

Automotive Industry The Jordanian Future Opportunity

Introduction

The automotive industry is amongst the few industries that have witnessed continuous growth since their conception. Even during the global economic recession following September 11th, the automotive industry managed to gather up a total of 55 million motor vehicle sales worldwide, matching sales of the previous year.

Moreover, the automotive industry continued to be an extremely dynamic industry in terms of its production techniques. The industry is primarily split into two main manufacturing sections – assembling the vehicle, and producing the components. While the automotive industry began with the belief that an automotive manufacturer was required to produce absolutely all components related to the assembly of vehicles, since the 1970s there has been a steady restructuring of the industry. Today's vehicles may consist of close to 12,000 individual parts, provided by a geographically broad network of suppliers who the majority of production is outsourced to. Moreover, the geographical base of the car assembly itself has widened, and manufacturers are spreading assembly plants all over the world.

Within this outsourcing, the global automotive supply chain has become more complex. Modularization of auto production has become widespread in the industry, such that the entire process of producing a vehicle no longer has strict geographical ties. The reasons behind modularization and outsourcing include the potential for cost savings, labor and otherwise; more efficient product development, with focused suppliers able to innovate more quickly and to distribute the costs across multiple customers; better management of complexity in the assembly plant, due to sequenced deliveries of modules; and access to new trading regions.

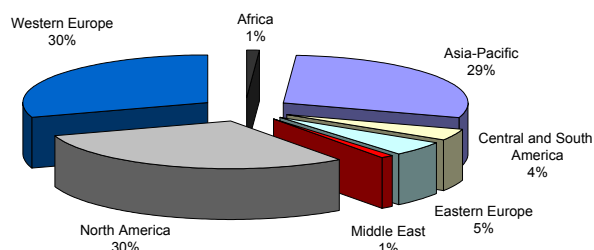
Within the context of the changing global supply chain where vehicle manufacturers have slowly been diminishing their roles restricting themselves to vehicle assembly, and outsourcing the remainder of their manufacturing needs, this paper, will provide a detailed analysis with the aim to explore Jordan's potential in this vast dynamic and developing sector and propose a related strategy to be undertaken by the different stakeholders in the sector.

Automotive Industry: An Overview

I. Assembly

The car assembly of the automotive industry is extremely developed; the industry produced about 60 million cars in the year 2000. The production was mainly dominated by light vehicles with a share of 71%. Trucks contributed the remaining 29%.

Figure (1): Worldwide Production, 2001



Source: Automotive Intelligence, www.autointell.com

Production, however, was mainly concentrated in three regions of the world namely; Western Europe, North America and Asia Pacific. These three regions count for about 90% of world production. The Middle East hardly contributes at all, having a mere share of 1% of global production. Despite the fact that a few countries in the Middle East have developed automotive industries, these countries remain unfamiliar sites to the list of production locations.

Production in the Middle East is concentrated primarily in three main countries; Iran, Turkey, and Egypt. Other smaller producers include Tunisia and Morocco. However, the large producers in the region, such as Egypt, Iran and Turkey are not the regional suppliers.

Table (1): Production in Middle Eastern Countries

Country	Passenger Car Manufacturing Companies	Commercial Bus Producing Companies	Production Capacity
Egypt	12	9	76000
Morocco	1	8	32000
Tunisia	-	4	6800
Algeria	-	2	5000
Saudi Arabia	-	5	2800
Libya	-	1	1500
Sudan	-	1	70
Jordan	-	1	100
Total	13	31	124270

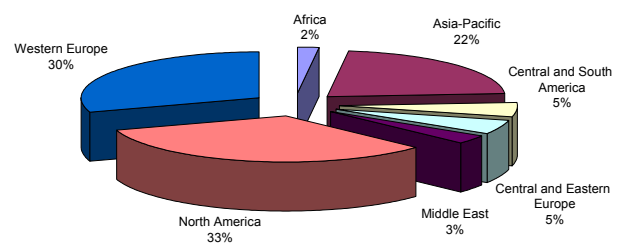
Source: The 3rd Arab International Automotive and Feeding Industries Conference, Arab Auto, 2003

Egypt and Iran produce mainly for their domestic markets, and Turkey sends more than half of automotive exports to 3 EU countries; namely Germany, France, and Italy; Egypt receives 2.6%, and Algeria 2%. Moreover, the main exporters to Saudi Arabia are not other regional producers, but to a large extent Western European suppliers.

Conversely, the global sales trend aligns with the global production trend, where the giant producing regions are considered the giant consumers accounting for about 85% of the world demand on vehicles. The Middle East on the other hand totals a mere 3% of sales worldwide, with Egypt, Saudi Arabia and United Arab Emirates contributing well over 50% of this market.

