Case 2

Observed	Values	Source
e_g	0.7381	UAE Household Expenditure Survey - 2008
u	0.1869	UAE Household Expenditure Survey - 2008
w_g	12.16	UAE Household Expenditure Survey - 2008
w_p	11.85	UAE Household Expenditure Survey -2008
b^f	9.86	UAE Household Expenditure Survey - 2008
δ_g	0.1	Dubai Labor Force - 2008
δ_p	0.1	Dubai Labor Force - 2008
$r(\%)$	3	UAE Central Bank

Assumptions	Values
λ	0.5
β	0.5
$m_p(\theta_p)$	$0.5\theta_p$
$m_g(\theta_g)$	θ_g

Calibrated	Values	
Y	14.41	Parameters
c	1.61	Parameters
θ_p	0.2124	Endogenous
θ_g	0.3289	Endogenous
v_g	0.0738	Endogenous
v_p	0.0397	Endogenous

Table 1.8: Variation in public sector employment - Case 2

Change in e_g	$e_g = 73.81$	$e_g = 66.43$
u	0.1869	0.1695 (-1.74 <i>p.p</i>)
e_p	0.075	0.1662 (+9.12 <i>p.p</i>)
w_p	11.85	11.96
θ_p	0.2124	0.454
θ_g	0.3289	0.263

Table 2.1: Baseline Case

Observed	Values	Source
E_g	0.7381	UAE Household Expenditure Survey - 2008
N	0.0741	UAE Household Expenditure Survey - 2008
X	4.6809	UAE. Household Expenditure Survey - 2008
w_g	12.16	UAE. Household Expenditure Survey - 2008
w^N	11.85	UAE. Household Expenditure Survey -2008
w^X	11.05	UAE. Household Expenditure Survey -2008
b	9.86	UAE. Household Expenditure Survey - 2008
r	0.04	UAE. Central Bank
δ	0.1	Dubai Labor Force - 2008
Assumptions	Values	
λ	0.2	
β	0.5	
$m_p(\theta_p)$	$\theta_p^{1/2}$	
$m_g(\theta_g)$	θ_g	
Calibrated	Values	
$Y^N = Y^X$	11.42	Parameters
γ	31.31	Parameters
θ_p	0.0047	Endogenous
c	0.0374	Parameter
θ_g	0.3643	Endogenous
v_g	0.0738	Endogenous
v_p	0.0009	Endogenous

Table 2.2: Variation in the cost parameter

Variation in c	$c = 0.02077^*$	$c = 0.0274$	$c = 0.0374$	$c = 0.0474$
U	0.1665 (-2.13 <i>p.p.</i>)	0.1771 (-1.1 <i>p.p.</i>)	0.1878	0.1949 (+0.71 <i>p.p.</i>)
N	0.0954 (+2.13 <i>p.p.</i>)	0.0848 (+1.1 <i>p.p.</i>)	0.0741	0.067 (-0.71 <i>p.p.</i>)
X	8.589 (+83.49%)	6.455 (+37.9%)	4.6809	3.668 (-21.6%)
w^N	12.43 (+58%)	12.1 (+25%)	11.85	11.71 (-14%)
rU	12.11	11.9	11.75	11.67
θ_p	0.0106	0.0071	0.0047	0.0034
θ_g	0.3978	0.3804	0.3643	0.3543
v_p	0.0018	0.0013	0.0009	0.00067
v_g	0.0738	0.0738	0.0738	0.0738
Profit	1.5904 (+79%)	1.2116 (+36%)	0.89	0.7 (-21%)

Table 2.3: Variation in Public Sector Employment

Variation in E_g	$E_g = 0.6643$	$E_g = 0.7381$	$E_g = 0.8119$
c	0.0374	0.0374	0.0374
U	0.2193 (+3.15 <i>p.p.</i>)	0.1878	0.1494 (-3.84 <i>p.p.</i>)
N	0.1164 (+4.23 <i>p.p.</i>)	0.0741	0.0387 (-3.54 <i>p.p.</i>)
X	4.8652 (+3.94%)	4.6809	4.5268 (-3.29%)
w^N	11.89 (+4%)	11.85	11.83 (-2%)
rU	11.76	11.75	11.79
θ_p	0.0067	0.0047	0.0028
θ_g	0.2738	0.3643	0.5167
v_p	0.0015	0.0009	0.0004
v_g	0.0664	0.0738	0.0812
Profit	0.8854 (-4%)	0.8899	0.8893 (-0.03%)

Table 3.1: Total Fertility Rates in the GCC (births per woman)

Country	1970-1975	1985-1990	1990-1995	1995-2000	2000-2005
Bahrain	5.9	4.1	3.4	2.8	2.5
Kuwait	6.9	3.9	3.2	2.6	2.3
Oman	7.2	6.8	6.3	5.1	3.7
Qatar	6.8	4.7	4.1	3.4	2.9
Saudi Arabia	7.3	6.2	5.4	4.6	3.8
United Arab Emirates	6.4	4.8	3.9	3.1	2.5

Source: UNDP, World Population Prospects, 2006 and Human development report 2007/2008

Table 3.2: Fertility Rates by Females' Age

Age Groups	TFR	MFR
15-19	0.02	0.67
20-24	0.28	1.32
25-29	1.28	2.50
30-34	2.88	3.83
35-39	4.79	5.29
40-44	5.49	5.89
45-49	5.80	6.01
# of observations	8018	3591

Source: Authors calculations based on UAE Household Expenditure Survey 2008

Table 3.3: Fertility Rates by Females' Education

Education of Female in Years	TFR	MFR
0-7 years	4.81	6.01
11 years	1.57	4.83
14 years	1.27	3.26
16-18 years	1.55	3.07
20-23 years	1.33	2.82
# of Observations	8018	3591

