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A Dynamic Panel Analysis of French Exports and Outward FDI in Selected Mediterranean Countries

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Abstract: This article investigates the relationship between exports and FDI in the Mediterranean area using gravity analysis. Due to the controversial literature, the theory strongly supports the substitutional hypothesis, meanwhile, the complementary case supported empirically, others doubt that the later relationship is spurious statistical complementarity relationship. Discovering the relationship nature reflects essentially on the local and foreign macroeconomic indicators and hence the policy making. Therefore, we examine this hypothesis by using the most recent static and dynamic panel data analysis, which are H-T model, FEVD and DPD system. This application of dynamic method in the subject can avoid several econometric problems that faced researches before. We formulate an original model of two dynamic gravity equations intersected transversely to detect the relationship between the variables. The dynamic analysis shows a clear-cut substitution significant relationship between the variables. The other determinants show a significant importance of explaining both indicators.

Keywords: Outward FDI; Exports, Panel data analysis, France and MENA countries
JEL classification: F14, F21, C33

1. Introduction

In home country, export is in the focus of economic researches and decision makers due to its multiple positive contributions to improve the macroeconomic indicators. In addition, it contributes to achieve the macroeconomic stability and alleviating the macroeconomic problems, such as unemployment, trade deficit, accelerating economic growth and increasing the international competitiveness of the local economy. Similarly, firms' internationalization and increasing outward FDI improve the access for the external resources and markets, for which increases the foreign affiliates' employment and financial transfers to the local economy.

On the other hand, attracting FDI and reducing imports are in focus of decision makers in the host countries. In fact, inward FDI augmentation increase local production and improve the macroeconomic indicators, such as unemployment. Hence, formulating polices that attract FDI may also target reduce imports from FDI home country.

Therefore, the nature of the relationship of the two variables is very essential for policy making, whereas in the home country, the substitutional relationship should decrease the output and raising the unemployment in the long run, in case of FDI increasing. In contrast, the complementary relationship would stabilize the local economy and improving employment, growth, the foreign economic presence and competitiveness, and in turn boosting a positive relationship with each other, and vice versa in the host country.

The relationship between FDI and exports is complex since there are several aspects that must be taken into account. In addition, controversial literature discussion about the nature of the relationship exists; where the theory strongly supports the substitutional hypothesis, meanwhile, the complementary case supported by many empirical researches, others doubt that the later relationship is spurious statistical complementarity relationship, Head and Ries (2004).

This article studies the relationship between the French outward FDI and exports in the selected MENA countries (Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Turkey), which France is one of the main exporters and investors in the Mediterranean area. The Mediterranean area is one of the most important areas, which has high potential trade and investment in the future, in case of more economic integration progress with and within the area. Hence, this work would participate in understanding the economic effects of these international activities, at the country and region levels, and to detect the further effects of the Union for the Mediterranean process. In addition, it participates to the theoretical debate about the relationship nature between these variables, Head and Ries (2004).

We proceed as follows; Firstly, we briefly review the related literature of the relationship between exports and FDI. Secondly, we present the model and predict the relationship between variables. Thirdly, we present the data. Fourthly, we introduce three econometrics methods used in the estimation; which are two static methods, Hausman Taylor (H-T) and Fixed Effect Vector Decomposition (FEVD). In addition, we use Arellano-Bover/Blundell-Bond (ABBB) method, which is the Dynamic Panel Data System (DPDsys). Finally, we estimate and conclude.

2. Literature Review

Exports and overseas production (FDI) are alternative modes for serving foreign markets. MNEs are recently facing an important question, i.e. should they provide the market in country j (foreign market) using the existing factory in country i (home country), or should they invest to manufacture locally in country j. For example, should the French MNEs supply their cars to the MENA consumers by exporting from their plants in France or by setting up other car plants in the MENA countries? This example clarifies that exports and FDI are an alternative strategies to provide products to the foreign consumers. Many empirical studies have struggled to support this proposition and others to contradict it. Meanwhile, the previous MNEs theories literature formats a good base to explain the relationship between exports and FDI, but it still controversial. In fact, we should ask why we interest to know whether exports and FDI are substitutes or complements. Multinationals play a leading role in the world economy. Different groups and parts are interesting about various subjects such as environment, balance of payments, labor market, tax revenue and others, and how these subjects could be affected by the globalization, and the relationship between multinationals activities, Head and Ries (2004).

In addition, the government formulation to the trade and foreign investment policies benefits from clear understanding of how MNEs make decision choice between exports and FDI. For example, could the increasing of FDI tax cost induce more production at home? Or would less favorable tax treatment for income earned by overseas affiliates simulates the manufacturing sector at home and encouraging local production? On the other side, if the overseas activities tend to complete home activity, it may not actually be in domestic workers' interest to discourage overseas investment, because it won't increase the unemployment level, Head and Ries (2004). In addition, understanding of the factors, which determine the decisions of MNEs strategy choice decision between exports and FDI. In addition, the analysis of the main strategy, chosen by these multinationals, whether to serve a foreign market via exports or FDI formulates a paradox between different researches. The previous discussion shows that the internal economic indicators of production and employment will be affected either positively or negatively depending on the expected relationship between FDI and exports, whether its substitutes or complement.

