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Factors Driving World Market Integration: *The Case of Jordan's Industries*

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ABSTRACT

Objectives: The purpose of this study is to examine the factors driving world market integration, using panel data from 20 industries (at the 2-digit ISIC level) over the period 2009-2017.

Methods: The present study suggests a relatively large system of simultaneous equations to avoid simultaneous and specification bias. The model consists of three endogenous variables (industrial production, manufactured exports, and manufactured value-added) and four exogenous variables (workers' compensation, intermediate goods, intermediate services, and spending on improvement and development).

Results: The simultaneous model was estimated for all industries and for each of the previously defined groups. Intermediate goods showed impressive success in most of the estimated equations, confirming the role of imported inputs in driving world market integration in Jordan. Workers' compensation was found to have a significantly positive effect on most of the endogenous variables across all industries, particularly in the high-exporting group. Intermediate services, however, did not show a significant effect in most models, except for the high-exporting group. Meanwhile, spending on improvement and development had a significantly positive effect for the entire sample and the low-exporting group. Finally, the hypothesis of export-led growth received no empirical support at any significance level in all models.

Conclusions: To accelerate world market integration in Jordan, both the private and public sectors are strongly encouraged to play a key role in enhancing research and development, generating new knowledge, new markets, and new products.

Keywords: World Market Integration, Simultaneous Equations Model, International Fragmentation of Production, Intermediate goods, Imported Inputs, Manufactured Exports, Manufactured Value-Added, Research and Development.

1) Introduction

Since the early 1980s, integration into the world market has been considered one of the most important strategies for promoting economic growth, sustaining development, and reducing poverty. The role of industrial sectors in driving world market integration remains a subject of considerable debate among economists and policymakers. An IMF staff study (2001) examined the experience of integration in several developing countries across Asia, the Middle East, and Latin America. The

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study found that only a few countries achieved significant success, while many experienced uneven and intermittent progress.

Measures of integration into the world market fall into two major categories. The first category consists of international-level measures aimed at creating export markets, removing trade barriers, and standardizing tariffs and trade laws. The second category comprises national-level measures focused on producing new goods and services that are compatible with foreign markets, enhancing domestic productive capacity, and promoting value-added manufacturing. Dolfsma (2019) and Dolfsma and Łukasz (2020) argue that the effectiveness of these measures depends on the national industrial policies implemented by governments, whose intentional efforts to influence the private sector attract foreign direct investment to achieve societal goals.

The International Fragmentation of Production (IFP) has been among the most effective and widely adopted industrial strategies in both developing and developed countries to accelerate integration into global markets. The IFP process involves improving domestic productive capacities, boosting exports, and increasing value-added output.

This study is the first to examine the effectiveness of the industrial sector in integrating into the world market. Integration implies two key aspects: a) increasing the dependency of domestic markets on foreign markets, and b) reducing reliance on domestically produced inputs.

Gonzalez (2016) argues that increasing the dependency of domestic markets on foreign markets can have an adverse impact on GDP unless these imports are manufactured more cheaply than their domestically produced equivalents. In such cases, imports can help consumers manage strained household budgets. Similarly, Kee (2015) and Kee & Tang (2016) indicate that increasing reliance on imported goods enables domestic industries to use more productive inputs at lower costs, thus becoming more competitive in foreign markets. The growing dependence on imported inputs can also enhance production efficiency and increase the value added to manufactured products (Timmer et al., 2019; Hiau & Heiwai, 2016).

In this study, intermediate goods will be used as a proxy for imported inputs, as most raw materials and capital used in the industrial sector are imported. Likewise, intermediate services will be considered one of the factors driving world market integration. However, this variable may not be a key driver of world market integration since it mainly comprises fixed expenses that are independent of a firm's output.

As suggested by Porter (1985), skilled labor can also be considered an important factor driving economic integration into the global economy. Skilled labor refers to segments of the workforce that are highly educated, trained, or experienced, and can promote competitiveness while increasing the value added to manufacturing. Market conditions suggest that increases in skilled labor wages will not negatively impact labor demand if the increase in the worker’s marginal product value exceeds the wage rate.