Source: Authors calculations based on UAE Household Expenditure Survey 2008

Table 3.4: Fertility Rates by Females' Labor Market Status

Labor Market Status of Female	TFR	MFR
Working	1.53	3.10
Not Working	3.71	4.65
Full Time Student	0.03	1.09
# of Observations	8018	3591

Source: Authors calculations based on UAE Household Expenditure Survey 2008

Table 3.5: Fertility Rates by Females' Age of Marriage

Age of Marriage	MFR
13-15	6.81
16-20	5.4
21-25	3.68
26-30	2.93
>30	3.64
# of Observations	2816

Source: Authors calculations based on UAE Household Expenditure Survey 2008

Table 3.6: Fertility Rates by No. of Domestic Workers in the Household

No. Domestic workers	TFR	MFR
0	1.95	4.04
1	2.06	4.16
2	2.06	4.55
3	1.93	4.50
>4	1.90	4.52
# of Observations	8018	3591

Source: Authors calculations based on UAE Household Expenditure Survey 2008

Table 3.7: Fertility Rates by Family Income

Family Income	TFR	MFR
<20,000	1.82	4.30
20,000-40,000	2.10	4.27
40,001-60,000	2.38	4.13
60,001-80,000	2.27	4.09
80,001-100,000	2.57	4.12
>100,000	2.21	4.27
# of Observations	8018	3591

Source: Authors calculations based on UAE Household Expenditure Survey 2008

Table 3.8: Fertility Rates by Emirate

Emirate	TFR	MFR
Abu Dhabi	2.17	4.48
Dubai	1.90	3.89
Sharjah	1.91	4.14
Ajman	1.94	4.51
Umm Al Quwain	1.70	3.90
Ras Al Khaimah	1.92	4.07
Fujeirah	2.48	4.95
# of Observations	8018	3591

Source: Authors calculations based on UAE Household Expenditure Survey 2008

Table 3.9: Distribution of the Sample According to the No. of Children

Emirate	0	1	2	3	4	5	6	7	8	9	10	>10	Total
Frequency	106	184	324	440	472	425	338	260	201	110	68	88	3016
Percent	3.51	6.1	10.74	14.59	15.65	14.09	11.21	8.62	6.66	3.65	2.25	2.92	100
Cumulative	3.51	9.62	20.36	34.95	50.6	64.69	75.9	84.52	91.18	94.83	97.08	100	-

Table 3.10: Variables' Characteristics

Variables	Description	Mean	Std. Dev	Min	Max
# of Children born to a wife	Number of Children per female	4.75	2.71	0	17
Age of Wife	Age of the Wife	36.01	7.27	18	49
Wife's Gross Income	Annual Gross Income (100,000 AED)	0.369	0.932	0	17.2
Husband's Gross Income	Annual Gross Income (100,000 AED)	3.926	6.541	0	284.74
Abu Dhabi	Dummy=1 if Abu Dhabi	0.39	0.49	0	1
Dubai	Dummy=1 if Dubai	0.25	0.43	0	1
Sharjah	Dummy=1 if Sharjah	0.18	0.38	0	1
Other Emirates	Dummy=1 if Other Emirates	0.18	0.38	0	1
Wife is working	Dummy=1 if Wife is working	0.21	0.40	0	1
Wife is not working	Dummy=1 if Wife is not working	0.79	0.41	0	1
Wife is a student	Dummy=1 if Wife is a student	0.01	0.08	0	1
Husband is working	Dummy=1 if Husband is working	0.73	0.44	0	1
Husband is not working	Dummy=1 if Husband is not working	0.27	0.44	0	1
Education of the Wife	Years of education	10.77	6.10	0	23
Education of the Husband	Years of education	11.46	5.80	0	23
# of Domestic Workers	Number of Domestic Workers	1.12	0.92	0	7
# of Bedrooms	Number of Bedrooms	4.71	2.20	0	36
Nationality of Wife	Dummy=1 if Wife is a UAE national	0.95	0.23	0	1
Polygamy	Dummy=1 if Polygamous Household	0.09	0.29	0	1

Table 3.11: Results

Variables	Coefficient	Odds Ratio	Semi Standardized Odds Ratio
Age of Wife	0.2438 * ** (0.0140)	1.2760	5.8784
Age Squared of Wife	-0.0030 * ** (0.0002)	0.9970	0.2099
Husband's Gross Income	0.0003 (0.0008)	1.0003	1.0018
Dubai	-0.0934 * ** (0.0215)	0.9108	0.9602
Sharjah	0.0272 (0.0266)	1.0276	1.0105
Other Emirates	0.0372 (0.0254)	1.0379	1.0143
Wife is not working	0.1757 * ** (0.0239)	1.1921	1.0745
Wife is a Student	0.0966 (0.0964)	1.1014	1.0075
Husband is not working	0.0730 * ** (0.0216)	1.0757	1.0328
Education of the Wife	-0.0188 * ** (0.0021)	0.9814	0.8917
Education of the Husband	-0.0025 (0.0019)	0.9975	0.9853
# of Domestic workers	0.0358 * ** (0.0099)	1.0365	1.0335
# of bedrooms	0.0359 * ** (0.0076)	1.0366	1.0820
Nationality of Wife	0.2341 * ** (0.0514)	1.2638	1.0542
Polygamy	-0.1213 * ** (0.0343)	0.8858	0.9654
Constant	-3.5754 * ** (0.269)		
Wald chi2 (df)	1683.13(15)		
Pseudo R2	0.1283		
Log Pseudo likelihood	-6382.9417		
*, **, and *** denote significance at the 10%, 5%, and the 1% levels, respectively.			

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