The multinationals theories show that country and company characteristics affect the company decision of serving the foreign market. The two possible strategies of serving the foreign market are exports and FDI, in which the productivity, company economies of scales and other company characteristics which influence the profits that determines the strategy decision at the company level, Helpman et al. (2004). In addition, fixed costs of setting up a new factory and home country comparative advantage positively related to exports and negatively to FDI. On the other hand, the similarity between countries, relative factor endowments, market size, exchange rate, openness and others influence the strategy decision on country level. In addition, trade cost or distance is positively related to FDI and negatively to exports.

Traditional economic theory identifies a clear cut relationship between FDI and trade, Mundell (1957) investigates the role of capital mobility in the two-sector HO static model, he sets up an extreme case where capital is perfectly mobile and labor completely immobile, where the flows of FDI and trade pattern depend on the differences in factor prices and factor endowments between countries. With international factors becoming mobile, these differences become smaller. Therefore, he concludes that capital mobility driven by FDI constitutes a perfect substitute for exports. These theories depend on presumptions made upon the sources of comparative advantages, and on the factor-price-equalization result of the free trade in goods. Brainard (1993) depending on the proximity concentration trade off introduced transportation costs and economies of scales at the plant level, to get substitution relationship between exports and FDI.

Additionally, other theories, as for instance the theory of internalization Williamson, (1975); Markusen and Venables, (1995) suggest that FDI substitute for exports as the OLI conditions as developed by Dunning (1977). Furthermore, Brainard (1993) states that the "proximity-concentration trade off" that determined by the companies fixed costs, transportation costs, and trade barriers, which is the explanation for the substitutive link between FDI and trade.

On the other side, Markusen (1983) based his analysis on H-O and with free movement of factor movements between countries. Capital movements and goods trade are complements if differences in production technology, product market distortion (production taxes, monopoly and increasing returns to scale), or factor market distortion exist.

The theory of international capital markets that considered an important determinant for FDI and consists of two main models. The first, Capital Asset Pricing Model (CAMP), and the second is the Arbitrage Pricing Theory (APT). The two models considered substitutional relationship between exports and FDI, Heckelei and Weissleder (2008).

The analysis on the country level shows a dominant complementary effect, Clausing (2000) investigates the relationship and found a strong positive influence of FDI on exports. Falk and Hake (2008) also investigate the relationship at the country level using panel data causality testing method, they got strong complementary relationship between outward FDI and exports in both directions similar to Pfaffermayr (1994, 1996) using causality testing method. Andersen and Hainaut (1998) find a complementary relationship for the USA, Japan, and Germany but not for the United Kingdom.

Head and Ries (2004) argue that the two variables may be substitutes for each other, but unobserved variation possible in the extent that customers prefer the particular goods produced by home country firms when this demand is relatively high, home exports and affiliate production sales will tend to be high and conversely, exports by other less preferred firms will be lower.

Some researches argue that different types of data could be used or lack of using sufficient group of explanatory variables to study the relationship between exports and FDI may lead to statistical complementarity, which results from unobserved demand cause increasing in the FDI and exports, and the economical relationship doesn't exist, Head and Ries (2004).

An important aspect of empirical research on the effects of FDI on exports is addressing the issue of a spurious statistical relationship (complementarity relationship) which defined according, Greenaway and Kneller (2007) that exports and FDI become positively correlated if there are horizontal or vertical complementarities across product lines. Specifically, it would be incorrect to interpret a simultaneous rise in exports and foreign investment resulting from an exogenous increase in foreign demand as evidence of a complementary effect. Likewise, it may be the case that companies with superior products both export and invest overseas more than other companies, but this does not imply that more FDI generates higher exports, Head and Reis (2001).

The case of representative company with single product, which in case of the countries have identical endowments, preferences and technology, the complementarity relationship could stands. These companies continue entering the foreign market as investors until satisfying the foreign market capacity, which starting to crowd out partially and decrease profits. The last case also allow for the co-existence of the both strategies. On the other hand, if exports increases marginal profits, this will lately increases FDI, which present FDI and exports complementary strategies, Head and Reis (2004).

Finally, while the theoretical justifications to suggest both complementary and substitutive relationships, unless, the substitutive reasons are wider theoretically, and this may return to the basic assumptions and limitations on traditional theoretical models.

On the other hand, empirical literature shows widely and net justifications for complementary relationship between exports and FDI affiliates sales (outward FDI and exports), through different types of works which switching or diverging theoretical results.

Our work contributes to the controversial discussion, in addition, its first work in the Mediterranean area relating to the subject, according to our knowledge.

3. The Empirical Model

Basing on the previous empirical literature in the field, we derive two dynamic equations for the empirical examination. In addition, we include the main determinants of exports and outward FDI which are the following. The GDP growth rate, similarity between both countries France and each j country, the weighted geographical distance between France and each j country, the bilateral exchange rate and finally, the economic freedom, which includes an indices of different risk types of political or and economical risk.