Finally, most economists agree that investment in R&D plays a crucial role in boosting productivity and producing high-value-added products (Szarowská, 2018). Therefore, spending on improvement and development will be used as a proxy for R&D.

The purpose of this study is to examine the impacts of imported inputs, intermediate services, workers' compensation, and investment in research and development on factors driving world market integration, using panel data on 20 industries (at the 2-digit ISIC level) over the period 2009-2017. This study proposes a relatively large system of simultaneous equations models to avoid simultaneity and specification bias (Johnson, 2014). As will be shown in the third section, the model consists of three endogenous variables (industrial production, manufactured exports, and manufactured value added) and four exogenous variables (workers'

compensation, intermediate goods, intermediate services, and spending on improvement and development).

The study consists of five sections. The next section reviews the most recent literatures pertaining to the subject matter. The third section introduces the econometric model and define the data. The fourth section discusses the empirical finding and compares their robustness. The fifth section concludes the study.

2) Literature Review

This section reviews the most important previous studies concerning the measures implemented by both developed and developing countries to integrate into world markets. The literature review focuses on the varying strategies adopted across countries to enhance domestic productive capacity and promote industrial value-added, thereby accelerating the process of integration into foreign markets.

Choi (2013) employed the gravity model, the Heckscher-Ohlin model, and the Ricardian model to study the determinants of trade value-added across 40 countries and 35 industries over the period 1996-2009. When using data on trade in value-added, the explanatory power of the gravity model was found to be relatively small compared to pooled data on trade in gross value. Additionally, the results indicate that the export and import values in value-added were smaller than those in gross value.

Hummels et al. (2001) analyzed the dimensions of rising trade shares using case studies and input-output tables. The study provided empirical evidence supporting the role of imported inputs in the production of goods destined for export. It also confirmed the changing nature of trade—from producing complete goods from start to finish, to specializing in specific stages of production. This "vertical trade" is what links increased international trade with greater international production.

Zhang (2017) examined China's industrial development using eight indicators grouped into three dimensions (industrial capacity, industrial intensity, and industrial quality) over the period 1978-2014. One of the main conclusions is that China's industrial development has been driven by development strategies, industrial policy, and success in exports and foreign direct investment (FDI). International comparisons suggest both advantages and disadvantages for China in industrial development. The advantages include a strong and effective central government, abundant, cheap, and productive labor, a huge and growing domestic market, high-quality infrastructure, and a culture of patience, persistence, innovation, and frugality.

Anil (2012) conducted an empirical study to investigate how regions in Canada move toward a higher-skill, higher value-added equilibrium. The study confirmed that higher-skill jobs are created when firms compete through innovation, and any improvement—whether in productivity or value addition—requires the use of cutting-edge knowledge and learning new skills.

Massimiliano et al. (2016) proposed a new methodology to measure the quantity of jobs and value wages embodied in exports for several large countries and sectors during intermittent years between 1995 and 2011. The analysis documented several findings, including that the global share of labor value added in exports has been declining since 1995. It also confirmed that the composition of labor contained in exports is skewed toward skilled labor in high-income countries compared to developing countries.

Hajnalka (2017) analyzed the implications of international trade on employment and skills demand in selected countries, including Cambodia, Ghana, Jordan, Malawi, Morocco, Myanmar, the Philippines, Tunisia, and Viet Nam. The classification of merchandise exports by their skill and technology intensity provides insight into the employment creation potential of exports and the skill levels for which they generate demand.

Rahardja and Varela (2015) investigated the impact of imported inputs on productivity in Indonesia. The study

revealed empirical results showing that the growth of intermediate imports roughly matches the growth of Indonesian GDP, suggesting a stable reliance on imported inputs. The study also found that users of imported inputs in Indonesia grow faster in terms of output, value added, and employment; they are also more productive and pay higher wages.

Erdum et al. (2020) investigated the evolution of the import content of production and exports in Turkey from 2002 to 2018. Their findings confirm that import dependency increased for exports but remained relatively stable for production over time. Overall, the import content of production was lower than that of exports. This difference is primarily attributable to the services sector, which has low import dependency yet plays a significant role in production.