The Jordanian market, however, is rather limited in the capacity it offers to automotive manufacturers, contributing only 2.3% of regional sales, translating into fewer than 15 thousand cars demanded annually. In 2003, the average number of new cars registered in Jordan totaled 45% of the total number of registered cars.

Figure (2): Worldwide Sales, 2001



Source: Automotive Intelligence, www.autointell.com

Jordan's automotive industry is considered infant. Currently, there are two companies working in the field of vehicle assembly with a production capacity of 300 buses, 40 ambulances and about 300 special purpose 4x4 cars annually. Elba House is the first company in the Jordanian market to establish a vehicle assembly plant. The company, specialized in prefabricated buildings production, and expanded its scope of

production to establish a new line for manufacturing transport vehicles, such as trailers, low-beds, tippers and tankers, in addition to manufacturing bus-bodies in accordance with the required specifications of different types of chassis, such as Mercedes, Man, Volvo and others. In 1999, the company started producing ambulance vehicles, both "van" and "box" type, and is currently producing them on Mercedes, Chevrolet, Ford, GMC, Citroen and other chassis.

The company employs about 650 employees, and has a capital investment of about \$21 million. As for the production process, the company assembles the imported (mainly from Germany, Brazil, Belgium and Turkey) chassis parts, engines, and gearboxes, meanwhile the body and interior are produced locally.

Indeed, the company realizes that the Jordanian market has a small capacity, even though its annual production capacity does not exceed 340 vehicles. Therefore, exports constitute 75% of total production whereby the remainder goes to the local market (mainly in public transportation, the army and police forces). While the Iraqi market used to be the main export market for the company, recent developments in Iraq pushed the company to increase its share in other markets such as Saudi, Kuwait, Sudan and Libya.

Recently having partnered with the British firm SHP Motorsports, a company called Jordan Light Vehicle Manufacturing was established under the umbrella of KADDB to produce the Desert Iris a 4x4 version of the 2x4 Black Iris. The current production of the factory is one car per day, produced almost purely by labor intensive processes. 80% of the total cost of the vehicle is attributable to pure material costs alone, which are high since they are almost entirely imported. The remaining 20% is made up of overheads and indirect costs. Since most of the components in the vehicle are imported, from markets such as the UK, Germany, South Africa and Japan, transportation is a constant problem, and makes up 3-4% of the vehicle's cost, compounded by the frequent shipment delays. The factory also has another line of armored vehicles which is currently in production.

Box (1): King Abdullah II Design and Development Bureau (KADDB)

The KADDB institute began in 1978 as part of an initiative to establish an indigenous capability for the supply of independent, high quality, efficient and cost-effective scientific and technical services to the Jordanian Armed Forces (JAF). Actual production began four years ago in August 1999 by Royal Decree. So far the organization has one established factory, a second is being built, and a third is in the conception stage.

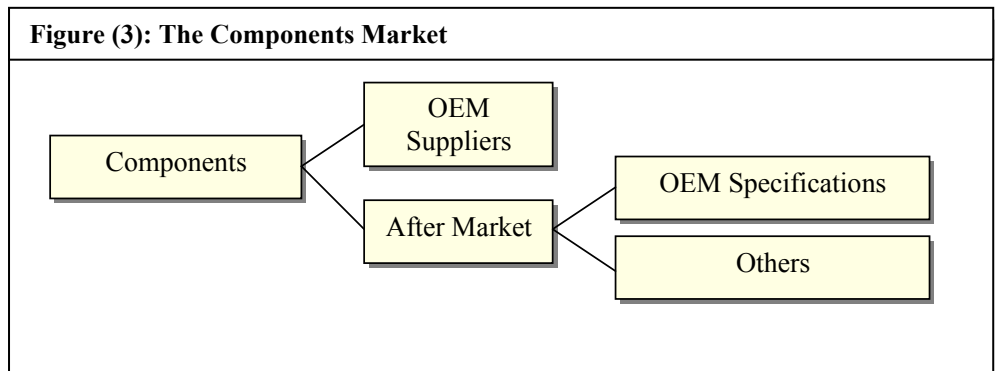
KADDB creates and finalizes concepts, but then passes on the knowledge to the private sector to finalize production plans. If no private sector corporation is willing to take up the initiative, KADDB creates their own.

There are currently eight firms that KADDB has helped incubate. Among them are CIS-Jordan, Raytech-Jordan, a fiber-glass factory (currently located on the KADDB premises), Jaws, and Seabird Aviation-Jordan. The lifespan of KADDB itself has been about four years, with a 1-2 year lifespan for each of the incubators.