In this section, we discuss each of these determinants, and state the predicted relationship (sign) for each explanatory variable with the dependent one, which specify the role of the host area to attract the French FDI or receive the French exports.

Initially, the two dependent variables are the exports for the first equation, and the FDI for the second equation. We detect the relationship between the exports and the FDI by the

transversely interconnection between the two dynamic equations, this interconnection is done by using each dependent variable as an explanatory variable in the other equation with lags periods, Egger (2001), Xing and Xuan (2008). These variables are used in lagged periods firstly, to avoid the endogeneity problem, secondly, to ensure that each variable has started influencing the other; which the FDI needs time to affect the exports, and vice versa. Moreover, the lagged period of the independent FDI variable in exports equation, should be higher than that of the independent exports variable in the FDI equation. However, we interconnect these equations and include the lagged variables basing on the theory, which, states that FDI explain exports, and vice versa; which means the investors and the exporters learn from each other's; and to detect the relationship between them.

3.1 Foreign Direct Investment

We use the FDI stock which used recently in researches. This is to avoid the multicollinearity problem, as long as, both dependent variables influenced by the same determinants. In addition, FDI stock has an accurate measure in the economy, as such the extent to which FDI stock facilitates or obstructs trade flows, Africano, and Magalhaes (2005). FDI flow requires more lags which reduces the observation numbers, and some researchers indicate that stock is more appropriate than flow, Blonigen et al. (2004). FDI does not react immediately to the changes in the foreign demand because of the presence of adjustment costs; investment plans and capacity constraints, etc, Camarero and Cecilio (2003), hence, we prefer to use the FDI stock instead of flow.

3.2 Lagged Variables of Exports and FDI

The using of lagged exports or FDI based on many theoretical considerations as follows:

1- The lags required to achieve the effect of FDI on acquired domestic companies or the established foreign affiliates. Export oriented foreign investment should takes time more than the direct exports from home country. One can assume that building a new plant and achieving a desired level of production takes time, Girma et al. (2007). In addition, to detect the relationship between exports and FDI should allow for the presence of adjustment costs, since neither exports nor FDI react immediately to changes in foreign demand because of the presence of investment plans, capacity constraints, etc, Camarero and Cecilio (2003). Moreover, some of the information becomes available only with a lag (needs time to be available), e.g. statistics, Bevan and Estrin (2004).

2- The linkage effects between exports and FDI can be accounted by the inclusion of lagged variables, which is the main goal of our work.

3- Transferring technology accompany FDI such as patents taken out in the home country companies take time to be placed in their affiliates in the host country. There is a lag before the innovations come into operation, for example, the patents registration, Pain (1997).

4- Lagged measures of FDI and exports are used in the equations an attempt to avoid any problems with potential endogeneity. The validity of such an approach rests on the assumption that there is a unique long run relationship between the exports and FDI, Pain and Wakelin (1997). In addition, there is a potential endogeneity issue, when regressing exports on FDI, and vice versa. Hence, using FDI stock with lags should alleviate this problem, Girma et al. (2007). In addition, the problem of endogeneity occurs as there a dual causality between FDI from one

side and GDP from another, which used in constructing some of the tested variables. Similarly with exports, so to avoid this problem, we use period's lags.

5- The lagged exports variable included to take into consideration the fact that, the export performance in one year would normally act as a good predictor for the next year's exports. In addition, when foreign investors decide to build new production facilities overseas, they are influenced strongly by location decision of previous foreign investors. Hence, exporters are relatively well developed learning capability is likely to reap the early benefits from their association with a multinational company Girma et al. (2007); Pain and Wakelin, (1997); Roberto (2004). In other words, the exporters and investors learn from the previous activities of each other's. The nature of FDI can thus feature complementary or substitutive (positive or negative) spatial dependence with respect to previous FDI to the related countries. Hence, we have also to include a lagged dependent variable to account for the fact that, FDI decisions are part of a dynamic process, i.e. more FDI in a host country seems to attract more FDI in the same host country, Kukenova and Monteiro (2008).

3.3 GDP Growth Rate

GDP growth rate can be characterised as FDI-led and it is used often as proxies for the size and growth of market demand and supply. The GDP growth rate also is the national income indicator of the host economy potentiality and size, especially for market seeking FDI, which is related to total of production, consumption, and distribution of goods and services of a country, Bevan and Estrin (2004); Gopinath and Echeverria (2004); Jaumotte (2004); Hong and Hsieh (2005); Hsiao and Hsiao (2006); Nguyen (2006).

We include the GDP growth rate as a proxy for the market dimension, potentiality, which has a positive effect on both exports and FDI, Jaumotte (2004); Hong and Hsieh (2005). In addition, GDP growth captures the macroeconomic stability, e.g. the variance in growth rates, inflation or exchange rate stability, institutional stability reflected in policies towards FDI or international trade.

3.4 Distance

Distance is an important determinant of transaction flows, Anderson (1979), as a proxy for trade costs, of FDI and trade preferences. Theory suggests that firm will tend to prefer FDI to exports as trade costs rise. More distant markets will tend to be served by overseas affiliates rather than by exports, Portes and Rey, (2005); Di Mauro, (2000).

