

# Labor Skills and Factor Proportions Trade in the GCC

Henry Thompson  
Auburn University  
*thomph1@auburn.edu*

Hugo Toledo  
American University of Sharjah  
*htoledo@aus.edu*

A new measure of factor intensity and abundance from trade theory is utilized to predict potential trade and income redistribution between traditional and modern economies in the Gulf Cooperation Council. Differences in labor skill intensity and abundance suggest there will be substantial trade between the modern (Bahrain, Qatar, UAE) and traditional (Kuwait, Oman, Saudi Arabia) economies in the GCC. Due to the limited data, the UAE and Kuwait are taken to represent the modern and traditional economies.

The Gulf Cooperation Council began a customs union in 2003 but tariffs persist, operational details remain under negotiation, and there is uncertain trade potential. The present paper measures factor abundance and intensity across six labor skill groups and four product groups to predict trade potential within the GCC. In such high dimensional data, factor abundance and intensity have no clear definition but the present study applies the Euclidean distance measure of Thompson (2003).

The present paper focuses on the UAE and Kuwait, two economies that characterize the modern (Bahrain, Qatar, UAE) and traditional (Kuwait, Oman, Saudi Arabia) economies in the GCC. There is no such production data for the other GCC countries. These economies have similar oil reliance, climate, geography, legal systems, and expatriate labor, but differences in labor skill abundance and intensity suggest gains from GCC trade. National incomes will rise but relatively scarce factors will lose in the competitive general equilibrium.

## 1. Background on the GCC

The GCC customs union includes a 5% common external tariff CET and over 400 duty free items, mainly foodstuffs and industrial inputs. Tariffs from 10% to 20% are allowed, however, and Saudi Arabia lists over 800 protected goods. Rules of origin specify that at least 40% of value added must be GCC to qualify for the CET. Bowman (2008) reports that 71% of firms surveyed in Dubai have had problems with custom procedures in Saudi Arabia, while Bahrain is the least problematic country with only 12% reporting difficulty. Trading with traditional economies appears to be more problematic.

In the early 2000s current account surpluses in the GCC soared to 26% of GDP with high oil prices. Import spending tripled from a total of \$114 billion in 2000 to \$345 billion in 2007. Saudi Arabia and the UAE lead the GCC in total import spending as a share of national income.

Table 1 reports export revenues between GCC economics for 2005 in US dollars. Saudi Arabian exports to Bahrain and the UAE stand out as the largest by far, followed by UAE exports to Bahrain and Saudi Arabia, and Oman's exports to the UAE. Exports from traditional economies to modern economies total \$7.9 billion, over twice the \$3.5 billion in the opposite direction. Across the nine inter-country flows from traditional to modern, export revenue averages \$873 million compared to \$393 million from modern to traditional. This pattern suggests the countries take advantage of trade opportunities consistent with Boughanmi (2008) who finds trade within the GCC is twice as large as predicted by a gravity model. Export revenues between the traditional economies average \$353 million for the six inter-country flows and between modern economics \$634 million. The modern economies on average are larger importers.

Table 2 reports GCC export revenue and import spending relative to national incomes. Bahrain is by far the most involved in GCC trade and the modern economies are more involved in both exporting and importing. The simple average of relative export revenue and import spending for the modern economies is 6.5% and only 1.2% for the traditional economies.

**Table 1. Direction of GCC Exports in 2005 (\$mil)**

X	M	Modern			Traditional		Saudi Arabia
		Bahrain	Qatar	UAE	Kuwait	Oman	
Modern	Bahrain		\$114	\$158	\$84	\$41	\$647
	Qatar	\$69		\$1,176	\$38	\$19	\$226
	UAE	\$1,557	\$728		\$907	\$516	\$1,056
Traditional	Kuwait	\$31	\$36	\$205		\$23	\$223
	Oman	\$21	\$70	\$1,329	\$41		\$259
	Saudi Arabia	\$4,970	\$709	\$4,807	\$1,181	\$390	

Source: Cooperation Council for Arab States of the Gulf (2008)

**Table 2. GCC Export Revenue and Import Spending as a Share of National Income**

	X/Y	M/Y
Modern		
Bahrain	6%	24%
Qatar	1%	2%
UAE	3%	3%
Traditional		
Kuwait	0.5%	2%
Oman	1%	2%
Saudi Arabia	1%	0.5%

The GCC depends on oil and gas exports and diversification remains a challenge although some economies have managed to diversify somewhat. Oil production and prices have raised living standards but reliance on oil is a liability during economic downturns and falling oil prices. Falling oil prices during the 1980s led to declining income per capita in the GCC.

