ESSAYS ON DETERMINANTS AND IMPACTS OF PREFERENCE FOR LEISURE

EMEKCAN YÜCEL

BOĞAZİÇİ UNIVERSITY

2012

ESSAYS ON DETERMINANTS AND IMPACTS OF PREFERENCE FOR LEISURE

Thesis submitted to the

Institute for Graduate Studies in the Social Sciences

in partial fulfillment of the requirements for the degree of

Master of Arts

in

Economics

by

Emekcan Yücel

Boğaziçi University

2012

Thesis Abstract

Emekcan Yücel, “Essays on Determinants and Impacts of Preference for Leisure”

This thesis consists of two essays about the determinants and impacts of weight of leisure in preferences.

In the first essay, I investigate the determinants of weight of leisure in preferences. First, using a dynamic general equilibrium model, I back out the weight of leisure in preferences for 52 countries over the period from 1950 to 2009. Then, I perform several panel data regressions using the backed out values of the preference for leisure as the dependent variable. Estimation results imply that GDP per-capita, openness and average temperature positively affect the weight of leisure in preferences in a robust manner. I also find some evidence on the effect of unionization on leisure preference.

In the second essay, I investigate how weight of leisure in preferences might affect informal sector size. First, I construct a two-sector dynamic general equilibrium model and investigate how the informal sector size in my model varies with respect to weight of leisure in preferences. My model implies that higher weight of leisure in utility relative to consumption increases informal sector size relative to the formal sector. Then, using a panel data framework for 152 countries over 9 years between 1999 and 2007, I also find empirical support for the theoretical implications of the model.

Tez Özeti

Emekcan Yücel, “Serbest Zaman Tercihinin Belirleyicileri ve Etkileri”

Bu tez, serbest zaman tercihinin belirleyici faktörleri ve etkileri üzerine yazılmış iki makaleden oluşmaktadır.

İlk makalede, serbest zamanın tercihlerdeki ağırlığını belirleyen faktörleri araştırdım. İlk olarak, bir dinamik genel denge modeli kullanarak 52 ülke ve 1950-2009 yılları arası için serbest zamanın tercihlerdeki ağırlığını kalibre ettim. Daha sonra, serbest zaman tercihinin kalibre edilmiş değerlerini bağımlı değişken olarak kulandığım çeşitli panel veri analizleri yaptım. Sonuçlar kişi başına düşen GSYİH, ticari açıklık ve ortalama sıcaklığın serbest zamanın tercihlerdeki ağırlığını arttırdığını tutarlı olarak gösterdi. Ayrıca sendikalaşmanın da serbest zaman tercihi üzerinde etkileri olduğuna dair bulgular elde ettim.

İkinci makalede, serbest zamanın tercihlerdeki ağırlığının kayıt dışı ekonomi büyüklüğünü nasıl etkileyebileceğini araştırdım. Önce, iki sektörlü bir dinamik genel denge modeli kurarak modelimde kayıt dışı ekonomi büyüklüğünün serbest zamanın tercihlerdeki ağırlığına göre nasıl değiştiğini araştırdım. Modelim, serbest zamanın tercihlerdeki ağırlığı arttıkça kayıt dışı ekonomi büyüklüğünün de arttığını gösterdi. Daha sonra, 152 ülke ve 1999-2007 yılları arası için panel veri analizi kullanarak modelin kuramsal sonuçlarına gözlemsel destek de buldum.

ACKNOWLEDGEMENTS

First and foremost, I would like to thank my supervisor Assist. Prof. Ceyhun Elgin for his supportive and caring approach throughout the whole process of this thesis work. This thesis would be impossible to finish without his tremendous support, guidance and contributions. I would also like to thank Assist. Prof. Tolga Umut Kuzubaş and Prof. Burak Saltoğlu for their valuable comments and suggestions.

I would like to thank Dr. Mehtap Işık for her lasting support and encouragement before and during the program.

I would like to acknowledge the Scientific and Technological Research Council of Turkey (TUBITAK) for granting me a generous graduate scholarship.

I dedicate this thesis to my family and to my beloved ones, who have always supported and encouraged me with love.

CONTENTS

FIGURES

TABLES

CHAPTER 1

DETERMINANTS OF PREFERENCE FOR LEISURE

Introduction

There have been many studies intending to account for the cross-country and time-series differences in hours worked. Among the many examples, Bell and Freeman (2001) focus on inequality as they explain the difference in hours worked between Germany and the USA. Prescott (2004) investigates the gap in hours worked between the USA and Europe and finds tax rates as the major cause. Moreover, McGrattan and Rogerson (2004) investigate the changes in hours worked in the United States between 1950 and 2000 among different demographic groups. Rogerson (2006) builds a quantitative model to explain variations in hours worked in a panel data framework.

While these studies were concerned with the variations in the hours worked and therefore in absolute leisure time, there is no study that focused on the sources of variations in preference for leisure. In this paper, I try to account for the variations in preference for leisure across countries and over time. My ultimate aim is to provide some insights as to why people on some countries value leisure more than others and to why valuation of leisure changes in a given country over time.

Maybe the most important issue with a study investigating the preference for leisure is regarding its measurement. As the valuation of leisure is an abstract concept related to the formation of preferences, it is not readily available in the data

and cannot feasibly be measured directly. At the microeconomic level, surveys that are asking people to score their leisure valuation can be conducted to obtain data but scoring standards may differ among individuals and across countries, leading to inconsistent measures. My way of measuring leisure preference in this paper is based on solving a simple macroeconomic model and using one of the equilibrium conditions to obtain preference for leisure numerically from the model. To this end, I use a simple one sector dynamic general equilibrium model with a parameter indicating valuation of leisure and I back out the leisure preference parameter from one of the equations characterizing this model. I calibrate the leisure preference parameter using macroeconomic data. Then I make regressions using these calibrated values as the dependent variable. I also include several variables among the independent variables that I think are likely to affect preference for leisure. Estimation results imply that GDP per-capita, openness and average temperature positively affect weight of leisure in preferences in a robust manner. I also find some evidence about the effect of unionization on leisure preference.

The rest of the essay is organized as follows: Empirical methodology for static panel data analysis and panel-VAR is discussed next. Then, formation of leisure preference parameter and other data are presented. Empirical results are provided later and finally comes the conclusion.

Empirical Methodology

Static Panel Data Analysis

As observations are for 52 countries over the period between 1950 and 2009, I use panel data estimation methods. Since I investigate the determinants of leisure preference, I take leisure preference as the dependent variable and use several other variables as independent variables. In a static setting, the estimated panel equation is of the following form:

$$\varphi_{i,t} = \beta_0 + \sum_{k=1}^{n} \beta_k X_{k_{i,t}} + \theta_i + \varepsilon_{i,t}$$

where for country i in year t, φ stands for the weight of leisure in preferences and $X_{ki,t}$ are various explanatory variables included in the regression. Moreover, θ_i represents the country fixed effects and $\varepsilon_{i,t}$ is the error term.

Hausman test suggests using fixed effects and Wooldridge test suggests autocorrelation in the data. Hence, I use fixed effects estimators with AR(1) errors as the benchmark case. However, to check the robustness of results in different econometric specifications and especially to take care of potential endogeneity issues, I also run regressions using alternative estimation methods, namely Arellano-Bond and Arellano-Bover estimators. In this dynamic panel data setting, the estimated equation is of the following form:

$$\varphi_{i,t} = \alpha_0 + \alpha_1 \varphi_{i,t-1} + \sum_{k=2}^{n} \beta_k X_{k_{i,t}} + \theta_i + \varepsilon_{i,t}$$

I also perform sensitivity analyses by omitting and transforming some variables that are associated with weight of leisure in preferences directly through its formula and by using estimated labor share values instead of assuming it to be constant.