The company is mainly directing its sales to armed forces both domestically and in the Gulf region. New expansion plans are underway to accommodate the new armored vehicles production line, and the company is planning to introduce a new model of the vehicle to be launched in 2005.

II. Components

Within the component's industry, manufacturers are split into OEMs (Original Equipment Manufacturers) and aftermarket manufacturers. The OEM manufacturers supply directly to the automotive manufacturer and their products are used directly in vehicles. The aftermarket manufacturers primarily produce spare parts and direct their



production to wholesalers and retailers. The OEM manufacturers also have a share of the aftermarket, if they have excess supply not sold to original manufacturers.

Today's vehicles consist of close to 12,000 individual parts. To supply the various systems and components, the Original Equipment Manufacturers (OEMs) industry has traditionally been organized along a three tiered structure. A tier 1 producer manufactures and supplies components directly to the assembler and is generally characterized as a systems developer. A tier 2 manufacturer builds discrete parts or subsystems and supplies these to independent or affiliated tier one producers. Tier 3 includes raw materials and service providers.

In the early 1990s, global sales of original equipment manufacture components were estimated at around \$500 billion. However, international trade in components is substantial. In the 1990s global trade in automotive components and accessories grew by 11% per annum. U.S. imports for the mid 1990s alone are in the range of \$25-30 billion, of which about 20% comes from developing countries. Brazil, Mexico and Korea have traditionally dominated the components market; however, Thailand, Indonesia, India and the Philippines have been rising as competitors. The EU alone imported automotive components and accessories for \$48 billion annually during 1996 and 1997 (a growth rate of 12%). Switzerland imported automotive parts for about \$472 million per annum during the same period. The average growth rate for imports in the 1990s was about 7%.

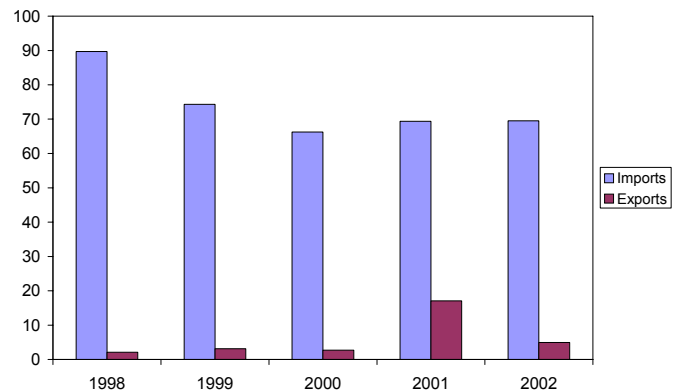
Indian component manufacturers have made remarkable progress in recent years, and the recent liberalization provided increased impetus to export. Between 1986-87 and 1992-93 output rose from \$274 million to \$915 million, and exports grew at an annual rate of 39%.

Trends towards greater sophistication of parts, and greater outsourcing by assemblers, indicated a growth rate towards the middle and late 1990s in excess of that for any other part of the automotive industry. Moreover, the components market is able to maintain these high rates of growth even when there is a downturn in vehicle sales, since replacement markets offer a constant outlet for expansion.

Yet, most of this trade is regionally focused. In the Middle East, the total spare parts market totals \$11 billion, with re-exports from Dubai alone valued at between US \$1 and \$1.5 billion annually. It is estimated there are over 6 million vehicles in the Saudi Arabia alone, and automotive aftermarket imports, excluding tires, exceeded US \$665 million last year.

In the case of Jordan, the trade balance of auto components witnessed a significant deficit during the period 1998 till 2002. The Jordanian imports of various automotive components far exceeded the domestic exports. The trade figures thus reflect a potential market offering the possibility of an avenue for the development of an auto components industry in Jordan. Despite this potential, the auto components industry's growth rate has, to date, remained low.

Figure (4): Trade Balance of Components in Jordan, million USD

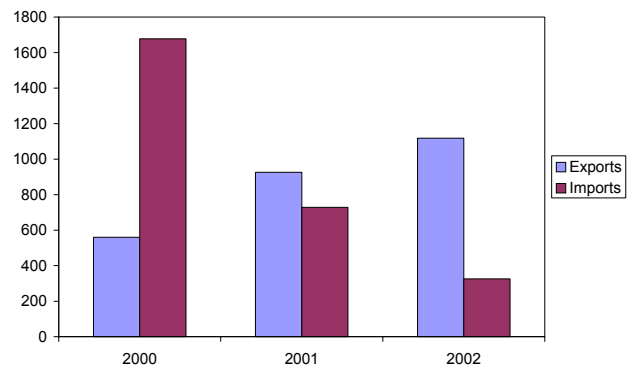


Source: Department of Statistics, Economics, External Trade

There remain, however, several success stories. The main Jordanian exports of automotive components are radiators and car batteries, both of which are manufactured to relatively high quality standards.