3) The Model and the Data

In this section, we aim to formulate a theoretical framework to evaluate the role of the Jordanian industrial sector in enhancing domestic productive capacity and promoting manufactured value-added to integrate into the world market. Most previous studies on this issue have tested the hypothesis of export-led growth using single equation models and macro-level data (Alkhatib, 2021). However, such models often suffer from simultaneity and specification bias (Golden et al., 2019). To address this, a relatively large system of simultaneous equations is suggested, which differentiates between endogenous and exogenous variables.

The set of endogenous variables includes industrial production, manufactured exports, and manufactured value-added. These endogenous variables are functions of other endogenous variables, not just exogenous ones. On the other hand, the exogenous variables have been selected based on mainstream economic theory and data availability. These exogenous variables reflect the inputs that businesses use to enhance domestic productive capacity and promote industrial value-added products. The factors are:

a. **Workers' compensation** (wages, salaries, medical coverage, disability rehabilitation, and death compensation), which serves as a proxy for the use of high-skilled workers (ILO, 2011). Equilibrium market theory asserts that business owners will be willing to pay high wages as long as the marginal product of labor exceeds the wage rate.

b. **Intermediate goods**, defined as products made during the manufacturing process that are also used in the production of other goods. Intermediate goods can be subdivided into three categories: parts or components embedded in final goods, fixed inputs that assist in the production of other goods, and consumption (or final) goods. Jordanian industries notably rely on imports of intermediate goods. Therefore, intermediate goods are included in the model to account for reduced reliance on domestically produced inputs as an important factor in expanding domestic productive capacity and promoting manufactured value-added.

c. **Intermediate services**, defined as services used as intermediate inputs in the production of other goods and services. These services critically affect the competitiveness of the economy (Behuria and Khular, 1994).

d. **Spending on improvement and development**, which can be used as a proxy for R&D. R&D plays a vital role in fostering innovation and developing new competitive advantages.

The theoretical framework will use the generalized Cobb-Douglas function, which provides an important structure for measuring productivity and the employment of factors of production (Amuka et al., 2018). The equations are as follows:

$$y_1 = a_1 y_2^{\gamma_1} x_1^{\beta_1} x_2^{\beta_2} x_3^{\beta_3} e^{\epsilon_1} \quad (1)$$

$$y_2 = a_2 y_3^{\gamma_3} x_1^{\beta_4} x_2^{\beta_5} x_3^{\beta_6} e^{\epsilon_2} \quad (2)$$

$$y_3 = a_3 x_1^{\beta_7} x_2^{\beta_8} x_4^{\beta_9} e^{\epsilon_3} \quad (3)$$

The endogenous variables are: $y_1$represents the industrial production, y_2 represents the manufactured exports, and y_3 represents the manufactured value-added.

The exogenous variables are: x_1 represents workers' compensation, $x_2$represents intermediate goods, x_3 represents intermediate services, and x_4 represents spending on improvement and development.

The nonlinear system of equations (1-3) can be transformed into a loglinear model as:

$$\log(y_1) = c_1 + \gamma_1 \log(y_1) + \beta_1 \log(x_1) + \beta_2 \log(x_2) + \beta_3 \log(x_3) + \epsilon_1 \quad (4)$$

$$\log(y_2) = c_2 + \gamma_3 \log(y_1) + \beta_4 \log(x_1) + \beta_5 \log(x_2) + \beta_6 \log(x_3) + \epsilon_2 \quad (5)$$

$$\log(y_3) = c_3 + \beta_7 \log(x_1) + \beta_2 \log(x_2) + \beta_9 \log(x_4) + \epsilon_3 \quad (6)$$

where c_i=log(a_i) $i = 1,2,3$. All explanatory variables and endogenous on the right-hand side are assumed to be uncorrelated with the stochastic error term (ϵ_i). The simultaneous equations system (4-6) will be simultaneously estimated using 3SLS method which is relatively more efficient than the 2SLS and superior to the OLS methods.

The data come from industry surveys conducted by the Department of Statistics between 2009 and 2017. Appendix (a) shows that the sample consists of 20 industries at the 2-digit SIC level, which together account for about 77% of total industrial production during this period. These industries are divided into two equal groups, each comprising 10 industries, based on the average export-to-output ratio over the period 2009–2017.