The oil sector is capital intensive and employs little labor. As increasing numbers of young workers enter the labor force, contraction of public sector increases pressure to diversify. The World Bank (2008) estimates that the Middle East and North Africa need to create about 100 million jobs by 2020, an unprecedented challenge.

Sturm, Strasky, Adolf, and Peschel (2008) examine diversification of GCC economies in commodities, manufacturing, finance, and tourism, and the four modern economies exceed GCC averages. The index of FDI and the share of government spending G in national income in Table 3 (IMF 2003, 2005) provide further evidence on the difference between the traditional and modern economies. Bahrain, Qatar, and the UAE attracted much more FDI during 2000-2002, the latest data available, and their lower shares of government spending also suggest more modern economies. The modern economies have consistently higher incomes per capita (UNdata, 2006) as well as reported in Table 3.

**Table 3. Modern and Traditional GCC Economies**

	FDI Index	G/GDP	GDP/POP
Modern			
Bahrain	9.1	.20	\$22,700
Qatar	7.5	.18	\$32,600
UAE	2.4	.15	\$26,600
Traditional			
Oman	0.1	.22	\$17,900
Kuwait	-0.4	.26	\$16,600
Saudi Arabia	-1.5	.25	\$13,600

The UAE has managed to diversify with outward looking development moving it from the most oil dependant GCC economy at 90% of GDP in 1980 to the least dependent at 50% in 2004. Exports have evolved from oil, petrochemicals, fertilizers, cement, and aluminum to include electronics, light manufacturing, machinery, and transport equipment. The UAE has developed banking and tourism although other services such as telecommunications and insurance remain closed to FDI and less developed.

At the other extreme traditional Kuwait has experienced low investment and slow growth since the 1991 invasion. Reconstruction has increased dependency on expatriate labor and the lack of investment has led to a specialized economy. The GDP share of oil rose to 56% in 2004 and the public sector remains the employer of last resort for young Kuwaitis.

## 2. The Distance Measure of Factor Intensity and Abundance

There is data on six labor skills (managers, professional & technical, clerks, sales & service, agricultural, operators & crafts) across four major sectors (manufacturing, services, agriculture, mining) in the UAE and Kuwait. Samuelson (1953) defines factor intensity for two factors and two products with factor  $l$  intensive in product  $l$  as  $a_{2l}/a_{1l} < a_{22}/a_{12}$  where  $a_{ij}$  is the input of factor  $i$  in product  $j$ . Factor proportions theory with many factors and products has been developed by Chipman (1966), Vanek (1968), Jones and Scheinkman (1976), Chang (1979), and Ethier (1984) but there is no measure of factor abundance.

Thompson (2003) defines factor intensity as the Euclidean distance to the intersection of an intensity ray with the unit value  $a_{ij} = 1$ . With six types of labor, the Euclidean distance for labor  $l$  to the intensity hyperplane for product  $j$  is

$$d_{lj} = ((a_{2j}/a_{1j})^2 + \dots + (a_{6j}/a_{1j})^2)^{1/2}. \quad (1)$$

Product  $m$  uses labor type  $h$  intensively relative to good  $n$  if  $d_{hm} < d_{hn}$ .