The improvements in the car batteries industry can be seen by the balance of trade in this sector. As Jordan's local industry grew, imports were gradually reduced, and exports increased. These figures are reflective of a developed industry consisting of three main companies. The largest company in the field of car batteries produces, at full capacity, 250 thousand batteries a year and employs 80 workers.

Figure (5): Trade Balance of Electric Accumulators of Lead Acid (Batteries), in thousand USD



Source: Department of Statistics, External Trade

The company strives to manufacture the batteries in their entirety from raw materials. Lead is the main component in the battery and makes up 70% of the total material inputs. The main source of lead in the region is Saudi Arabia. Another major part is the batteries' plastic boxes that are imported from a well-known manufacturer in Italy. Hardly any of the batteries' relevant raw materials are supplied locally.

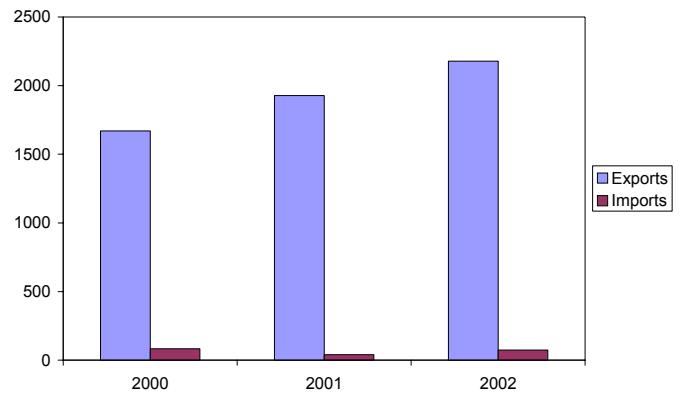
For the time being, the company controls around 40% of the local market share with annual sales of about 100 thousand batteries. The remainder of production, 150 thousand units, goes to export markets such as Syria, Lebanon, Egypt, Sudan, Palestine, Iraq, Oman, and Dubai.

Another Jordanian success story is the production of radiator systems. This sub-sector is composed of three major factories. One of the most advanced factories in this segment of auto components concentrates on the production of automotive radiators. The factory's expansion strategy to date has been vertical in that it invests in furthering production in related radiator lines as well as producing related components.

The factory produces about 120,000 radiators. Almost all of the factory's production is exported (about 99%) with the remaining 1% directed towards the local market. Local capacity does not exceed this amount because of the stiff competition in prices from alternative production sources, though they may be of lower quality. The main export markets are the Gulf region, Canada, Europe (UK, Holland, Finland, and France) and Eastern Europe (Yugoslavia, Macedonia, Slovakia, and Poland).

The factory produces under its own brand name. However, upon the request of certain buyers it produces under the title of alternative brands. While the factory has traditionally been an aftermarket supplier, it has recently entered into the OEM supplier market, and will continue with this approach. Despite its current successes, this segment of auto component production in Jordan is still faced with fierce competition from the East Asian products characterized with their relatively low prices.

Figure (6): Trade Balance in Radiators, in thousand USD



Source: Department of Statistics, External Trade

Jordan: Potential Paths for Development

The analysis thus far has defined two distinct but interrelated possibilities of growth for the automotive industry in Jordan. The first is to find niches for establishing assembly plants in the Kingdom that may find successes in the domestic as well as export markets; and the second is to find the best ways for nurturing a local base for the manufacturing of automotive components that can later affect the decision of mass producing assemblers to locate their plants in the country.

I. Assembly

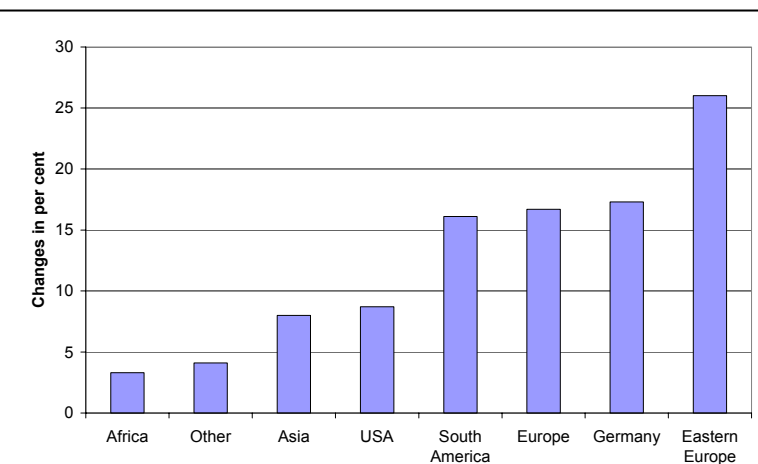
Most developing countries with an established automotive industry began as assembly hubs. There is potential for new countries to enter the mass production automotive assembly industry, supported by the trend of outsourcing that is presently occurring. However, the trends in the automotive industry are tending towards locating mass production assembly plants in Eastern Europe, or the larger developing nations whose domestic economy can support such a venture. The Middle East has not been a key location for outsourcing of such initiatives.