Distance can play the role as a proxy for transaction costs of foreign activities. For example, transportation, insurance, public infrastructure, communication costs, and costs of employing abroad and operating costs such as costs of institutional and legal factors, costs of local tax laws and property rights regulations. Distance assumed to increase all of the above mentioned costs, Bougheas et al., (1999); Brenton et al., (1999); Limao and Venable, (2001); Bevan and Estrin, (2004); Borrmann et al., (2005). So, distance coefficients in the model expected to be negative either on the exports or FDI, which the increasing of distance increases the trade barriers, and all other cost such as transportation and transaction costs.

3.5 Openness

Openness, namely the sum of exports and imports to gross domestic product (GDP), and more open trade regime is supposed to be conducive to stronger growth effects in the host country through the liberalization process, thereby attracting more FDI and facilitate a better FDI environment, Adamopoulos et al. (2004); Basu and al. (2003).

On the other hand, export expansion can increase productivity, offering greater economies of scale. Exports are likely to alleviate foreign exchange constraints and can thereby provide greater access to international markets and greater entrance to the local market because of the liberalization, Jayachandran and Seilan (2010).

Therefore, FDI and the openness of the economy should be related positively because FDI is encouraged if the trade regime of the host economy is liberal. This is because, given internalization advantages for investing companies, multinational companies have a higher propensity to export, Bevan and Estrin (2004). Hence, we predict a positive coefficient sign for the openness variable. In addition, many early studies of the links between exports and growth confirm a positive statistical relationship between export growth and output growth, Jayachandran and Seilan (2010). This increases the income and the market size, and hence, increases the exports from and to the market. Consequently, the higher the level of openness in the j economies, the easier it is for French investors to invest in, and exporters to export into, these countries.

3.6 Exchange Rate

Exchange rate represents the bilateral exchange rate between the French currency[1] and the currency of $j's$ countries partners in the period t. Exchange rate is one of the important components affecting FDI and exports. In the short to medium run, nominal exchange rates also have a significant impact on the ratio of price levels across related countries. It is expected that the French export increases, when the European Euro depreciates versus the importing j country's currencies and vice versa. Thus, one would expect the coefficient to be positive or negative for goods exports, in case of decreasing and increasing the exchange rate, respectively. Since the exchange rate is defined as the number of foreign j country currency units per European Euro. This means that the increasing in the exchange rate increases the number of the j country currency units per Euro, and the Euro is appreciated and the exports decreases, and vice versa.

The economic reasons behind, the supposed relationship between exchange rate and exports flow come from, the fact that the exporters pay some production costs in their own currency, while the future revenues are expressed in a foreign one. Any change in the exchange rate during the period before payment is therefore a potential loss or benefit for the exporter. Hence, the exchange rate variable is more important to explain the exports flow than that concerning the FDI, which the FDI fixed costs could be paid in an international currency, or from outside the home country in other currency.

[1] The French currency refers to the French Franc and the European Euro which depends on the period of the bilateral exchange rate used between it and each MENA currency.

The exchange rate affects the relative currency prices of closely matched manufactured goods produced in different countries. In terms of trade, an increase in the value of an importing country's currency implies a depreciation of the Euro, and it is expected to have a positive impact on exporting products that are produced in France. A higher value in Euro currency enables French investors to invest in the j economies more inexpensively, thus the amount of FDI will rise, and vice versa, which reflects positively and negatively on FDI, in case of the Euro appreciation and depreciation, respectively. A higher value in j currencies also makes exporting French products more expensive to j countries consumers, so FDI in these countries would be stimulated to overcome this cost disadvantage, which reflects positively on the FDI. Anyway, the Euro appreciation or the j countries depreciation overall effect could be positive or negative on the FDI, whereas the exchange rate may also reduce the investment, Bergstrand (1985, 1989, 1990).

In addition, $Exch$ as the exchange rate index is a good measure that would capture the competitiveness between and within the two areas (France and j countries), Njong (2008); Turkcan (2006). The index of exchange rate construct in a way that an increase in $Exch$ denotes the appreciation of the French currency. Thus, it is expected that the coefficient is negative or positive on exports and FDI. Table 1 shows exchange rate expected impacts on the French exports and outward FDI.

3.7 Similarity between Countries

We add explanatory variables in order to capture different factors that facilitate or obstruct exports and FDI flows into j countries. SIMI (as defined in the equations) is included to capture the degree of similarity between France and j countries in terms of economic development. It would captures the relative size of the markets, which induce the horizontal FDI. In addition, as would be predicted by the "Linder hypothesis", that when the investment conditions in developing countries such as insufficient infrastructure systems are discouraging, the firms in developed countries avoid shifting their low skilled production stages into developing countries. Since, the trade off between the extra costs due to these unpleasant conditions and the cost savings due to cheap labour is not favourable, Ethier (1982); Frankel et al. (1995); Africano and Magalhaes (2005); Turkcan, (2006).