Panel-VAR

In addition to the static and dynamic panel data estimations, utilizing the relatively long time-series dimension of my dataset I will also use a panel-data vector autoregression (VAR) methodology. As well known, this method extends the traditional VAR approach to a panel data setting and allows one to control for country level unobserved heterogeneity. In the estimated model, following specification will be posed:

$$y_{i,t} = \sum_{j=1}^{p} \beta_j y_{i,t-j} + \sum_{j=1}^{p} \delta_j x_{i,t-j} + f_i + s_{c,t} + v_{i,t}$$

Applying the VAR methodology to panel data presents a problem associated with lagged dependent variables in both fixed and random effects settings. In order to address this problem I use the methodology proposed by Holtz-Eakin, Newey and Rosen (1988). In the traditional VAR, one needs to impose the restriction that the data generating process is the same for each cross-section of observation which is hardly met in practice. Therefore, in order to control for country level heterogeneity I

introduce fixed effects, f_i in the model. In the VAR setting, because of the dynamic nature of the estimation, lagged dependent variables are correlated with the disturbance term. For the fixed effect estimator transformation of variables eliminates f_i however, the regressor $y_{it-1} - \overline{y}_{i.-1}$,with $\overline{y}_{i.-1} = \Sigma_{t=p+1}^{T} y_{it-1} / (T-p)$, will still be correlated with the error term $v_{it} - v_{i.}$, where $v_{i.} = \Sigma_{t=p+1}^{T} v_{it} / (T-p)$, because y_{it-1} is correlated with $v_{i.}$ by construction. Therefore, the mean-differencing procedure commonly used to eliminate fixed effects would create biased coefficients especially with a limited number of time-series observations. In order to eliminate this problem, I use forward mean-differencing, known as the "Helmert procedure". This procedure only subtracts the mean of all the future observations available for each country-year. This transformation satisfies the orthogonality assumption between transformed variables and lagged regressors. Therefore, one can use lagged dependent variables as instruments and estimate the coefficients by system GMM. (see Love and Zicchino, 2006 and Arellano and Bover, 1995 for more details). I also include time dummies for each country in order to capture country level shocks to macroeconomic conditions. These dummies are eliminated by subtracting the means of each variable calculated for each country-year.

A model with country effects that relaxes the time stationarity assumption is the one used in this estimation, in which I modify the empirical model as follows:

$$y_{i,t} = \alpha_{0t} + \sum_{j=1}^{m} \alpha_j y_{i,t-j} + \sum_{j=1}^{m} \gamma_j x_{i,t-j} + f_i + u_{i,t}$$

where y and x's will be the endogenous variables I use in my specification and f_i is the unobserved individual effect.

Finally, once the estimation is done, I analyze impulse-response functions and also present variance decompositions. Following Love and Zicchino (2006), I calculate standard errors of the impulse response functions generating confidence intervals using Monte-Carlo simulations.

Data

Preference for Leisure

Since preference for leisure is an abstract concept, it is not subject to direct measurement. Hence, neither micro nor macro data on leisure preference is readily available. I therefore build my own leisure preference data using a simple macroeconomic growth model. This model in turn gives leisure preference as a function of common macroeconomic variables that are already measured. I use the formula that the model gives in order to construct the leisure preference data.

The model I use is a one sector dynamic general equilibrium model with elastic labor supply. I solve the social planner's problem for a representative household who enjoys consumption and leisure. Household lives infinitely, endows K_0 units of capital and has a time endowment of $T > 0$ each period. Time endowment is divided on two activities: working or enjoying leisure. The two factors of production are physical capital and labor. Hence, the household has the trade-off between work and leisure, where an additional hour of work increases utility by increasing production and therefore consumption, and decreases utility by decreasing the leisure time. Household solves the following maximization problem:

$$\max_{\{C_t, l_t, I_t, K_{t+1}, N_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t U(C_t, l_t)$$

s.t.

$$C_t + I_t = Y_t \tag{1}$$

$$K_{t+1} = (1-\delta)K_t + I_t \tag{2}$$

$$N_t + l_t = T \tag{3}$$

In this problem, $\beta < 1$ is the discount factor with which household discounts future and $\delta < 1$ is the depreciation rate of capital. Equation (1) demonstrates the feasibility constraint, which implies that the sum of consumption and investment is equal to production. Equation (2) is the law of motion for capital. Equation (3) demonstrates the time constraint, where the sum of time devoted to labor and leisure equals time endowment T.

Solution of this problem requires assuming specific functional forms for the utility function U(.) and production Y(.). Assuming log utility and Cobb-Douglas production function, substituting leisure from Equation (3) into utility function, and substituting investment from Equation (2) into Equation (1) yields:

$$\max_{\{C_t, K_{t+1}, N_t\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t [\log(C_t) + \varphi \log(T - N_t)$$

s.t.

$$C_t + K_{t+1} - (1-\delta)K_t = \theta K_t^{\alpha} N_t^{1-\alpha} \tag{4}$$

Here φ measures how much the household values leisure relative to consumption. This parameter is the one I would like to obtain, as it measures the preference of the household for leisure. Production has constant returns to scale where θ is the total

factor productivity. Maximization problem of the household gives the following first order conditions:

$$\frac{\beta^t}{C_t} = \lambda_t \tag{5}$$

$$\lambda_t = \lambda_{t+1}(\theta\alpha K_{t+1}^{\alpha-1} N_{t+1}^{1-\alpha} + 1 - \delta) \tag{6}$$

$$\frac{\beta^t \varphi}{T - N_t} = \lambda_t \theta(1-\alpha) K_t^{\alpha} N_t^{-\alpha} \tag{7}$$

Combining Equation (5) and Equation (6) yields the intertemporal condition:

$$\frac{C_{t+1}}{C_t} = \beta(\theta\alpha K_{t+1}^{\alpha-1} N_{t+1}^{1-\alpha} + 1 - \delta) \tag{8}$$

Combining Equation (5) and Equation (7) yields the intratemporal condition:

$$\frac{\varphi C_t}{T - N_t} = \theta(1-\alpha) K_t^{\alpha} N_t^{-\alpha} \tag{9}$$

Rearranging the intratemporal condition and using the fact that $\theta K_t^{\alpha} N_t^{1-\alpha}$ equals output divided by labor, one can obtain the leisure preference parameter in terms of choice variables:

$$\varphi = (1-\alpha)\frac{l_t}{C_t}\frac{Y_t}{N_t} \tag{10}$$

Now that the formula for the leisure preference parameter is obtained, it remains to obtain the data of the variables in the formula. Assuming the existence of a representative household, it is safe to take the aggregate country data on these variables and work with aggregate terms. I use GDP as output and multiply GDP by share of consumption in GDP to obtain consumption data. I take both GDP and consumption share data from Penn World Table (PWT 7.0) for 52 countries in the period 1950-2009. Data on hours worked in a given year in a country provide me with a measure for the distinction between leisure and labor. I take the hours worked data from the Conference Board Total Economy Database. I take hours worked as labor (N_t) and subtract hours worked from total hours, which I find by multiplying hours in a year by employment, to obtain the aggregate leisure time (l_t). For simplicity, I set the capital share α to be 0.35 for all countries.

Other Variables

Now that the leisure preference data is obtained, I will use it as the dependent variable in the regressions. I then need to determine which variables to include as dependent variables for those regressions. Choosing the variables that are most likely to affect leisure preference depends on economic intuition. According to my economic intuition, I suspected that real GDP per capita, average temperature, unionization, unemployment, young population ratio, openness, population and share

of government expenditures in GDP are likely to determine leisure preference of people in a country.

I take the real GDP per capita, openness, population and share of government expenditures from Penn World Table (PWT 7.0) for 52 countries in the period 1950-2009. I obtain the unemployment and young population ratio data from World Bank World Development Indicators Database. Dell, Jones and Olken (2008) provide the average temperature data up to the year 2006. Finally unionization data comes from OECD Database. Table 1 reports summary statistics of all variables used in the regressions.