Investing in new locations is a long-term decision for the investor. Once an investor chooses a site the average period of stay is twenty years.

However, a wide range of locational factors need to be weighed according to companies' specific needs. Amongst the reasons for the successful location of a mass production assembly plant are; the existence of a strong local supplier base of components; the existence of a local market for vehicles, supported by high tariffs if necessary; and the ability to mass produce to gain from economies of scale.

When analyzing the parameters that affect the location decision for mass producing vehicle assembly plants, success stories in the region were considered. Among the current producing nations regionally are Egypt, Turkey, and Iran. During the shift to industry that occurred in the post World War II era, these three nations entered the automotive assembly industry. Their success initially is attributable to the support the industry received from a strong domestic market, import substitution policies that protected the domestic production with high tariffs, and the ability to mass-produce.

Figure (7): New Business Locations Selected by German Manufacturers over the Last Five Years



Source: Auto Annual Report, 2003, German Association of the Automotive Industry (VDA)

After the introduction of the WTO rules and regulations, many of such factors no longer exist for these countries, which puts Jordan on equal footing. However, for Jordan to bridge the experience gap and emulate their success, it should first target niche markets primarily taking advantage of its strategic location, the numerous number of trade agreements signed, proximity to regional demanding markets, and the political support behind such projects.

Moreover, trade logistics are extremely important to vehicle assemblers today, and it is on the Government agenda. Many efforts are taking place to improve the situation when trade logistics are involved i.e. the length of time it takes to cross borders, and fill out paperwork and receive the necessary permissions. The Jordanian government is committed to improving the situation for industrialists in the Kingdom. Moreover, Jordan has an advantage when it comes to trade logistics on the final product side. The country is located strategically bordering many of the largest regional markets. This mean that any production facility can benefit from the lower costs involved with shipping a completed vehicle.

Jordan has signed trade agreements with many of its neighbors ensuring conditions of relatively free trade and low custom duties for Jordanian goods. These include trade agreements with the EU, USA, and other countries in the Middle East. The most important highlights from these agreements to vehicle assemblers interested in Jordan, are the implications of the Agadir agreement, signed in February of this year, which allows components imported from Egypt, Tunisia and Morocco to be considered local components. This means that Jordan can effectively import automotive components from these countries, and use them to assemble vehicles, while still benefiting from the other multilateral and bilateral trade agreements it has signed.

On the supply-side, in the status-quo situation, Jordan has an advantage in producing vehicles that are easy to assemble, and high in labor content. These include pickups, four-wheel drives, and other limited production vehicles such as ambulances and vans. Assembling these vehicles is also profitable, and vehicle manufacturers worldwide establish limited production factories depending on cheaper labor costs alone. This mitigates Jordan's limited experience in mass production.

Box (2): Toyota Starts Argentine Plant for Hilux Pickups

Toyota opened its plant in Zarate, Buenos Aires province, Argentina. The plant will produce 10,000 Hilux pickup trucks annually. Of these, 5,000 will be exported to Brazil. Toyota is spending US\$150 million for the plant, gain of 40 dealers and development of parts suppliers. Toyota wants a 10% market share (300,000 units in 2000) in Mercosur and will begin producing the Corolla. Mercedes will produce the Sprinter in a US\$100 million plant in Argentina. Chrysler will begin producing Grand Cherokees in Cordoba in early 1997.

There are certain concentrations of sales within the region that make the production of these vehicles especially attractive.

For example, among the cars with assembly that does not require high technology, the medium pickups total 12.31% of the entire market share of vehicle sales in the region. And within this figure, Toyota alone contributes 49.1% of the market share within its brand. Targeting this specific market niche by assembling medium pickups under license might well be a potential avenue for Jordan's growth, as long as other factors such as government investment into infrastructure are met.