Therefore, it is expected to have a positive impact on FDI and exports flows from France into j countries with higher levels of development, which tend also to have similar demand structures.

3.8 Relative Factor Endowments

The relative factor endowments variable captures the production factors relative prices, which induces the vertical type of the FDI. These types of FDI also influence the types (intermediate and final) and movements (exports and imports) of the goods.

We used the known formulas and definition of these variables, similarly to, Egger (2001), Peridy (2004).

According to Helpman and Krugman (1985), a greater differential in per capita incomes would imply a greater disparity in the relative factor endowments, which would be reflected in the

lower relative levels of intra industry trade. Thus, there is an expected negative relationship between bilateral inequality in per capita GDP and the trade in final goods (exports). Markusen (1983) argued that factor movements could give rise to trade, if it was based not on relative factor difference, but on external economies of scale and different production technologies. In addition, the included variable capturing variations in demand and in supply sizes. According to Helpman and Krugman (1985), differences in market size indicates differences in their ability to manufacture differentiated products; as countries become more similar in terms of their market size, the potential for overlapping demand for differentiated products is enhanced. Therefore, RLF_{Fj} is expected to be negative for exports (trade is intra industry nature, and positive for inter industry). In addition, while the final goods exports are expected to vary negatively with the bilateral inequality in per capita GDP between two areas, the sign for intermediate goods exports is positive. Linder (1961) and other studies use per capita income differences as proxies for consumer tastes and preferences. It has been argued that as per capita incomes of two countries become equal, their tastes and preferences also become similar. Hence, the trade in final goods rises as the difference in per capita declines, Turkcan (2006).

The expected sign of GDP per capita differences on FDI may be positive or negative depending on the strategic factors (sectors) attracting FDI (a capital or labour intensive industry). According to Buch et al. (2003), and Limao and Venables (2001), if the FDI is attracted by demotic service market in j countries, the effect should be negative, since it targets the higher purchasing power in these countries. On the other hand, if the FDI encouraged being exports platform, the effect should be positive, for which these countries have relatively low labour cost in j countries. Hence, GDP per capita differences may be increase trade relative to FDI based production.

3.9 The Economic Freedom Index (EFI)

The variable measures "ten" components of economic freedom, which represent different indices assigning a grade in each using a scale from 0 to 100, which 100 represent the maximum freedom. A score of 100 signifies an economic environment or set of policies that is most conducive to economic freedom. Overall index is calculated from the last indices in average to give an overall economic freedom score for each country. These "ten" indices of economic freedom are, business freedom, trade freedom, fiscal freedom, government spending, monetary freedom, investment freedom, financial freedom, propriety rights, freedom from corruption and labour freedom. The mentioned indices are calculated basing on the last factors and many others as prices, wages and regulation and black market activity. It is therefore an indicator of the "market friendliness" of economic policies in the host country, and reflects different types of risk (social, economical and political) and economic freedom are different between (inter) these areas and within (intra) the second area, Bevan and Estrin (2004). We expect a negative sign if countries have a less favourable environment to foreign investors or exporters, and vice versa.

Finally, we summaries the predicted effects of the previous variables on the FDI and exports, with brief explanation of the prediction reasons, in Table 2.

We build the equations and present them in the general form. The following equations include the static variables, which we derived previously, (distance, openness, GDP growth rate, similarity between countries, relative factors endowments, exchange rate and the economic

freedom index). These equations are used in two static estimations (Econometric methods) of the panel data, in the j countries. The equations take the following forms:

$$\ln ex_{Fj} = \beta_0 + \beta_1 \ln FDI_{Fjt} + \beta_2 \ln Yg_{jt} + \beta_3 \ln RLF_{Fjt} + \beta_4 \ln SIMI_{Fjt} + \beta_5 \ln DISTW_{Fj} + \beta_6 \ln Exch_{Fjt} + \beta_7 \ln OP_j + \beta_8 \ln EFI_j + \mu_j + \nu_{Fjt} \quad (1)$$

And

$$\ln FDI_{Fj} = \beta_0 + \beta_1 \ln ex_{Fj} + \beta_2 \ln Yg_{jt} + \beta_3 \ln RLF_{Fjt} + \beta_4 \ln SIMI_{Fjt} + \beta_5 \ln DISTW_{Fj} + \beta_6 \ln Exch_{Fjt} + \beta_7 \ln OP_j + \beta_8 \ln EFI_j + \mu_j + \nu_{Fjt} \quad (2)$$

Where F refers to France, and j refers to the selected Southern and Eastern Mediterranean countries, and t is time, FDI_{Fj} is the outward French FDI stock into j countries, ex_{Fj} is the French exports into j countries, which both are the dependent variable. The formulas regarding, similarity between countries (SIMI), relative factor endowments (RLF) and openness (OP) similar to the literature as follows[2]:

$$SIMI_{Fj} = \ln\left[1 - \left(\frac{GDP_F}{GDP_F + GDP_j}\right)^2 - \left(\frac{GDP_j}{GDP_F + GDP_j}\right)^2\right]$$

$RLF_{Fj} = \ln\left(\frac{GDP_F}{POP_F} - \frac{GDP_j}{POP_j}\right)$ as a proxy for relative factor endowments.

$$OP_j = \frac{\exp orts_j + imports_j}{GDP_j}$$

Yg_{jt} is the gross domestic product growth of each j country.