Table 1: Complete Dataset Summary Statistics

	Mean	Std. Deviation	Minimum	Maximum
Preference for Leisure	3.50	0.85	1.61	8.82
Unionization	38.76	19.77	1.08	94.30
GDP per capita	16.76	10.82	1.83	89.81
Openness	62.49	62.01	3.54	443.18
Average Temperature	11.94	5.73	1.06	26.71
Unemployment	8.00	4.40	0.60	25.57
Young Population Ratio	40.46	17.00	15.95	94.57
Population	29.02	44.76	0.13	307.01
Government expenditures/GDP	9.08	3.59	0.99	28.27

Empirical Results

Static Panel Data Analysis

I use panel data estimation methods and run regressions with weight of leisure in preferences as dependent and several other variables as independent variables. I use fixed effects estimation with AR(1) errors as the benchmark case since the Hausman test proposes using fixed effects and autocorrelation is present in the data. For sensitivity analysis, I run other panel data estimation techniques as well.

Benchmark case is presented in Table 2. Significant variables are GDP per capita, openness, average temperature, unemployment and young population ratio. Coefficient signs are positive for all variables. Significance levels for GDP per capita and openness are 1 percent for all regressions. The result that unemployment and young population ratio increase preference for leisure is rather surprising. If anything, I would expect these variables to affect leisure preference negatively. In case of high unemployment, I expect that current workers would feel more threatened by their reserves, so they would concentrate more on keeping their jobs and care less about leisure. Additionally, I expect that the willingness of young people to work should be higher than that of older people, so leisure preference should be lower in countries where the young population ratio is high. Given some counter-intuitive results, I run regressions using some additional panel data estimation methods to check the robustness of the benchmark case results.

Table 3 shows the Arellano-Bond estimation results. Significant variables are unionization, GDP per capita, openness, average temperature, unemployment and population. Coefficient signs are positive for all variables except population. Significance levels for GDP per capita and openness are 1 percent for all regressions. Unionization becomes significant once openness is added to the regression. Population, which was insignificant in the benchmark case, is only significant at 10 percent confidence level. The counter-intuitive result in the benchmark case that young population ratio increases leisure preference is not supported by this regression.

Table 2: Preference for Leisure and Explanatory Variables - Fixed Effects AR(1)

Dep. var.: ϕ

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unionization	-31.77***	7.73	10.00	6.70	-23.38	-30.00	-26.70	-24.21
	(17.28)	(16.79)	(16.66)	(17.08)	(29.51)	(71.34)	(29.42)	(29.30)
GDP per capita		0.46*	0.39*	0.40*	0.36*	0.38*	0.39*	0.42*
		(0.03)	(0.03)	(0.04)	(0.05)	(0.05)	(0.05)	(0.05)
Openness			38.96*	37.93*	42.34*	44.60*	44.73*	45.13*
			(8.70)	(9.05)	(10.83)	(10.84)	(10.78)	(10.72)
Temperature				76.89**	91.52**	86.67**	86.47***	91.97**
				(31.73)	(44.02)	(43.92)	(44.17)	(44.35)
Unemployment					71.13**	71.69**	73.69**	65.21***
					(34.19)	(34.06)	(33.96)	(34.27)
Young Pop. Ratio						174.15**	191.71*	195.03*
						(75.36)	(70.54)	(68.00)
Population							-0.04	0.04
							(0.04)	(0.05)
Gov. Exp./GDP								226.62
								(138.36)
R-squared	0.01	0.18	0.20	0.21	0.24	0.25	0.27	0.28
Observations	1148	1148	1148	1091	636	636	636	636
F-Test	3.38	124.80	94.25	69.65	38.74	33.51	31.46	29.24

All panel regressions include a country fixed effect. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Table 3: Preference for Leisure and Explanatory Variables - Arellano-Bond

Dep. var.: ϕ

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unionization	-2.22	2.92	6.03**	6.50**	22.14*	20.79*	21.20*	21.36*
	(2.79)	(2.90)	(2.96)	(3.04)	(5.92)	(6.11)	(6.08)	(6.10)
GDP per capita		0.03*	0.02*	0.02*	0.04*	0.04*	0.05*	0.05*
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Openness			8.98*	8.36*	15.71*	16.30*	15.31*	14.81*
			(1.93)	(2.12)	(3.28)	(3.35)	(3.38)	(3.54)
Temperature				80.01**	112.69**	115.28**	112.19**	110.22**
				(37.43)	(47.31)	(47.39)	(47.20)	(47.45)
Unemployment					27.48**	27.24**	26.54**	27.87**
					(12.72)	(12.72)	(12.66)	(12.98)
Young Pop. Ratio						8.48	6.40	5.49
						(9.53)	(9.56)	(9.76)
Population							-0.01***	-0.01***
							(0.01)	(0.01)
Gov. Exp./GDP								-28.01
								(58.20)
Observations	1146	1146	1146	1089	634	634	634	634

All panel regressions include a country fixed effect. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Table 4 presents Arellano-Bover estimation results, which are quite similar with Arellano-Bond results. Significant variables are the same and significance levels are slightly different. GDP per capita is significant at 5 percent confidence level in some regressions instead of 1. Average temperature becomes significant at 1 percent confidence level once population is added to the regression.

Table 4: Preference for Leisure and Explanatory Variables - Arellano-Bover

Dep. var.: ϕ								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unionization	-1.07	3.99	6.46**	7.79*	21.11*	19.83*	16.93*	17.55*
	(2.49)	(2.62)	(2.63)	(2.81)	(5.02)	(5.15)	(5.26)	(5.32)
GDP per capita		0.03*	0.01**	0.02**	0.02**	0.03**	0.04*	0.03*
		(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)	(0.01)
Openness			9.12*	9.36*	13.28*	13.52*	11.08*	10.74*
			(1.34)	(1.53)	(2.19)	(2.20)	(2.40)	(2.44)
Temperature				37.13***	68.43**	66.53**	87.76*	86.82*
				(21.67)	(29.93)	(29.97)	(31.05)	(31.12)
Unemployment					26.09**	25.83**	24.27**	26.40**
					(12.40)	(12.40)	(12.35)	(12.60)
Young Pop. Ratio						9.96	9.31	7.63
						(8.94)	(8.90)	(9.11)
Population							-0.008**	-0.008**
							(0.003)	(0.003)
Gov. Exp./GDP								-38.63
								(43.51)
Observations	1176	1176	1176	1119	666	666	666	666

All panel regressions include a country fixed effect. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Table 5 displays the regression results when GDP per capita is dropped out of explanatory variables. I make this sensitivity analysis because GDP per capita is directly linked to the formula of leisure preference φ since it includes Y_t in its numerator. Hence, the observed relationship between GDP per capita and weight of leisure in preferences might be spurious, so there is a need to check the significance of other variables in the absence of GDP per capita as an explanatory variable.

For this case, the significant variables are unionization, openness and average temperature. Coefficient signs are positive for average temperature and openness but negative for unionization, where coefficient sign of unionization is positive for all other regressions that unionization turns out to be significant. Significance levels are 1 percent for openness, 5 percent for average temperature and 10 percent for unionization. The counterintuitive result in the benchmark case that unemployment and young population ratio positively affect preference for leisure is not supported by this regression without GDP per capita in independent variables.

Table 5: Preference for Leisure and Explanatory Variables - Fixed Effects AR(1) without GDP per capita

Dep. var.: ϕ

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Unionization	-31.77***	-22.64	-27.10	-59.49***	-58.69***	-59.44***	-58.71***
	(17.28)	(17.03)	(17.46)	(30.33)	(30.35)	(30.36)	(30.32)
Openness		73.04*	72.65*	77.43*	76.32*	75.53*	72.55*
		(8.62)	(8.88)	(10.21)	(10.29)	(10.31)	(10.49)
Temperature			104.68*	108.71**	109.18**	108.99**	102.60**
			(32.79)	(44.45)	(44.46)	(44.45)	(44.61)
Unemployment				-30.14	-28.59	-26.74	-14.48
				(32.98)	(33.04)	(33.08)	(34.21)
Young Pop. Ratio					-92.06	-100.16	-97.57
					(106.65)	(106.94)	(107.74)
Population						0.07	0.07
						(0.07)	(0.07)
Gov. exp./GDP							-195.40
							(139.32)
R-squared	0.01	0.06	0.08	0.12	0.12	0.12	0.12
Observations	1148	1148	1091	636	636	636	636
F-Test	3.38	38.69	28.66	19.94	16.08	13.58	11.83

All panel regressions include a country fixed effect. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Because of the relationship between GDP per capita and weight of leisure in preferences directly through the formula, I make a nonlinear transformation to GDP per capita and add squared GDP per capita to explanatory variables. I do this in order to better evaluate the effect of GDP per capita on leisure preference and catch the

real relationship between these two variables. Results are reported in Table 6. Like GDP per capita itself, squared GDP per capita is also significant at 1 percent for all regressions, indicating an existence of a positive relationship between income and leisure preference other than the artificial relationship through the formula of leisure preference. Other significant variables are openness and average temperature. Coefficient signs are positive for both variables. Significance levels are 1 percent for openness and 5 percent for average temperature.