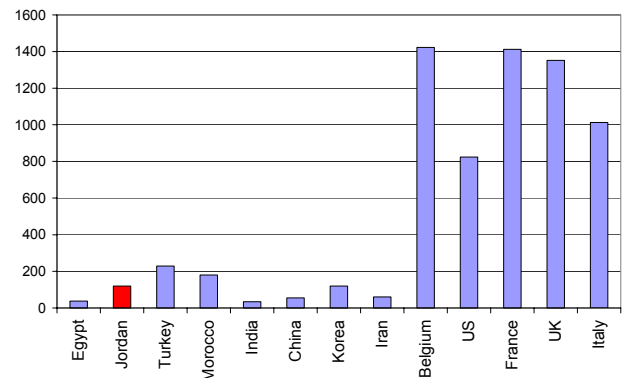
Commercial Wagon	0.07	Medium Family Wagon	0.47
Entry Luxury	1.54	Medium Pickup	12.31
High Luxury	0.89	Medium Utility	5.46
Intermediate	13.68	Medium Van	1.60
Large	5.12	Mid Luxury	0.28
Large Family Wagon	1.77	Mini	0.42
Large Luxury	1.61	Small	6.07
Large Pickup	0.60	Small Family Wagon	0.11
Large Utility	11.34	Small Pickup	0.32
Large Van	2.52	Small Utility	2.11
Light Commercial	4.96	Small Van	1.97
Lower Medium	15.76	Sport	0.15
Med/Heavy	2.42	Sport Low	0.03
Medium Family Van	0.62	Upper Medium	5.79

Furthermore, when targeting a niche, flexibility in production will be maximized. The production lines for such vehicles are not rigid and the vehicles can easily be customized based on customer demand and requirements.

The current automotive assembly efforts in Jordan already cater to a niche market. Both Land Rover and the KADDB manufacture vehicles primarily for military use. These vehicles are generally easy to assemble, with low automation, and high labor content (contributing over 60% in direct costs to the vehicle, which Jordan can provide at competitive prices). Jordan should target mother companies in the countries characterized with high labor wages worldwide. As the figure indicates, the possible investors that Jordan may attract will be located mainly in Western European countries such as Italy, France and Belgium in addition to the USA.

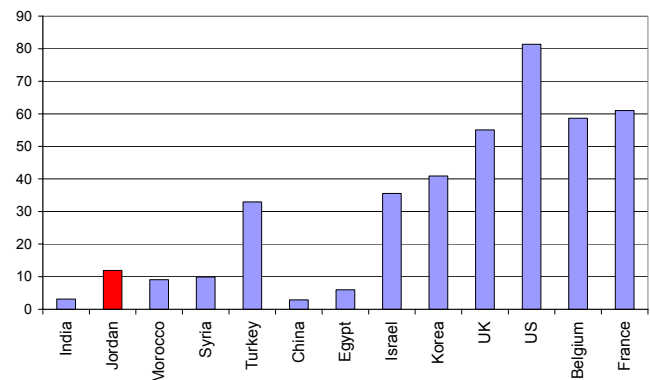
Considering the wage level differentials, Jordan is in better position for this type of vehicle assembly than some countries in the region especially Turkey and Morocco. And although Egypt and Iran are in a better position than Jordan in terms of wage levels, Jordan beats many regional competitors in terms of labor productivity

Figure (8): Minimum Wages Internationally, USD/month



Source: International Labor Organization Database, 2001

Figure (9): Labor Productivity Internationally, Value Added as thousands USD/year



Source: World Development Indicators, 2000

measured at the manufacturing value added per employee.

The labor force available in the Kingdom can indeed be used as a source of strong appeal for automotive manufacturers. Jordan has a relatively high tertiary enrollment rate (at 29%), and a high average for the number of years of schooling per adult (at 6.9 years, compared to Egypt at 5.5, and Turkey at 5.3). In the Global Competitiveness Report Rankings for 2003-4, Jordan ranked 12th out of 102 countries for the availability of scientists and engineers, over Tunisia at 13th, and Egypt at 57th. Although these engineers are not specialized in the automotive field, the figure gives an indication of Jordan's potential.

II. Components

The automotive industry's supply chain has undergone several developments over the past decade. Vehicle manufacturers have slowly been diminishing their roles gradually restricting themselves to vehicle assembly, and outsourcing the remainder of their manufacturing needs. Amongst the firms working to satisfy these needs, there has been a migration from the production of make-to-print parts and assemblies to value-added parts and assemblies.

	1985	1989	Percentage Change 1985-1989
Ford (North America)	20,000	6,000	(70.0)
Ford (Europe)	2,500	900	(64.0)
Austin Rover	1,200	700	(41.7)
Renault	1,415	900	(36.4)
Peugeot	1,229	950	(22.7)

Source: Automotive Component Supplier Industry, JBA and EAIG

Moreover, there has been an ongoing consolidation process amongst these suppliers, and despite a slowdown in this trend in recent years, the number of suppliers worldwide is predicted to fall from 5,600 at the present time to 3,500 by the end of the decade. Within this consolidation process there has been continued integration amongst these suppliers and more frequently firms are working towards offering a package to car assembly plants consisting of a variety of related products, rather than focusing their efforts on a narrow production base.