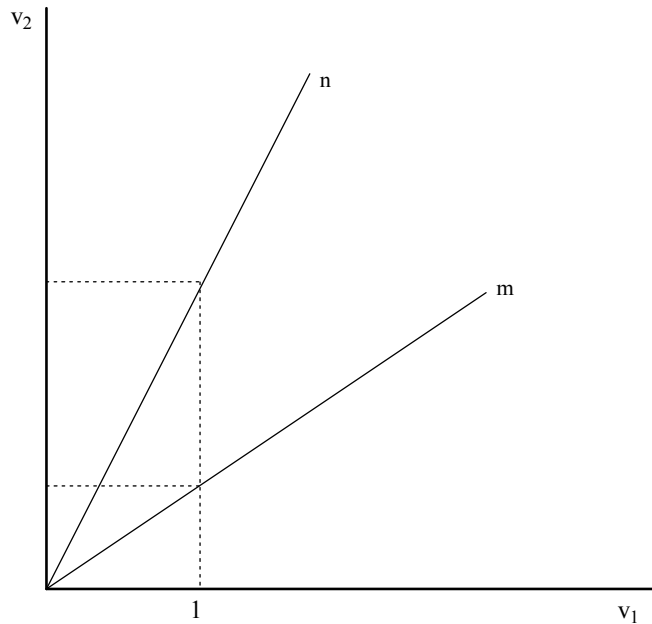
Similarly, factor abundance is the Euclidean distance to the intersection of an endowment ray with the unit hyperplane. Figure 1 illustrates distance abundance for two factors with endowment rays for countries  $m$  and  $n$ . The vertical line from  $v_{1j} = 1$  intersects the two abundance rays. Country  $m$  is abundant in factor 1 since the distance  $d_{1m} = v_{2m}/v_{1m}$  from the unit value of factor 1 to ray  $m$  is less than the distance  $d_{1n} = v_{2n}/v_{1n}$  to ray  $n$ .

Across the six types of labor, the abundance of factor 1 in country  $m$  is

$$d_{1m} = ((v_{2m}/v_{1m})^2 + \dots + (v_{6m}/v_{1m})^2)^{1/2}. \quad (2)$$

Country  $m$  has an abundance in labor 1 if  $d_{1m} < d_{1n}$ . The measure can be applied to a large number of countries as in Kang, Malki, Rassekh, and Thompson (2007).

**Figure 1. Abundance distance with two factors**



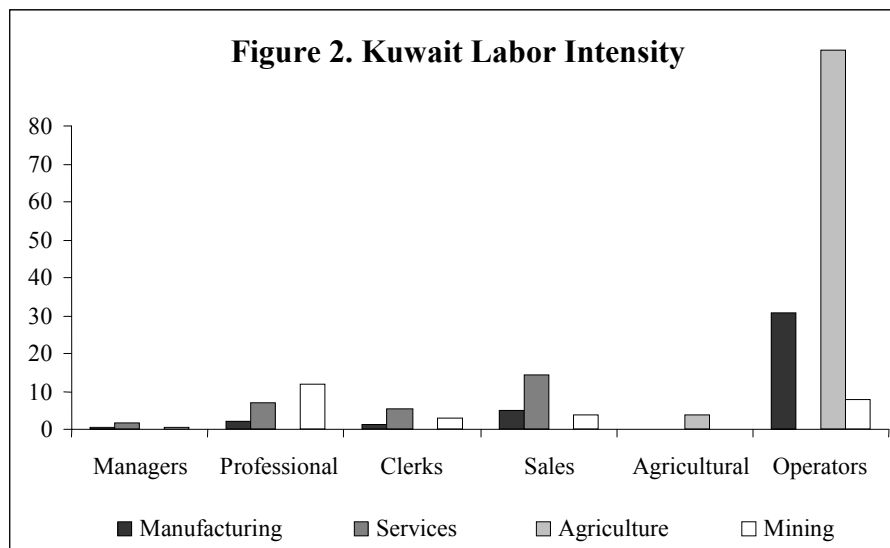
With trade, economies with identical homothetic utility would consume equally priced products in the same ratio and export products according to factor intensity. In high dimensional models such as the present one, there are no necessary production links but factor abundance and intensity might nevertheless provide insight into trade potential.