First, industries in the low-exporting group (4.5 < export-to-output ratio ≤ 25) produced approximately 55% of the total output in the sample. Second, industries in the high-exporting group (export-to-output ratio > 25) produced about 45% of total production over the same period. Eight industries were excluded from the sample as they did not have any export-oriented industrialization strategy. These excluded industries include five utility sectors (oil and natural gas extraction, metal mining, gas and electric supplies, water supply, and waste management), as well as three industries focused solely on the domestic market (wood processing, manufacture of coke and refined petroleum products, and vehicle maintenance and repairs).

4) The Empirical Results

The simultaneous equations model (4-6) was estimated for the entire sample and separately for the high and low exporting groups using the 3SLS method. Distinguishing between high and low exporting industries is important because these groups differ significantly in terms of strategy, competitiveness, innovation, and access to foreign markets (Negassi et al., 2019). These differences are likely to be reflected in the empirical results of the models estimated for each group.

Table 1 shows that intermediate goods have a positive and significant effect on the endogenous variables in all equations for the entire sample, confirming the importance of relying less on domestically produced inputs to promote industrial production, manufactured exports, and manufactured value-added. The results also highlight the significant role of workers' compensation in promoting manufactured value-added and exports at the 1% significance level, underscoring the importance of high wages in attracting skilled labor. Finally, spending on improvement and development has a positive and significant impact on manufactured value-added.

Contrary to expectations, the export-led growth hypothesis has not received empirical support at any conventional level of significance. As Pryor (1999) suggests, the insignificant impact of exports on economic growth could be attributed to two factors. First, high-export industries may rely more on unskilled workers to enhance their competitive position in foreign markets by reducing

costs. Second, increased exports are often accompanied by rising imports, which can negatively affect economic growth.

Medina-Smith (2001) provided evidence indicating that the validity of the export-led growth hypothesis may vary across countries, depending on factors such as physical investment and population. Additionally, the evidence supporting export-led growth may differ not only across countries but also across different historical periods, influenced by varying economic conditions and development strategies.

Equations (4 & 6) show relatively high explanatory power ($\bar{R}^2$ = 0.865 and 0.78, respectively), while it is moderate ($\bar{R}^2 = 0.468$) for equation (5).

Estimating the model for industries in the high-exporting group reveals impressive results regarding the effect of intermediate goods, which are significant and positive in all equations. Workers' compensation also shows a significantly positive effect on industrial output and manufactured value-added. Intermediate services, however, have a positive impact only in equation (4). The explanatory power is very high for equations (4) and (6), while it is moderate for equation (5).

In contrast, for industries in the low-exporting group, intermediate goods have a significantly positive effect only on manufactured value-added. The explanatory power drops considerably to 0.395 and 0.604 for equations (4), while it increases to 0.711 for equation (5). These results highlight the relative importance of high-exporting industries over low-exporting industries in integrating into global markets.

Table (1): The Results of the Simultaneous Equations Model for the Entire Industries, and High and Low Export Industries.

	Var	Entire Industries		Industries in the high exporting group		Industries in the low exporting group	
		Coef.	se	Coef.	se	Coef.	se
Equation (4)	C_1	1.021	0.600	1.110**	0.277	1.885	3.127
	y_2	-0.017	0.310	-0.074	0.123	1.483	6.313
	x_1	0.239	0.249	0.222**	0.056	-0.242	1.790
	x_2	0.776**	0.205	0.725**	0.105	-0.604	6.027
	x_3	-0.002	0.112	0.138**	0.028	0.522	2.276
	$\bar{R}^2$	0.865		0.984		0.395	
	N	176		88		88	
	SE	0.422		0.129		0.994	
Equation (5)	C_2	-1.043	1.204	-1.280	2.075	-0.322	1.333
	y_3	-0.809	0.755	-1.980	2.094	-0.129	0.742
	x_1	1.109**	0.232	1.834	1.178	0.358	0.261
	x_2	1.125*	0.466	1.428*	0.633	1.048	0.589
	x_3	-0.359	0.234	-0.040	0.418	-0.417	0.250
	$\bar{R}^2$	0.468		0.450		0.604	
	N	176		88		88	
	SE	1.091		1.001		0.880	
Equation (6)	C_3	1.639**	0.537	0.860	0.505	1.950	0.813
	x_1	0.348**	0.072	0.715**	0.062	0.130	0.129
	x_2	0.506**	0.076	0.259**	0.066	0.670**	0.125
	x_4	0.063**	0.022	0.031	0.018	0.065	0.037
	$\bar{R}^2$	0.780		0.920		0.711	
	N	176		88		88	
	SE	0.548		0.306		0.675	

*&** Significant at 5% and 1% significance levels, respectively.