When analyzing the auto components industry, and considering its potential, it is extremely important to differentiate two important segments of this market: namely the Original Component Manufacturers (OEM) supplying directly to the auto assemblers and the aftermarket manufacturers working in the field of auto spare parts.

Components suppliers working in the OEM segment are expected to provide several essential services. They must be of dependable quality, adopting a zero-defect-concept for quality; they must be able to react quickly to deliver whatever part the assembler needs; and the assembler must be able to adapt his production to the stock on hand.

Auto assemblers are mainly concentrating their outsourced components suppliers in countries that can provide prompt delivery in addition to less cost and agreed upon quality. The current trend amongst the world's leading OEMs and their suppliers is to relocate European design and manufacturing facilities to countries in Central and

Eastern Europe. Countries like the Czech Republic are growing in the number of outsourced OEM automotive activities that they are receiving, for various pertinent reasons.

The Czech Republic, for example, already has a hub of major component producers. Barum Continental produces well over 15 million tires annually. Bosch has three manufacturing divisions in the Czech Republic, with 7000 employees. The Republic is Europe's leading recipient of automotive projects and overtook traditional leaders like France and the UK to secure one out of five of all automotive component investment decisions in Europe in 2002 .

Looking at reasons for the success of these factories, the first major draw factor is the location of these countries, close to the major European assembly plants, so that transportation of components for the "just-in-time" production system employed is uncomplicated. Approximately three quarters of Central and Eastern European automotive assembly plants and suppliers are within a 200 km radius.

One of the major buyers of Czech Republic components production is Volkswagen in Germany. The group cites several reasons for outsourcing to the Czech Republic. Geographic proximity and reliability of suppliers are the top two. Following these is the fact that there is an innovation-oriented educational base in the country. There are over 4,000 employees in R&D departments, and the average OEM supplier in the Czech Republic has approximately 5% of its employees directly linked to innovative activities.

Box (4): Trade Logistics Case Study: Tunisia and Romania

A German car part manufacturer in Tunisia had 2,400 employees and produces electronic components for DaimlerCrysler. It imports its raw material from Germany, the assembly takes place in Tunisia, and then the final product is returned to Germany. There is a 9-day order-to-delivery cycle as follows: 1 day for assembly, and 8 days for transportation.

In Romania, the Just-in-time production techniques have cut the cycle from 9 to 6 days. As a result Tunisia recently lost new factory (1700 jobs, 12 million Euros) to Romania for transport reasons. The Company explains, "Tunisia an excellent production base, but transport is a key constraint."

The OEM components industry is not an easy one to enter. In the OEM supply chain, trade logistics play an incredibly large role. Transportation time alone can make the difference between a successful and an unsuccessful industry. If Jordan is to seriously enter this industry and provide integrated component services to automotive suppliers it must be ready to meet deadlines efficiently and speedily.

Success in the components industry also depends on the ability to mass produce at a decent quality standard. For a country like Jordan, with very little large industrial experiences in the production of automotive

Box (5): Tunisia: Components Industry Success Story

While the first components factory opened in Tunisia in 1958 for the production of automobile batteries, it remained the only components firm until 1974 when it was joined by an auto paint factory and a cable factory.

Today the components industry hosts more than 124 firms employing about 16,000 workers. 27% of this sector's production is exported, mainly to France, Germany, and Italy. 80% of the Tunisian auto parts are accredited by the European manufacturers; especially filters, batteries, and shock absorbers.

As Tunisia is opening towards the global economy, the Tunisian government launched a program to rehabilitate the existing industries. This program will assist this industry to enhance their competitiveness to face the fierce competition resulting from Tunisia' entry into the global economy.

components, the intense competition in the OEM components sector will not be easy to overcome. Because of the large competition base, cost pressures in the past decade have been mounting on these suppliers, and major automotive companies have been announcing price cuts averaging about 5% per year. OEM suppliers are also transferring some of the cost burden onto tier 1-3 suppliers; through delegating the responsibility for research and development, more integrated systems of component parts, as well the burden of raw materials. The very suppliers Jordan will represent if it enters the OEM market.

However, to succeed, the government is putting sustained efforts into improving the research and development base in Jordan, to improve the link between universities and industry, to provide a better platform for the Jordanian industrial base.

Jordan does have a potential in entering the aftermarket. The aftermarket segment of the market represents the largest demand share, at about 65% of the world market, while the OEM world market share represents only 35%. Furthermore, the aftermarket parts field is less complex and much more flexible than the OEMs' market.