$DISTW_{Fj}$ is the weighted distance from France to each j country.

$Exch_{Fjt}$ is the exchange rate between the French currency to each j country currency.

EFI_j is the economic freedom index for the j countries.

μ_j represents the unobserved country specific effects.

ν_{Fjt} is the standard error.

The dynamic panel analysis includes the mentioned lagged variables. The following equations are used to run the dynamic panel data system, which calculates the first difference of the variables between the periods (t, t_{-1}). Hence, the equations are:

[2] The formulas used in calculating the SIMI, RLF and openness variables are the same to the previous literature, see (Di Mauro, (2000), Egger, (2001) and Péridy (2004).

$$\Delta \ln ex_{Fj} = \beta_0 + \beta_1 \Delta \ln ex_{Fj(t-1)} + \beta_2 \Delta \ln FDI_{Fj(t-1)} + \beta_3 \Delta \ln Yg_{jt} + \beta_4 \Delta \ln RLF_{Fjt} + \beta_5 \Delta \ln SIMI_{Fjt} + \beta_6 \Delta \ln DISTW_{Fj} + \beta_7 \Delta \ln Exch_{Fjt} + \beta_8 \Delta \ln OP_j + \beta_9 \Delta \ln EFI_j + \mu_j + \Delta v_{Fjt} \quad (3)$$

And,

$$\Delta \ln FDI_{Fj} = \beta_0 + \beta_1 \Delta \ln FDI_{Fj(t-1)} + \beta_2 \Delta \ln ex_{Fj(t-1)} + \beta_3 \Delta \ln Yg_{jt} + \beta_4 \Delta \ln RLF_{Fjt} + \beta_5 \Delta \ln SIMI_{Fjt} + \beta_6 \Delta \ln DISTW_{Fj} + \beta_7 \Delta \ln Exch_{Fjt} + \beta_8 \Delta \ln OP_j + \beta_9 \Delta \ln EFI_j + \mu_j + \Delta v_{Fjt} \quad (4)$$

The variables included represent the same variables shown in the equations (1) and (2), and they are calculated by the same formulas mentioned before.

4. Data

We use the dependent variables data of outward French FDI and French exports to Southern and Eastern Mediterranean countries, which are (Algeria, Egypt, Jordan, Lebanon, Libya, Morocco, Palestine, Syria, Tunisia and Turkey).

In addition, we use the GDP data of each j country, which used with the French GDP to calculate the similarity between France and these countries, (SIMI variable).

GDP per capita data of France and the other countries are used also to calculate the proxy of the relative factor endowments between countries, which is the absolute difference of GDP per capita between France and these countries, according the formulas introduced previously concern RLF variable).

Exports and imports of each j country also are used to calculate the openness, which used as explanatory variable. The exchange rate of French currency to each local currency of the j countries, one exception of Palestine, which the US dollar used, as it officially indicated in the UNCTAD database.

All the previous data reached from the UNCTAD data base except the outward French FDI stocks from OECD database, whereas it is available by country.
The weighted distance[3] between France and each of the mentioned countries are also included as an explanatory variable. We got the data for the weighted distance variable from " CEPII " organization.

Economic Freedom Index (EFI) is included as an independent variable, the data collected from Heritage organization website.

The overall panel data for the "ten" j countries from 1994-2009, hence, our database has 160 observations for the overall panel data sample.

[3]The weighted distance measure use city-level data to assess the geographic distribution of population inside each nation, which calculates distance between two countries based on bilateral distances between the largest cities of those two countries, those inter-city distances being weighted by the share of the city in the overall country's population. They use latitudes, longitudes and population data of main agglomerations of the countries. The distance formula used is a generalized mean of city-to-city bilateral distances developed by Head and Mayer (2002), which takes the arithmetic mean and the harmonic means as special cases.

Variables are used in logarithm. We use the variables in algorithm to reduce multicollinearity, the possible problems of endogenous variables, which should carefully deal with the dynamic panel data analysis.

5. Econometric Methodology

Hausman and Taylor (1981) specify a model as a hybrid version of the FEM and REM[4] using instrumental variables (IV) techniques. The HT approach therefore simply splits the set of time varying variables into two subsets $X_{it} = (X1_{it}, X2_{it})$, where $X1_{it}$ are supposed to be exogenous with respect to μ_i, which is country specific effect and ν_{it}, which is the error term. $X2_{it}$ variables are correlated with μ_i and thus endogenous with respect to the unobserved individual effects. The basic idea of HT model is to find appropriate internal instruments to estimate all the model parameters including the invariant variables, in empirical terms the HT model is estimated typically by Generalized Least Squares (GLS), Mitze (2010).
Finally, the order condition for the HT estimator to exist is $K \geq g$. That is, the total number of time varying exogenous variables K that serve as instruments has to be at least as large as the number of time invariant endogenous variables g, Baltagi (2008).