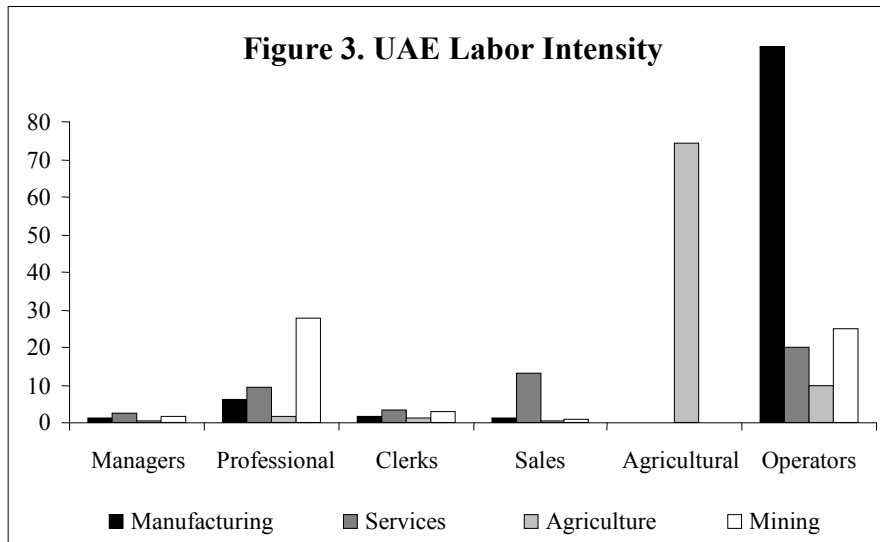
### 3. Labor Skill Abundance and Intensity in the UAE and Kuwait

Table 4, Figure 2, and Figure 3 report labor intensity across the four major sectors and six labor skill groups in the UAE and Kuwait. Intensity measures are inverted and rescaled to an index ranging from 0 to 100. Mining excludes oil and is mainly lime and clay to form clinker for cement. The excluded oil sector will have little impact inside the GCC.

**Table 4. Distance Labor Intensity Index (0 to 100)**

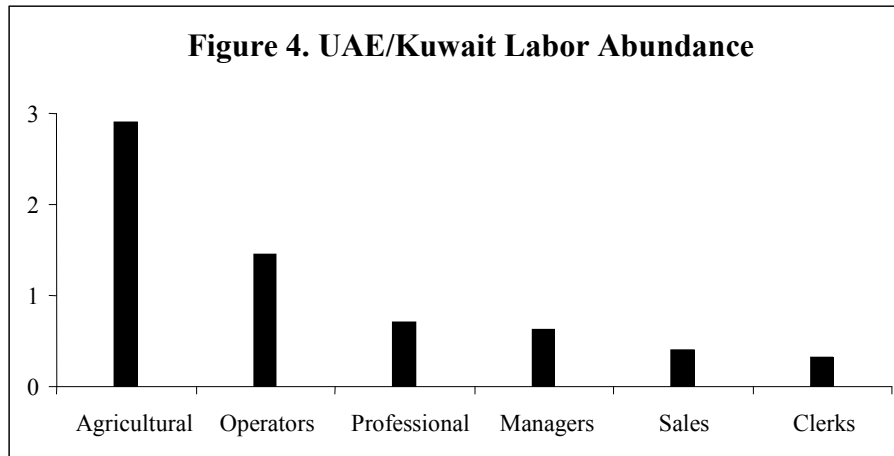
	Manufacturing		Services		Agriculture		Mining	
	Kuwait	UAE	Kuwait	UAE	Kuwait	UAE	Kuwait	UAE
Managers	0.4	1.1	1.7	2.4	0	0.2	0.5	1.5
Professional	2.1	6.3	6.9	9.5	0	1.8	11.7	27.6
Clerks	1.3	1.5	5.4	3.2	0	1.1	3.0	2.8
Sales	4.7	1.3	14.4	13.1	0	0.6	3.7	1.0
Agricultural	0.01	0.2	0	0.04	3.7	74.4	0	0.03
Operators	30.6	100	0	20.1	100	9.7	7.9	24.8





There are large differences in labor skill intensity. Operators are the most intensive in Kuwaiti manufacturing at 19 but the corresponding UAE intensity is 100. Operators are the most intensive input in Kuwait agriculture at 100 while in the UAE agricultural workers are the most intensive suggesting Kuwait is more involved in food processing. Manufacturing and mining are more intensive in professionals and operators in the UAE than Kuwait. Production processes in the two economies are unrelated with a correlation across intensities of only 0.03.

Figure 4 shows the labor skill abundance with the UAE most abundant in agricultural labor and operators and Kuwait the most abundant in clerks and sales labor with managers and professionals in some abundance. The UAE would export products intensive in agricultural labor and operators, namely agriculture and manufactures. Kuwait would export mining and services as well as some manufactures given the intermediate abundance of managers and professionals.