With this in mind, looking at the break down of automotive components in a vehicle, over 30% of the car is composed as follows:

- Seat and seat belts: 7.5%
- Glass: 5%
- Plastic parts: 9%
- Electric equipment: 8.5%

These are all components that are easy to manufacture to quality standards locally. With certain incentives and support, local companies would be able to become suppliers for the local assemblers as well for the aftermarket suppliers easily. Starting out with the less complex components and slowly graduating onto the more complex ones will increase Jordan's ability to succeed in the components industry.

In spite of the large market, this type of industry still requires economies of scale and large consumer markets. The Jordanian market demand of spare parts will not be sufficient enough to help jump start this industry. Therefore, having the geographical proximity to the Gulf market which has the capacity to absorb large amounts of spare parts is a tremendous asset for Jordan.

Box (6): Saudi Arabia Market for Aftermarket Components:

According to industry figures Saudi Arabia is the biggest importer of vehicle components and accessories in the Middle East. It is estimated there are over 6 million vehicles in the Kingdom and automotive aftermarket imports, excluding tires, exceeded US \$665 million last year.

With better servicing facilities, Saudi car owners are keeping their vehicles longer and with the increase in vehicle life, the market for spare parts, particularly brake parts and batteries, is experiencing double digit growth. Last year replacement vehicle components accounted for over 60% of automotive aftermarket imports.

In Saudi Arabia, climate and long travel distances are additional factors contributing to the need for spare parts and garage equipment. In addition, the influx of used cars generates further demand, since a large number of these vehicles require repairs and reconditioning before being sold to the retail market.

Most of this trade in components is regionally focused, and suggests that cost savings for vehicle assembly could be achieved if "regional content" were accepted instead of local content in domestic manufacturing policies. Jordan's recent trade agreements, redefining certain rules of origin, will support the country in capitalizing on this trend.

Efforts for Success

There are several factors necessary to be instated if Jordan is to succeed in entering as a competitor in the aftermarket components industry, or by entering as a niche vehicle assembler.

In terms of an assembly plant, certain large initial investments are required, whether the plant produces one vehicle a day for a niche market, or over 10,000. These include the machinery required for painting the vehicle, testing grounds, and the infrastructure for transporting the vehicle. The Land Rover plant in Jordan is estimated to have invested \$70 million in initial buildings and machinery. Moreover, this investment is a long term initiative, and so investors must be willing to wait patiently for the project to take off.

In Jordan, the government is currently establishing such infrastructure and incentives on a large scale catered for automotive manufacturers to support the existing and the potential assemblers in the form of an automotive city in Ma'an.

The cost of doing business in Jordan is also lower than many other countries, and firms can benefit from these low rates, as well as the different incentives provided to manufacturers.

The vocational training institutes are able to provide adequately trained workers for the automotive industry's needs according to assemblers such as Elba House. Moreover, Jordan has the technical capacity to design and test vehicles on computer software. There is also an adequate supply of administrative staff, high level management and professional engineers.

Table (4): Utility Costs in Jordan

Electricity tariffs	\$US
- Commercial 1-2500 KWN	.09
- Manufacture (small size firm) 2500 KWN and above	.03
- Manufacturing (medium size firms) Maximum Load	4.33
Day time	0.05
Night time	0.03

Source: Jordan Investment Board

Box (7): Sample Undergraduate Curriculum:

- Manual Transmission and Transaxle Principles
- Steering and Suspension
- Engine Principles
- Basic Fuel and Emission Control Systems
- Engine Electrical Systems
- Technical Drawing and Print Reading
- Circuits and Electronics
- Electromechanics
- Fluid Mechanics and Heat Transfer
- Mechanical Vibrations
- Stress Analysis
- Motorsport Technology
- Powertrain Systems
- Automotive Design and Manufacture

Suggested High School Preparation

Courses in upper-level math, physics and chemistry. Communication skills.

However, the existence of middle-management, and auto specialized engineers are the country's main drawback. Nevertheless, there are almost 22 thousand students enrolled in engineering programs at Jordanian universities. This base of engineering skills represents an opportunity for Jordan to focus on automotive engineering with the mechanical engineering specialties available as a base for this.

To this end, an increase in the training standards of automotive workers is required, more so for the components industry than for assembly plants, which license the technology and production methodology from the mother company. Automotive components in the aftermarket have no such higher source. Therefore these companies are required to customize their own production techniques, as well as innovate for new production methods. For this reason, specialized courses must be provided either in universities or vocational training centers, focused on automotive manufacturing techniques, and there is also a commitment to create these courses in Jordanian universities as needed.

The political backing in Jordan exists, coupled with sustained government efforts to acclimatize the industrial base present for the establishment of an automotive industry. Such support will increase the attractiveness of Jordan as both an assembly and components manufacturing base in the Middle East.