The insignificance of intermediate services in three out of four equations has important implications. The weak impact of intermediate services can be attributed to the fact that this variable mainly consists of fixed costs and includes many nonproductive inputs. To assess the robustness of the results, the same model was estimated without intermediate services, as shown in Table 2. The empirical results remained unchanged, with the magnitudes almost identical to those in the original model in Table 1.

Table 2: The Results of the Simultaneous Equations Model for the Entire Industries and High and Low Export Industries (Excluding Intermediate Services).

	Var	Total Export		Industries in the high exporting group		Industries in the low exporting group	
		Coef.	se	Coef.	se	Coef.	se
Equation (4)	C_1	1.024*	0.491	0.722*	0.336	1.676	2.024
	y_2	-0.016	0.287	-0.097	0.155	1.300	4.871
	x_1	0.237	0.141	0.374	0.060	0.272	0.443
	x_2	0.776**	0.189	0.757**	0.132	-0.455	4.753
	$\bar{R}^2$	0.866		0.976		0.527	
	N	176		88		88	
	SE	0.421		0.158		0.879	
Equation (5)	C_2	-0.528	1.051	-1.175	1.368	-0.182	1.318
	y_3	-0.928	0.705	-1.993	1.943	-0.151	0.747
	x_1	0.796**	0.299	1.802	1.446	-0.062	0.202
	x_2	1.186**	0.443	1.429*	0.621	1.090	0.584
	$\bar{R}^2$	0.443		0.457		0.594	
	N	176		88		88	
	SE	1.117		0.994		0.892	
Equation (6)	C_3	1.639**	0.537	0.860	0.5045	1.951	0.813
	x_1	0.348**	0.072	0.715**	0.062	0.130	0.129
	x_2	0.506**	0.076	0.259**	0.066	0.670**	0.125
	x_4	0.063**	0.022	0.031	0.018	0.065	0.037
	$\bar{R}^2$	0.780		0.920		0.711	
	N	176		88		88	
	SE	0.548		0.306		0.675	

*&** Significant at 5% and 1% significance levels, respectively.

5) Conclusions and Recommendations

This study aims to evaluate the role of Jordan's industries in integrating into the global market by using panel data at the micro-level from 20 industries (ISIC - two digits) over the period 2009-2017. A simultaneous equations model was developed, consisting of three endogenous variables: industrial production, manufactured exports, and manufactured value-added. Each endogenous variable is assumed to be a function of independent variables or a set of exogenous variables representing classical inputs, along with a proxy for research and development efforts.

The model was estimated for the entire sample and separately for high and low exporting industries using the 3SLS method. The distinction between high and low exporting industries is particularly important, as these groups may differ significantly in strategy, competitiveness, innovation, and access to foreign markets, which is reflected in the empirical results.

The findings provide evidence of the significant role of

intermediate goods in all three equations, supporting the importance of imported inputs in expanding domestic productive capacity, manufactured exports, and value-added production. Additionally, workers' compensation was found to significantly impact all endogenous variables in the high-exporting group and influence manufactured exports and value-added for the entire sample. Finally, the results highlight the greater role of high-exporting industries in integrating into global markets, consistent with the theory of economic organization.

Based on the study's findings, the following recommendations are proposed to accelerate Jordan's integration into the global market:

1. Enhance Research and Development (R&D): Both the private and public sectors should play a crucial role in boosting R&D efforts. Increasing investment in R&D can drive the creation of new knowledge, markets, and products, which are essential for faster integration into the world market.
2. Increase R&D Spending: Currently, R&D expenditure in Jordan is less than 0.5% of total industrial production, compared to 2.5% in developed economies. This level of investment is insufficient to effectively drive the innovation process. Increasing R&D spending is crucial for fostering innovation and enhancing global market integration.
3. Foster Collaboration: Establishing robust partnerships among industry players, the public sector, research centers, universities, and vocational education institutions is vital. Such collaboration will enhance manufacturing competitiveness and support the overall goal of global market integration.