Table 6: Preference for Leisure and Explanatory Variables - Fixed Effects AR(1) with Squared GDP per capita

Dep. var.: ϕ

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unionization	-31.77***	-7.55	-4.88	-5.76	-28.80	-31.96	-30.68	-30.43
	(17.28)	(16.74)	(16.63)	(16.89)	(29.02)	(29.19)	(29.11)	(29.10)
Sq GDP/capita		3.99*	3.36*	4.63*	4.01*	4.03*	4.06*	4.13*
		(0.33)	(0.35)	(0.44)	(0.46)	(0.45)	(0.45)	(0.46)
Openness			43.90*	35.91*	42.66*	45.37*	46.52*	47.31*
			(8.87)	(9.21)	(10.41)	(10.52)	(10.45)	(10.47)
Temperature				83.06*	94.12**	92.92**	93.80**	96.84**
				(31.54)	(43.50)	(43.64)	(43.89)	(44.10)
Unemployment					13.30	11.57	11.51	5.54
					(31.98)	(32.02)	(32.04)	(32.97)
Young Pop. Ratio						86.13	95.15	93.04
						(71.71)	(68.00)	(67.56)
Population							-0.01	-0.01
							(0.04)	(0.04)
Gov. Exp./GDP								103.93
								(134.60)
R-squared	0.01	0.12	0.15	0.18	0.26	0.27	0.28	0.28
Observations	1148	1148	1148	1091	636	636	636	636
F-Test	3.38	73.94	64.81	57.04	42.02	36.68	33.52	29.71

All panel regressions include a country fixed effect. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Table 7 shows the results of the case where labor share in leisure preference formula is estimated for each country in the sample instead of taking it as being constant. In this case, GDP per capita, openness, average temperature and young population ratio are significant variables. Significance levels are 1 percent for GDP per capita,

openness and young population ratio. Coefficient signs are positive for all variables except young population ratio. Contrary to the benchmark case, the intuitive result that young population ratio negatively affects weight of leisure in preferences is obtained here.

Table 7: Preference for Leisure and Explanatory Variables - Fixed Effects AR(1) with Estimated Labor Share

Dep. var.: ϕ

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Unionization	-26.64	12.11	13.70	7.34	-20.02	-26.70	-25.94	-25.71
	(19.45)	(19.21)	(19.13)	(19.69)	(33.54)	(33.27)	(33.28)	(33.34)
GDP per capita		0.41*	0.35*	0.36*	0.28*	0.24*	0.26*	0.26*
		(0.04)	(0.04)	(0.04)	(0.05)	(0.06)	(0.06)	(0.06)
Openness			37.02*	37.06*	51.03*	49.27*	48.58*	48.59*
			(9.87)	(10.27)	(12.33)	(12.19)	(12.16)	(12.16)
Temperature				81.34**	87.17***	91.70***	90.64***	91.58***
				(35.88)	(48.66)	(48.23)	(48.29)	(48.55)
Unemployment					-8.42	-4.64	-2.20	-3.24
					(38.78)	(38.33)	(38.27)	(38.68)
Young Pop. Ratio						-458.98*	-452.47*	-447.40*
						(122.97)	(120.63)	(120.03)
Population							-0.11	-0.11
							(0.07)	(0.07)
Gov. Exp./GDP								33.14
								(157.82)
R-squared	0.01	0.11	0.13	0.14	0.16	0.18	0.19	0.19
Observations	1100	1100	1100	1045	617	617	617	617
F-Test	1.88	67.86	51.82	39.73	22.39	21.96	19.74	17.45

All panel regressions include a country fixed effect. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Assessing the results altogether, GDP per capita, openness and average temperature seem to be the significant variables positively affecting preference for leisure, independent of the estimation method. Benchmark case also suggests that unemployment and young population ratio increase preference for leisure but this result is not robust to different cases and estimation methods. Moreover, unionization is significant for some cases but its coefficient sign is both positive and negative for different cases. Hence, there is not much to say about the effect of unionization on

weight of leisure in preferences. Population is negatively significant for Arellano-Bond and Arellano-Bover estimations but it is insignificant for other estimation methods.

It remains to intuitively explain the relationship between significant variables and weight of leisure in preferences and assess how and through which channels these relationships may occur.

The positive relationship between GDP per capita and weight of leisure in preferences is quite reasonable. Rich countries have a higher ability to afford leisure and they have a higher consumption level compared to poor countries. Hence, their valuation of leisure relative to consumption is higher than poor countries. However, the formula of leisure preference includes Y_t in its numerator and the positive relationship observed in these regressions might be due to this rather than a real relationship. To deal with this, I made a nonlinear transformation on GDP per capita by taking its square and observed that squared GDP per capita is also significant in regressions. Hence, there is reason to believe that there is a real positive effect of income on leisure preference.

Regressions indicate that the positive relationship between openness and weight of leisure in preferences is quite strong: Openness is significant at 1 percent for all regressions in all different estimation methods. The impact of openness on preference for leisure might occur through a similar channel with GDP per capita. This positive relationship might be due to the fact that open countries are on average wealthier than others and people in wealthier countries have a higher valuation of leisure.

Perhaps the most important result of the paper is that average temperature positively affects leisure preference. This result supports the common belief that a

warm climate makes people more relaxed and decreases productivity and the tendency of people to work. Hence, the result suggests that as temperatures rise, people are more likely to avoid work since high temperatures make working more difficult. This makes people value leisure more in warmer countries. This result is also valuable in that it implies causation in one direction: Since average temperature is exogenous, it is not reasonable to claim that leisure preference causes higher temperatures. Therefore, it is safe to suggest that higher temperatures cause the rise in preference for leisure.

Panel-VAR

Table 8 reports the estimated coefficients of the system once the fixed effects and the country-time dummy variables are removed. What one observes from Table 8 is that the leisure preference gives a robust and significantly positive response to shocks to openness and unionization.

Table 8: Main Results of the Panel-VAR Model

Response of	Response to			
	ϕ(-1)	Openness (-1)	GDP per-capita (-1)	Unionization (-1)
ϕ	1.02*	0.003*	0.0003	0.002**
	(0.03)	(0.001)	(0.03)	(0.001)
Openness	2.34	1.26*	0.003	0.17*
	(1.74)	(0.10)	(0.02)	(0.07)
GDP per-capita	6.71	0.50**	0.11*	0.47*
	(5.22)	(0.23)	(0.06)	(0.19)
Unionization	-0.24	-0.04**	-0.004	0.94*
	(0.35)	(0.02)	(0.004)	(0.02)

Next, in Table 9 I present variance decompositions corresponding to the estimations presented in Table 8. It is seen that openness explains more of the variation in leisure preference 10 periods ahead in the sample, compared to GDP per-capita and unionization.

Table 9: Variance Decompositions

	ϕ	Openness	GDP per-capita	Unionization
ϕ	0.77	0.22	0.01	0.01
Openness	0.64	0.35	0.00	0.01
GDP per-capita	0.67	0.30	0.02	0.01
Unionization	0.64	0.33	0.00	0.03

Percent of variation in the row variable (10 periods ahead) explained by column variable.

Finally, Figure 1 presents the impulse-response functions and the 5 percent error bands generated by Monte-Carlo simulations. What one observes from Figure 1 is in line with the results presented in Table 8, that is, leisure preference gives a significant positive response to shocks to openness and unionization.