One recent and interesting estimator is Fixed Effects Vector Decomposition (FEVD) which developed by Plumper and Troeger (2007). This three stages FEM (two-step non IV alternatives) allows estimating parameters of time invariant variables, while addressing the endogeneity problem. Since, the unobservable individual effects capture omitted variables including time invariant variables, so, FEVD estimates a first stage FEM to obtain an estimate of the unit effects in the first stage. Therefore, in the second stage, it implements an instrumental regression of proxy of the individual effects (decomposing the fixed effect vector), obtained from a first stage, on the time invariant variables to obtain estimates for these variables from one side, and on the term error from another side. In the third and last stage, the model re-estimated by pooled Ordinary Least Squares (OLS), including all explanatory variables, time invariant variables and the error term. This allows firstly controlling the collinearity between time invariant and variant variables at the right hand side, and secondly, correcting the number of degrees of freedom for the use of a generated regressand in this second step, Greene (2010), Mitze (2010).

Hence, for the static analysis of the panel data, we estimate Fixed Effects Vector Decomposition (FEVD), and Hausman Taylor (HT).

The dynamic panel data is GMM systems approach that estimates the parameters from a system of equations: the first differenced model using lagged levels of FDI and exports as instruments for the lagged difference of FDI and exports, and the level model using lagged differences of FDI as instruments for the lagged level of FDI firstly (similarly for exports). Secondly, use the difference instrumental variables in the model, Arellano and Bover, (1995); Arellano and Bond (1998); Blundell and Bond, (1998).

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[4] Standard estimators for the static panel data model, which control for the existence of individual effects, are the Fixed Effects Model (FEM) and Random Effects Model (REM) approaches. The econometric analysis with these two models addresses several biases, these biases related to heterogeneity across countries and time. The problem with standard FEM is that, it cannot estimate parameters, which are time invariant, such as the distance variable in our panel data. On other hand, the problem of standard REM is the biases caused of endogeneity problem due to the potential correlation between one or several explanatory variables and the residuals. However, choosing among the FEM and REM estimator rests on an all or nothing decision with respect to the assumed correlation of right hand side variables (explanatory variables) with the error term. In empirical applications, the truth may often lie in between these two extremes, Mitze (2010).

Hence, for the dynamic analysis, we use Arellano-Bover/Blundell-Bond (ABBB) method, which is the Dynamic Panel Data System (DPDsys). We rely on dynamic analysis to state the relationship between exports and FDI for the panel data, in the areas and time zone stated before, through the transversely connection between the equations.

6. Results

Tables (3, 4) show the different models estimators, the long run coefficients and the post estimation test that show models validity. We calculate the long run coefficient for the different variables, according the following formula: Long run parameter (coefficient) = estimated ABBB parameter[5]/ (1- parameter corresponding to the lagged variable).

We introduce the Variance Inflation Factor (VIF) for the multicollinearity test. We test for multicollinearity to ensure a precision and robustness of predictions. We use the variance inflation factors (VIF) method to calculate an index, which measures the variance increasing of the coefficients due to multicollinearity. In practice, a VIF greater than 10 would indicate a presence of multicollinearity, whereas a VIF greater than 30 becomes problematic requiring specific corrections Kennedy, (2003). The variance inflation factor presented in the results is less than "3" that shows none presence of the multicollinearity problem for both equations.

In addition, we run Sargan test, which detect any possible problems with the instruments used in the dynamic analysis. The results shown clarify that, we are long away from rejecting the null hypothesis. Sargan test shows that all moment restrictions are satisfied for the dynamic specifications is not rejected (null hypothesis) at "1" percent significance level.

In addition, we test for the autocorrelation after the test of the two equations. The results for both equations are significant to accept the null hypothesis, which is none existence of the autocorrelation. The hypothesis that first-differences residuals are first and second order serially correlated can be rejected in all specifications. This is a necessary condition for valid instrumentation and can be seen from the robust test for first and stronger in second order serial correlation.

These tests strictly prove the robustness of the results, and no any serious related problems.

Statistically, we find robust results for the different models, the previous results show the models robustness, which fit the data and able to explain the relationship between the variables.

In the static models the coefficients, in general, are highly significant. The FDI and exports variable should be treated dynamically to avoid the endogeneity problem. Exports and FDI variable have a negative relationship and both are related negatively with distance.

The dynamic analysis proves significantly the substitutional relationship between exports and FDI, in the absence of the endogeneity problem, and the presence of time lags. FDI needs a comparatively longer time than exports to influence the future exports and to be executed, as explained before.

Table 5 shows that the independent variables are in line with the predicted relations and the economic literature.

[5] The ABBB refers to the Arellano Bover/ Blundell Bond model.

7. Conclusions

The dynamic panel data analysis emphasizes a clear-cut negative relationship between the exports and outward FDI. Exports have a stronger substitutional impact on FDI, than that of FDI on exports. FDI and exports can explain each other, and the two variables influenced mainly by the same determinants. Similarity between countries, relative factor endowments have strong impact either on FDI or exports, meanwhile, they have stronger impact on FDI, which explains horizontal and vertical FDI, respectively. Exporters and investors enhanced by their previous, and each other, activities. In addition, exporters are more influenced by their previous history, comparing of investors.