Appendix (a)

Total production and the average export-to-output ratio for industries in the sample (Figures in JD)

Industry	Production	Average Export-to-output ratio
Food Industry	19202708	13.81
Beverage Industry	4129225	17.89
Cigarettes and Tobacco Industry	5349100	9.69
Textile Manufacturing	789151	19.06
Apparel Industry	5442603	80.01
Leather products	365012	12.16
Paper and Paper Products	3064771	29.94
Printing and Reproduction of Recorded Media	2007487	26.13
Chemical Industry	10559000	49.28
The drug, chemical, and pharmaceutical industry	7599146	73.07
Plastic and Rubber Products	4165225	29.46
Nonmetallic Industry	7867924	4.52
Metals Industry	5336846	17.02
Fabricated Metal Products, except Machinery	5082342	26.73
Computer, Electronic and Optical	736917	16.08
Electrical Equipment	3353104	23.61
Machinery and equipment n.e.c.	1345441	49.05
Motor Vehicle, Trailers and Semi-Trailers	352647	33.93
Furniture	2047349	15.54
Manufacturing Industry	1159043	67.51

Source: Industry Survey 2009-2017, Department of Statistics, Amman.

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العوامل المحركة لتكامل الأسواق العالمية: حالة الصناعات الأردنية

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ملخص

الهدف: تهدف الدراسة إلى اختبار أثر العوامل الدافعة للاقتصاد الاردني نحو التكامل مع الاسواق العالمية، باستخدام بيانات مقطعية–زمنية على المستوى الجزئي لعشرين صناعة أردنية (على المستوى الثاني للتصنيف الصناعي الدولي الموحد) خلال الفترة 2009–2017.

المنهجية: اقترحت الدراسة استخدام نظام معادلات آنية كبير نسبيا وذلك لتجنب التحيز الآني والتحيز الناتج عن التوصيف. ويتكون النظام المقترح من ثلاث متغيرات داخلية (الانتاج الصناعي القائم، الصادرات الصناعية، والقيمة الصناعية المضافة) بالإضافة إلى أربع متغيرات خارجية (تعويضات العاملين، المدخلات السلعية الوسيطة، المدخلات الخدمية الوسيطة، الانفاق على التحسين والاضافات). هذا وقد تم تقدير النموذج الاني لجميع الصناعات في العينة ثم على مستوى الصناعات في كل مجموعة من المجموعات السابقة.

النتائج: أظهرت النتائج الدور الايجابي المعتبر للمدخلات السلعية في قيادة الاقتصاد الاردني للتكامل مع السوق العالمي في معظم المعادلات، وتليها في الأهمية تعويضات العاملين التي تؤكد النتائج أثرها الايجابي في معظم المعادلات على مستوى جميع الصناعات ومجموعة الصناعات عالية التصدير. أما فيما يتعلق بالمدخلات الخدمية، فكان تأثيرها محدودا جدا ويقتصر على الانتاج لمجموعة الصناعات منخفضة التصدير، بينما اقتصر أثر الانفاق على التحسينات والاضافات على مجموعة الصناعات عالية التصدير. وأخيرا لم تظهر النتائج أي تأييد يذكر لفرضية قيادة الصادرات الصناعية للنمو الصناعي.

الخلاصة: لتسريع عملية تكامل السوق العالمية في الأردن، يوصى بشدة أن يلعب القطاعان العام والخاص دوراً رئيسياً في تعزيز البحث والتطوير لتوليد معارف جديدة وأسواق جديدة ومنتجات جديدة.

الكلمات الدالة: تكامل السوق العالمية، نظام المعادلات الآنية، التجزئة الدولية للإنتاج، المدخلات السلعية، المدخلات المستوردة، الصادرات الصناعية، القيمة المضافة المصنعة، البحث والتطوير.

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