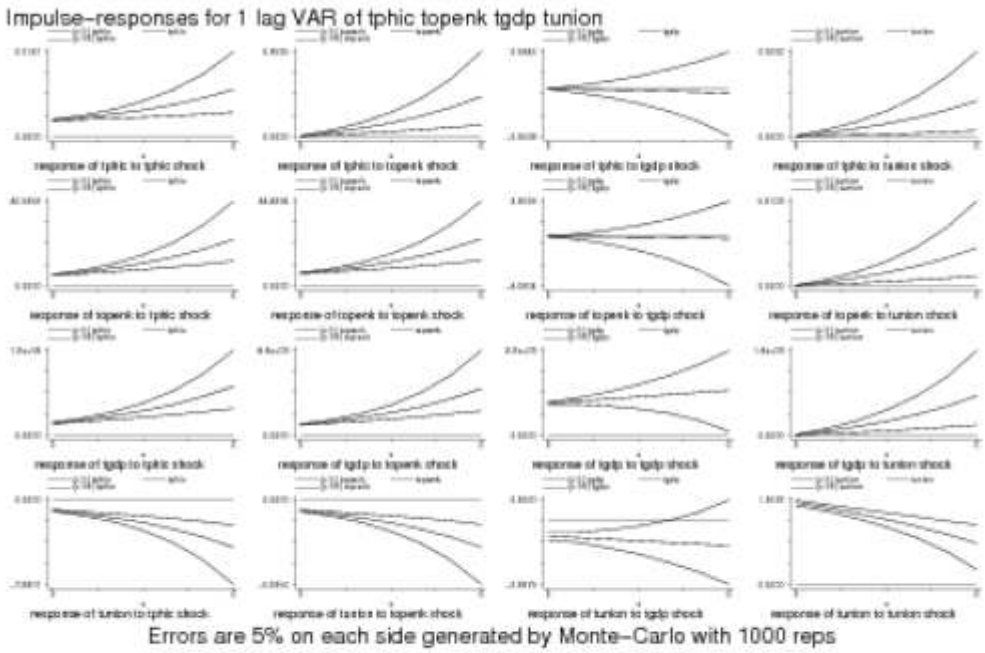

Figure 1: Impulse response functions

Conclusion

In this essay, I investigated the determinants of weight of leisure in preferences. Using a one sector dynamic general equilibrium model, I backed out the parameter for weight of leisure in preferences for 52 countries over the time period 1950-2009. Various kinds of econometric specifications with leisure preference as dependent variable indicate that preference for leisure is significantly and positively affected by GDP per capita, openness and average temperature. Results also yield some evidence about the effect of unionization on leisure preference.

The observed positive effect of GDP per capita and openness on leisure preference is likely to result from the fact that people in wealthier countries have a high consumption level and therefore have a lower preference for consumption and higher preference for leisure relative to consumption. The positive effect of average

temperature might be due to the fact that warmer temperatures make working difficult, causing people to value leisure more.

This is the first study that assumes endogenous preferences for leisure and investigates preference for leisure in an applied macroeconomic perspective. Further research has to focus on the economic mechanisms behind these observations. Such an analysis would require building a theoretical model with endogenous leisure preferences.

CHAPTER 2

INFORMALITY AND PREFERENCE FOR LEISURE

Introduction

Most of the previous studies on informal sector utilize theoretical models in which household enjoys only consumption. Examples are Loayza (1996), Fortin, Marceau and Savard (1997), Ihrig and Moe (2004), Amaral and Quintin (2006) and Antunes and Cavalcanti (2007). In these models, labor supply is perfectly inelastic as household would like to spend all its time working in either formal or informal sector to maximize its income and consumption. This household would choose no leisure at all since leisure means forgone consumption and brings no utility. Some studies with elastic labor supply are concerned with aspects such as cyclicality of the informal sector. Examples are Roca, Moreno and Sanchez (2001) and Busato and Chiarini (2004). Similarly, I use the framework with elastic labor supply and add leisure along with consumption in the utility function of the household. Hence, the household has three activities to spend its time endowment on: It can work in the formal sector, work in the informal sector or enjoy leisure.

I use the framework of Ihrig and Moe (2004) and extend their model by including leisure in the utility function of the household. I solve this extended model to obtain informal labor, formal labor and capital in terms of exogenous parameters. Then I look at the relationship between informal sector size and preference for leisure. My model suggests that a higher weight of leisure in preferences leads to no

change in time devoted to informal labor, less time devoted to formal labor and higher informal sector size for plausible parameter values. Next, I check the findings of the model through panel data regressions and see that empirical observations support my findings.

I incorporate leisure choice into an informal sector model because I believe that a growth model with leisure is a better approximation of the real world. Kydland (1995) supports my opinion that leisure is an important variable for growth models by stating that variation in hours worked accounts for around two third of the output variation. On the other hand, the main reason I choose to have leisure preference in utility is to assess the impacts of leisure preference on the informal sector. While other studies with inelastic labor supply on the informal sector investigated the effects of other exogenous parameters on the informal sector such as tax rate (Fortin et. al., 1997; Ihrig and Moe, 2004) and using a model with only consumption in utility for simplicity would also work for them; I assess directly the effects of leisure preference on informal sector, therefore it is essential for me to include leisure choice into the model.

The essay is organized as follows: The model, definitions of environment and equilibria are presented next. Then, characterization of the model and numerical simulations are provided. Empirical analysis includes data description, estimation methodology and empirical results. Finally comes the conclusion.

Model

I extend the framework of Ihrig and Moe (2004) by incorporating leisure into the utility function. In my model, the representative household enjoys not only consumption but also leisure. This household lives infinitely, has K_0 units of capital and $T > 0$ units of time endowment. The household has access to two production technologies: It can produce in either the formal or the informal sector. Time endowment $T > 0$ is equal to the sum of time spent working in the formal sector, working in the informal sector and enjoying leisure. The maximization problem of the household is as follows:

$$\max_{\{C_t, l_t, K_{t+1}, N_{It}, N_{Ft}\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t U(C_t, l_t)$$

$$s.t. \qquad C_t + K_{t+1} - (1-\delta)K_t = (1-\tau)\theta_F K_t^{\alpha} N_t^{1-\alpha} + (1-\rho\tau)\theta_I N_{It}^{\gamma} \tag{1}$$

$$N_{It} + N_{Ft} + l_t = T \tag{2}$$

The choice variable for leisure is denoted by l_t. Equation (2) denotes the time constraint of the household, as the sum of time devoted to formal sector, informal sector and leisure is equal to the time endowment of household. Assuming log-utility and substituting l_t from Equation (2) into the utility function yields:

$$\max_{\{C_t, K_{t+1}, N_{It}, N_{Ft}\}_{t=0}^{\infty}} \sum_{t=0}^{\infty} \beta^t [\log(C_t) + \varphi \log(T - N_{It} - N_{Ft})$$

$$s.t. \qquad C_t + K_{t+1} - (1-\delta)K_t = (1-\tau)\theta_F K_t^{\alpha} N_t^{1-\alpha} + (1-\rho\tau)\theta_I N_{It}^{\gamma} \tag{3}$$

In this problem, $\beta < 1$ is the discount factor with which household discounts future consumption and φ represents the household's valuation of leisure. For a given level of leisure time, higher φ generates more utility. Consumption C_t plus investment K_{t+1}-(1-δ)K_t equals the sum of production in two sectors according to feasibility constraint, which is demonstrated in Equation (3).

The formal sector has a constant returns to scale production which equals $(1-\tau)\theta_F K_t^{\alpha} N_{Ft}^{1-\alpha}$, where θ_F is the total factor productivity (TFP) in the formal sector and N_{Ft} represents time devoted to working in the formal sector. Production in the formal sector is taxed at the rate τ. The informal sector has a decreasing returns to scale production which equals $(1-\rho\tau)\theta_I N_{It}^{\gamma}$, where θ_I is the TFP in the informal sector and N_{It} represents time spent working in the informal sector. When operating in the informal sector, household attempts to hide the income generated from this sector but pays taxes at the rate ρτ, where ρ is the level of enforcement that government imposes on collection of taxes from informal output.