Skill wages will be affected by trade and the magnification effect of Jones (1965) implies wages would rise or fall more than prices in percentage terms. While predicting price changes requires an international market model, prices might be expected to change by at least the common GCC tariff of 5%. The result would be substantial changes in relative wages across labor skill groups as predicted for Colombia by Toledo and Thompson (2005).

#### **4. Conclusion**

Factor abundance and intensity differ between the modern and traditional economies in the Gulf Cooperation Council. The present application of factor proportions theory anticipates substantial trade between the modern (Bahrain, Qatar, UAE) and the traditional (Kuwait, Oman, Saudi Arabia) economies. The winning export sector in the modern economies will be manufacturing while mining and services will face import competition, and the opposite is projected for the traditional economies.

In the modern economies, scarce clerks, sales workers, and operators stand to lose while operators gain. In the traditional economies, scarce operators will lose while professionals benefit. Trade inside the GCC promises to substantially alter relative wages across labor skill groups as it generates overall net gains. Income redistribution policy might be considered as the countries move toward free trade.

Factor price convergence or equalization can be tested as trade in the GCC increases. Variation in factor intensities suggests examination of regional production, returns to scale, technological change, and production cones. Models of trade between the GCC and the rest of the world can be developed with oil exports playing a major role. Gravity models may provide evidence as trade evolves. The present measures of factor intensity and abundance provide a foundation for future research on production and trade in the GCC.

## References

- Boughanmi, Hounice (2008) "The Trade Potential of the Arab Gulf Cooperation Countries (GCC): A Gravity Model Approach," *Journal of Economic Integration* 23, 42-56.
- Bowman, Joel (2008) "Intra-GCC Trade Still Problematic for Many," *Arabian Business.com*.
- Chang, Winston (1979) "Some Theorems of Trade and General Equilibrium with Many Goods and Factors," *Econometrica* 47, 709-26.
- Chipman, John (1966) "A Survey of the Theory of International Trade: Part 3, The Modern Theory," *Econometrica* 34, 18-76.
- Cooperation Council for the Arab States of the Gulf Secretariat General, Information Center – Statistical Department (2008) webpage.
- Ethier, Wilfred (1984) "Higher Dimensional Issues in Trade Theory," in Ron Jones and Peter Kenen (eds) *Handbook of International Economics*, vol. 1, Amsterdam: North Holland, 131-84
- International Monetary Fund (2003) *Country Report No. 03/67, United Arab Emirates Selected Issues and Statistical Appendix*.
- International Monetary Fund (2005) *Country Report No. 05/234, Kuwait Selected Issues and Statistical Appendix*.
- Jones, Ronald (1965) "The Structure of Simple General Equilibrium Models," *The Journal of Political Economy* 73, 557-572.
- Jones, Ronald and José Scheinkman (1977) "The Relevance of the Two-Sector Production Model in Trade Theory," *Journal of Political Economy* 85, 909-35.
- Kang, Myeongjoo, Mostafa Malki, Farhad Rassekh, and Henry Thompson (2007) "Factor Abundance with Many Factors of Production and Countries," *International Review of Economics and Finance* 16, 207-89.

Ruffin, Roy (1981) "Factor Movements and Prices with Three Factors and Two Goods," *Economic Letters* 7, 177-82.

Samuelson, Paul (1953) "Prices of Factors and Goods in General Equilibrium," *Review of Economic Studies* 21, 1-20.

Sturm, Michael, Jan Strasky, Petra Adolf, and Dominik Peschel (2008) "The Gulf Cooperation Council Countries: Economic Structures, Recent Developments and the Role of the Global Economy," *European Central Bank Occasional Paper Series*, 92, July 2008.

Thompson, Henry and Hugo Toledo (2005) "FTAA and Colombia: Income Distribution across Labor Groups," *International Review of Economics & Finance* 14, 203-12

Thompson, Henry (2003) "Factor Intensity as Euclidean Distance," *Keio Economic Studies* 1, 1-7.

United Nations Statistical Database (UNdata) webpage.

World Bank (2008) "Creating 100 Million Jobs for a fast-Growing Work Force," webpage.