It is assumed that government's policy variables {τ, ρ} are exogenous and government revenue G_t is spent on unproductive activities which neither generate utility for household nor improve production technologies. Now one can go ahead and define the equilibrium in this environment:

Given the government policy variables {τ, ρ}, a competitive equilibrium of this two sector model is a set of sequences $\{C_t, l_t, K_{t+1}, N_{It}, N_{Ft}, G_t\}_{t=0}^{\infty}$ such that:

1. Household chooses $\{C_t, l_t, K_{t+1}, N_{It}, N_{Ft}\}_{t=0}^{\infty}$ to maximize its life-time utility.
2. G_t equals $\tau\theta_F K_t^{\alpha} N_{Ft}^{1-\alpha} + \rho\tau\theta_I N_{It}^{\gamma}$.

Characterization

First Order Conditions

Maximization problem of the household gives five first order conditions:

$$\frac{\beta^t}{C_t} = \lambda_t \tag{4}$$

$$\lambda_t = \lambda_{t+1}[(1-\tau)\theta_F \alpha K_{t+1}^{\alpha-1} N_{Ft+1}^{1-\alpha} + 1 - \delta] \tag{5}$$

$$\frac{\beta^t \varphi}{T - N_{Ft} - N_{It}} = \lambda_t (1-\tau)\theta_F (1-\alpha) K_t^{\alpha} N_{Ft}^{-\alpha} \tag{6}$$

$$\frac{\beta^t \varphi}{T - N_{Ft} - N_{It}} = \lambda_t (1-\rho\tau)\theta_I \gamma N_{It}^{\gamma-1} \tag{7}$$

$$C_t + K_{t+1} - (1-\delta)K_t = (1-\tau)\theta_F K_t^{\alpha} N_t^{1-\alpha} + (1-\rho\tau)\theta_I N_{It}^{\gamma} \tag{8}$$

Combining equations (4) and (5) yields the Euler equation:

$$\frac{C_{t+1}}{C_t} = \beta[(1-\tau)\theta_F \alpha K_{t+1}^{\alpha-1} N_{Ft+1}^{1-\alpha} + 1 - \delta] \tag{9}$$

Combining equations (6) and (7) yields the equation of marginal product equality:

$$(1-\tau)\theta_F(1-\alpha)K_t^{\alpha}N_{Ft}^{-\alpha} = (1-\rho\tau)\theta_I\gamma N_{It}^{\gamma-1} \tag{10}$$

By rearranging the Euler equation, one can obtain K_{t+1} in terms of N_{Ft+1}:

$$K_{t+1} = N_{Ft+1}[\frac{(1-\tau)\theta_F\alpha}{(1+g_c)/\beta-1+\delta}]^{\frac{1}{1-\alpha}} \tag{11}$$

where g_c is the growth rate of consumption ($1+g_c = c_{t+1}/c_t$). Now substituting for K_t in Equation (10) and rearranging, one gets:

$$N_{It+1} = \{\frac{(1-\rho\tau)\gamma\theta_I}{(1-\tau)(1-\alpha)\theta_F}[\frac{(1+g_c)/\beta-1+\delta}{\alpha(1-\tau)\theta_F}]^{\frac{\alpha}{1-\alpha}}\}^{\frac{1}{1-\gamma}} \tag{12}$$

which gives the evolution of the informal sector. An important feature of this formula is that it does not include φ, the coefficient of leisure in the utility function. Hence, the implication is that time devoted to working in the informal sector is independent of the household's leisure valuation.

The Steady State

Definition: A steady state is an equilibrium path where choice variables are constant through time. At the steady state:

$$C_{t+1} = C_t = C \tag{13}$$

$$K_{t+1} = K_t = K \tag{14}$$

$$N_{Ft+1} = N_{Ft} = N_F \tag{15}$$

$$N_{It+1} = N_{It} = N_I \tag{16}$$

So at the steady state, the informal labor becomes:

$$N_I = \{\frac{(1-\rho\tau)\gamma\theta_I}{(1-\tau)(1-\alpha)\theta_F}[\frac{1/\beta - 1 + \delta}{\alpha(1-\tau)\theta_F}]^{\frac{\alpha}{1-\alpha}}\}^{\frac{1}{1-\gamma}} \tag{17}$$

Four equations below constitute the first order conditions for the steady state:

$$1 = \beta[(1-\tau)\theta_F \alpha K^{\alpha-1} N_F^{1-\alpha} + 1 - \delta] \tag{18}$$

$$\frac{\varphi}{T - N_F - N_I} = \frac{1}{C}(1-\tau)\theta_F(1-\alpha)K^{\alpha}N_F^{-\alpha} \tag{19}$$

$$\frac{\varphi}{T - N_F - N_I} = \frac{1}{C}(1-\rho\tau)\theta_I \gamma N_I^{\gamma-1} \tag{20}$$

$$C + \delta K = (1-\tau)\theta_F K^{\alpha} N_F^{1-\alpha} + (1-\rho\tau)\theta_I N_I^{\gamma} \tag{21}$$

Rearranging Equation (18), one can get the steady-state version of Equation (11):

$$K = N_F[\frac{(1-\tau)\theta_F\alpha}{1/\beta-1+\delta}]^{\frac{1}{1-\alpha}} \tag{22}$$

Rearranging Equation (20), one can obtain C in terms of N_I and N_F:

$$C = \frac{T-N_F-N_I}{\varphi}(1-\rho\tau)\theta_I\gamma N_I^{\gamma-1} \tag{23}$$

Now substituting for C and K in Equation (21) and performing some tedious algebra gives the solution of formal labor:

$$N_F = \frac{(T-N_I)\gamma(1-\rho\tau)\theta_I N_I^{\gamma-1} - \varphi(1-\rho\tau)\theta_I N_I^{\gamma}}{\gamma(1-\rho\tau)\theta_I N_I^{\gamma-1} + \varphi[(1-\tau)\theta_F(\frac{\alpha(1-\tau)\theta_F}{1/\beta-1+\delta})^{\frac{\alpha}{1-\alpha}} - \delta(\frac{\alpha(1-\tau)\theta_F}{1/\beta-1+\delta})^{\frac{1}{1-\alpha}}]} \tag{24}$$

One may notice here that when $\varphi = 0$, $N_F = T - N_I$ and we go back to the case of inelastic labor supply. It is seen from the above equation that as φ changes by one unit, the numerator of N_F changes by $-(1-\rho\tau)\theta_I N_{It}^{\gamma}$ units and the denominator of N_F changes by the expression in the square brackets. Since N_F and φ must be positive, N_F decreases as φ increases by one unit if denominator increases more than the numerator, i.e. the below inequality holds:

$$(1-\tau)\theta_F(\frac{\alpha(1-\tau)\theta_F}{1/\beta-1+\delta})^{\frac{\alpha}{1-\alpha}} - \delta(\frac{\alpha(1-\tau)\theta_F}{1/\beta-1+\delta})^{\frac{1}{1-\alpha}} > -(1-\rho\tau)\theta_I N_I^{\gamma} \tag{25}$$

Plausible values for the parameters above are needed to determine whether the inequality holds. Ihrig and Moe (2004) calibrates values for the parameters α, T, θ_F, θ_I, γ, τ, δ, β; which are 0.33, 100, 2.1, 55.3, 0.495, 0.093, 0.08, 0.96 respectively. Using these parameter values, the above inequality holds. This means that under plausible parameter values, sign of the derivative of N_F with respect to φ is negative, which implies that higher weight of leisure in preferences leads to less time devoted to formal labor.

Also, from Equation (22), we know that K equals N_F multiplied with parameters yielding a positive number. Hence, K is positively related with N_F. This means that higher preference for leisure also leads to lower capital stock in the steady state.

Therefore, higher preference for leisure does not change informal labor (N_I) and it decreases formal labor (N_F) and capital (K) under plausible parameter values. Since informal output equals $(1-\rho\tau)\theta_I N_{It}^{\gamma}$ and formal output equals $(1-\tau)\theta_F K_t^{\alpha} N_{Ft}^{1-\alpha}$, informal output stays constant and formal output decreases as weight of leisure in preferences increases. This implies that higher preference for leisure leads to higher informal sector size relative to the formal sector.

Numerical Simulation

In order to better see the effects of the preference parameter for leisure on the choice variables, I run a numerical simulation. I take the parameter values other than weight of leisure in preferences from Ihrig and Moe (2004) and I take ρ as 0.5. Simulation results are presented in Figure 2, 3, 4 and 5. I take the range of φ between 0 and 0.12, since capital and formal labor takes negative values for values of φ greater than 0.12

using parameters of Ihrig and Moe (2004). Figure 2, 3 and 4 depict the relationship between choice variables of the model and leisure preference parameter. As φ increases; informal labor and informal output stays constant where formal labor, formal output, capital and consumption decreases. Figure 5 shows the positive relationship between φ and relative size of informal sector to formal sector. These figures graphically demonstrate the analytical findings of the model.

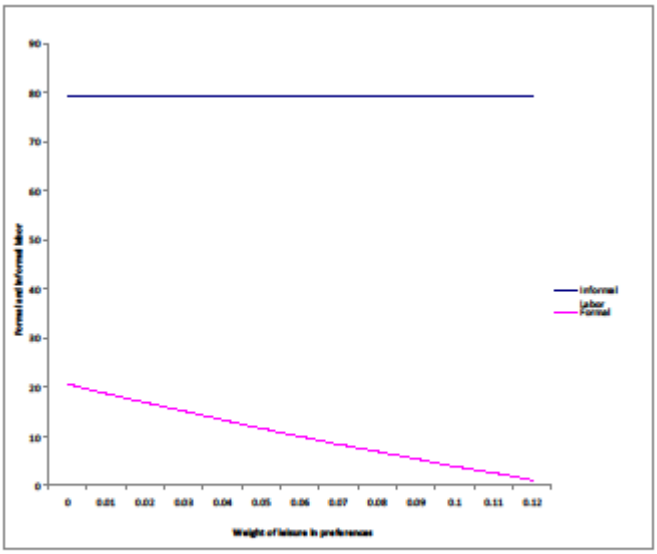

Figure 2: Leisure preference - formal and informal labor

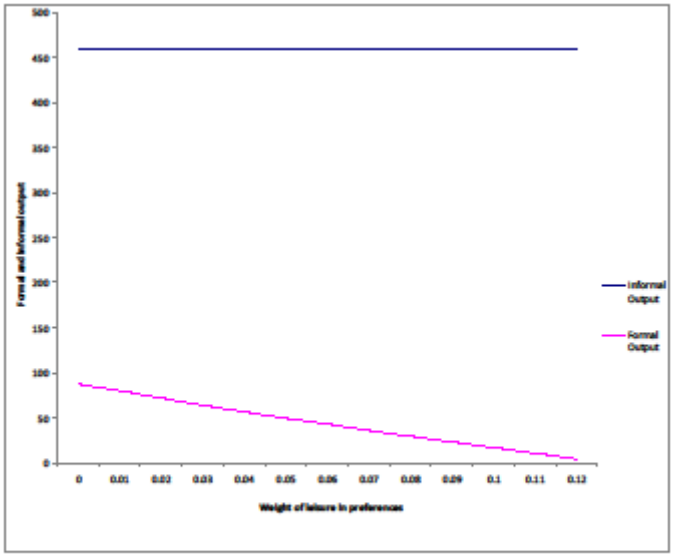

Figure 3: Leisure preference - formal and informal output

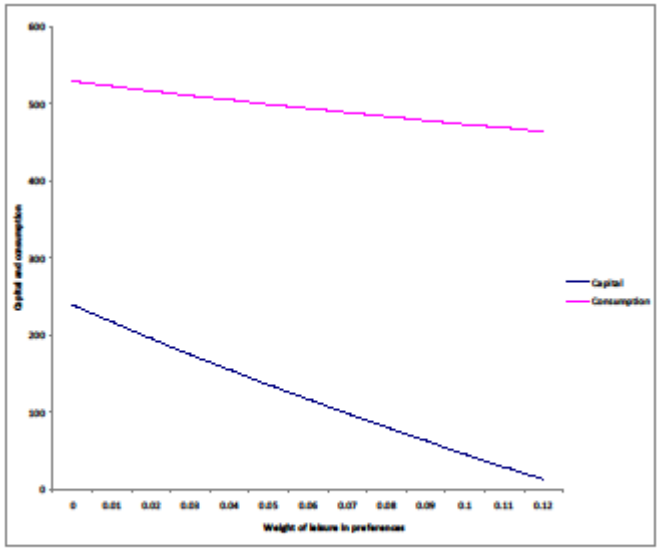

Figure 4: Leisure preference - capital and consumption

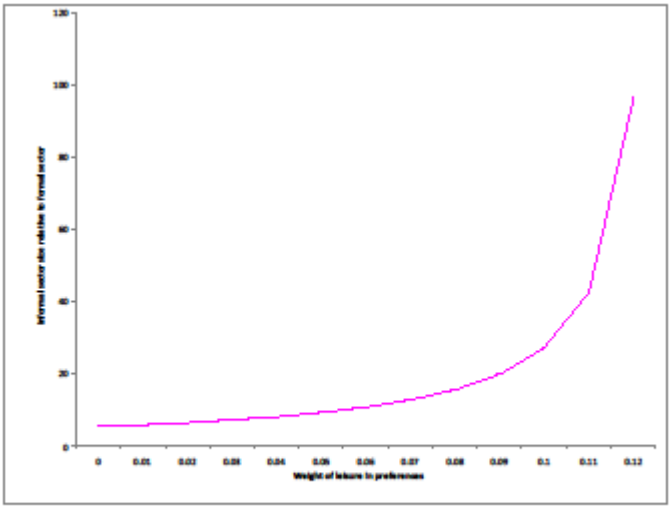

Figure 5: Leisure preference - informal sector size

Empirical Analysis

In this section I run panel regressions to gain a deeper understanding of the relationship between the size of the informal sector and preference for leisure. In the first subsection below, I first discuss how I select the variables and my data sources. In the second subsection I present estimation results of the panel analysis.

Data

In order to separate the effect of the variation in preference for leisure on the variation in the size of the informal sector, I use various control variables, most of which are widely employed in the empirical literature using informal sector size as the dependent variable. These control variables are capital-output ratio, trade openness, GDP per-capita (and GDP per-capita squared to control for possible inverted-U relationship), growth rate of GDP per-capita, and three institutional

quality variables, namely law and order, bureaucratic quality and corruption control indices.

The leisure preference parameter I back out from the following equation, which is one of the equations characterizing the competitive equilibrium of a one-sector growth model:

$$u_l(C_t, l_t) - w_t^e u_C(C_t, l_t) = 0, \quad t = 0, 1, ..., T.$$

I assume that $u(C_t, l_t) = \log(C_t) + \varphi \log(l_t)$ and back out φ using this equation together with data on aggregate consumption, employment, hours worked and capital stock as $w_t = \frac{\partial F(K_t, N_t)}{\partial N_t}$ where, F is the formal sector production function, K_t is the aggregate capital stock and N_t is employment.

I take the informal sector size data from Schneider, Buehn and Montenegro (2010). I use ICRG Database for law and order, bureaucratic quality and corruption control indices. I take the data for openness, capital-output ratio and GDP per-capita from Penn World Table 7.0. Table 10 reports summary statistics of all variables used in the empirical analysis of this section.

Table 10: Complete Dataset Summary Statistics

	Mean	Std. Deviation	Minimum	Maximum
Informal Sector Size (in %)	34.60	13.54	8.40	72.5
Law and Order Index	3.89	1.35	0.50	6.00
Bureaucratic Quality Index	2.23	1.11	0.00	4.00
Corruption Control	2.78	1.22	0.00	6.00
Openness	89.55	52.53	4.83	453.44
Capital-Output Ratio	2.33	1.97	0.74	10.91
GDP per-capita	12.09	12.99	0.31	88.29
Growth in GDP per-capita	3.10	5.50	-12.33	12.40
Preference for Leisure	0.16	0.33	-0.20	5.75

Estimation Results

The estimated panel equation is of the following form:

$$IS_{i,t} = \beta_0 + \beta_1 \varphi_{i,t} + \sum_{k=2}^{n} \beta_k X_{k_{i,t}} + \theta_i + \varepsilon_{i,t}$$

where for country i in year t, IS stands for the informal sector size as percent of GDP, φ for leisure preference, $X_{ki,t}$ are various control variables included in the regression. Moreover, θ_i represents the country fixed-effects and $\varepsilon_{i,t}$ is the error term.

Table 11 presents static panel estimation results using fixed effect estimators with AR(1) errors. In all of the 7 regressions I run, I find support for my theory, that is the leisure preference parameter φ is positively correlated with informal sector size in a robust way.

Table 11: Informal Sector Size and Preference for Leisure

Dependent variable: IS

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
ϕ	185.22*	183.24*	173.20*	246.11*	182.98*	172.56**	174.21**
	(61.36)	(61.27)	(58.38)	(76.36)	(73.59)	(71.34)	(71.42)
Openness		0.006*	0.007*	0.007*	0.004***	0.005**	0.005**
		(0.002)	(0.002)	(0.002)	(0.002)	(0.002)	(0.002)
Capital-Output Ratio			-1.52*	-1.43*	-1.17*	-1.09*	1.06*
			(0.15)	(0.16)	(0.16)	(0.15)	(0.16)
Bureaucratic Quality				-0.007	-0.006	0.01	0.09
				(0.19)	(0.18)	(0.18)	(0.18)
Corruption Control				-0.04	-0.04	-0.05	-0.05
				(0.05)	(0.05)	(0.06)	(0.05)
Law and Order				0.07	0.06	0.05	0.05
				(0.07)	(0.07)	(0.06)	(0.06)
GDP per-capita					0.5*	1.40*	1.40*
					(0.06)	(0.12)	(0.20)
GDP per-capita-squared						-0.02*	-0.02*
						(0.002)	(0.002)
Growth							0.002
							(0.002)
R-squared	0.05	0.02	0.05	0.03	0.15	0.18	0.18
Observations	1172	1172	1172	1012	1012	1012	1012
F-Test	9.11	8.89	39.59	16.70	27.11	33.62	29.96

All panel regressions include a country fixed effect. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Next, Table 12 presents the relationship between informal labor and preference for leisure. As both preference for leisure and informal labor are variables that are backed out from the data using a model related assumption, they are very much prone to measurement error. To address this issue I use a dynamic panel data framework here and use Arellano and Bond's GMM estimator i.e. the estimated equation is of the following form:

$$InfLabor_{i,t} = \alpha_0 + \alpha_1 InfLabor_{i,t-1} + \alpha_2 \varphi_{i,t} + \sum_{k=3}^{n} \beta_k X_{k_{i,t}} + \theta_i + \varepsilon_{i,t}$$

Consistent with my model, leisure preference and informal labor are not correlated with each other in a significant way.

Table 12: Informal Labor and Preference for Leisure

Dependent variable: Informal Labor

	(1)	(2)	(3)	(4)	(5)	(6)
ϕ	-5.76	-6.58	-5.88	-10.36	-25.10	23.23
	(8.62)	(8.58)	(8.14)	(9.73)	(16.12)	(14.83)
Openness		1.77**	1.86**	2.62**	0.47	0.33
		(0.78)	(0.77)	(1.04)	(0.66)	(0.6*)
Capital-Output Ratio			-0.25**	-0.27**	-0.23***	-0.13
			(0.10)	(0.12)	(0.13)	(0.98)
Bureaucratic Quality				-37.86	-20.58	28.06
				(23.27)	(19.48)	(19.44)
Corruption Control				-12.94	-3.63	-0.32
				(9.00)	(6.99)	(6.80)
Law and Order				-53.76**	-29.29	-26.70
				(25.79)	(19.23)	(17.47)
GDP per-capita					0.17*	0.16*
					(0.05)	(0.04)
Growth						6.23**
						(2.50)
Observations	1023	1023	1023	886	886	886
Wald Test	9.11	8.89	39.59	16.70	27.11	33.62

All panel regressions include a country fixed effect. Robust standard errors are reported in parentheses. *, **, *** denote 1, 5 and 10% confidence levels, respectively. In all regressions a constant is also included but not reported.

Conclusion

In this essay, I built a two sector general equilibrium model of the informal sector with elastic labor supply in order to assess the implications of preference for leisure on the informal sector size. Both theoretically and empirically I showed that a higher weight of leisure in preferences does not affect informal labor per se; however as it reduces formal labor and formal sector size, the relative size of the informal sector increases.

This study investigates the relationship between preference for leisure and informal sector using a highly aggregated macroeconomic data. As further research, microeconomic studies can check how this relationship is observed in the micro

level. One may also focus on using alternative models to assess this relationship. Finally, policy recommending studies on informal sector may use the framework with leisure choice.

REFERENCES

Amaral, P. S. & Quintin, E. (2006). A competitive model of the informal sector. *Journal of Monetary Economics*, 53(7), 1541-1553.

Antunes, A. & Cavalcanti, T. (2007). Start up costs, limited enforcement, and the hidden economy. *European Economic Review*, 51(1), 203-224.

Arellano, M. & Bover, O. (1995). Another look at the instrumental variable estimation of error-components models. *Journal of Econometrics*, 68(1), 29-51.

Bell, L.A., & Freeman, R.B. (2001). The incentive for working hard: explaining hours worked differences in the US and Germany. *Labour Economics*, 8(2), 181-202.

Busato, F. & Chiarini, B. (2004). Market and underground activities in a two-sector dynamic equilibrium model. *Economic Theory*, 23(4), 831-861.

Conference Board Total Economy Database. Retrieved July 27, 2011.

Dell, M., Jones, B.F., & Olken, B.A. (2008). Climate change and economic growth: Evidence from the last half century. NBER Working Paper 14132.

Fortin, B., Marceau N., & Savard, L. (1997). Taxation, wage controls and the informal sector. *Journal of Public Economics*, 66(2), 239-312.

Holtz-Eakin, D., Newey, W., & Rosen, H. S. (1988). Estimating vector autoregressions with panel data. *Econometrica*, 56(6), 1371-1395.

Ihrig, J. & Moe, K.S. (2004). Lurking in the shadows: the informal sector and government policy. *Journal of Development Economics*, 73(2), 541-557.

International Country Risk Guide Database. Retrieved November 30, 2011.

Kydland, F.E. (1995). Business cycles and aggregate labor market fluctuations. In T.F. Cooley (Ed.), *Frontiers of business cycle research* (pp. 126-156). Princeton: Princeton University Press.

Loayza, N. V. (1996). The economics of the informal sector: A simple model and some empirical evidence from Latin America. *Carnegie - Rochester Conference Series on Public Policy*, 45, 129-162.

Love, I. & Zicchino, L. (2006). Financial development and dynamic investment behavior: evidence from panel VAR. *The Quarterly Review of Economics and Finance*, 46(2), 190-210.

McGrattan, E.R. & Rogerson, R. (2004). Changes in hours worked, 1950-2000. *Federal Reserve Bank of Minneapolis Quarterly Review*, 28(1), 14-33.

Organization for Economic Cooperation and Development Database. Retrieved August 24, 2011.

Penn World Table 7.0 Database. Retrieved July 20, 2011.

Prescott, E.C. (2004). Why do Americans work so much more than Europeans? *Federal Reserve Bank of Minneapolis Quarterly Review*, 28(1), 2-13.

Roca, J.C.C., Moreno, C.D., & Sanchez, J.E.G. (2001). Underground economy and aggregate fluctuations. *Spanish Economic Review*, 3(1), 41-53.

Rogerson, R. (2006). Understanding differences in hours worked. *Review of Economic Dynamics*, 9(3), 365-409.

Schneider, F., Buehn, A., & Montenegro, C.E. (2010). Shadow economies all over the world: new estimates for 162 countries from 1999 to 2007. World Bank Policy Research Working Paper 5356.

World Bank World Development Indicators Database. Retrieved August 17, 2011.