Endnotes

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Table 1: The exchange rate impacts on the French exports and outward FDI.

Exchange rate	**French Exports**	**Outward FDI**	**Euro**	**The *j* currency**
Decreasing	Positive	Negative	Depreciation	Appreciation
Increasing	Negative	Positive	Appreciation	Depreciation

Table 2: The expected effect of the explanatory variables on exports and FDI.

Variables	**Exports**	**Theoretical considerations**	**FDI**	**Theoretical considerations**
Lagged exports	+	The same variable but lagged (previous trend).	-/+	Positive if complement, negative if substitute.
Lagged FDI	-/+	Positive if complement, negative if substitute.	+	The same variable but lagged (previous trend).
Openness of host countries.	+	Higher access for the multinational activities into the area.	+	Higher access for the multinational activities into the area.
Similarity between countries.	+	Expected pleasant development conditions for investors and exporters between the two areas.	+	Expected pleasant development conditions for investors and exporters between the two areas.
Relative endowments between countries	-/+	Negative for intra industry nature, and positive for inter industry nature.	+/-	Positive with relatively low labour costs, and negative if attracted by service sector.
Bilateral exchange rate	+/-	Positive if Euro depreciated, negative if Euro appreciated.	+/-	Positive if Euro appreciated, negative if Euro depreciated.
GDP growth of the host countries	+	GDP growth attracts FDI and exports.	+	GDP growth attracts FDI and exports.
Distance between the two areas.	-	Negative which increases the trade barriers, transportation and transaction costs.	-	Negative which increases the trade barriers, transportation and transaction costs.
Economic Freedom Index (EFI).	+/-	Positive if environment favourable to FDI and exports into the area, and vice versa.	+/-	Positive if environment favourable to FDI and exports into the area, and vice versa.

Table 3: The models estimators and the long run parameters for exports equation

Exports to *j* countries				
Exports equation	**DPDsys**	**Long-run parameter**	**Hausman-Taylor**	**FEVD**
Lagged 1	0.74*** (14.58)			
FDI	0.058** (2.03)	-	-0.004 (-0.19)	-0.00008 (-0.01)
Lagged 1	0.0003 (0.01)			
Lagged 2	-0.064** (-2.23)	-0.25		
RLF	0.244* (1.86)	0.94	0.59*** (4.91)	0.60*** (6.64)
SIMI	0.403*** (3.85)	1.55	0.88*** (7.03)	0.83*** (22.43)
GDP growth	0.064* (1.84)	0.25	0.0006 (0.08)	0.0012 (0.17)
Exchange rate	0.0003** (1.97)	0.0012	0.14*** (3.32)	0.11*** (13.6)
Openness	0.156 (1.01)	0.6	0.73*** (3.10)	0.46*** (6.15)
Distance	-0.25* (-1.81)	-0.96	-2.11*** (-2.67)	-2.11*** (-28.03)
EFI	0.46** (2.44)	1.77	-0.01 (-1.58)	-0.44*** (-4.01)
Constant	2.81* (1.73)		19.62*** (3.19)	19.2*** (20.35)
N. of obs.	150		160	160
	Wald chi2(11) = 54305.66***		Serial corr. (Rho) = 0.94	adj. R-squared= 0.98
Mean VIF (Variance Inflation Factor)			2.15	
The Sargant test	H0:overidentifying restrictions are valid			120.8***
Arellano-Bond test for zero autocorrelation in first-differenced errors				
Level 1	-1.956**			
Level 2	1.2733***			
	H0: no autocorrelation			

The symbols *, **, *** stand for the 10%, 5% and 1% significant.

Table 4: The models estimators and the long run parameters for FDI equation

Outward Foreign Direct Investment Stock to *j* countries				
FDI equation	**DPDsys**	**Long-run parameter**	**Hausman-Taylor**	**FEVD**
Lagged 1	0.56*** (8.73)	-		
Exports	0.49 (1.6)	-	-0.14 (-0.48)	-0.011 (-0.08)
Lagged 1	-0.50* (-1.66)	-1.14		
RLF	0.80* (1.93)	1.82	2.04*** (4.38)	1.14*** (3.80)
SIMI	0.83*** (2.89)	1.89	3.35*** (7.26)	3.93*** (11.79)
GDP growth	0.07 (0.53)	0.16	0.026 (0.94)	0.27** (2.12)
Exchange rate	0.0008 (1.55)	0.002	-0.28* (-1.75)	-0.5*** (-9.83)
Openness	1.62** (2.33)	3.7	2.54*** (2.87)	1.6*** (4.32)
Distance	-1.06** (-2.08)	-2.41	-1.53** (-1.89)	-0.7** (-2.46)
EFI	0.99 (1.61)	2.25	1.8* (1.73)	1.5*** (3.17)
Constant	-0.26 (-0.04)		-15.13 (-0.73)	-26.5*** (-6.7)
N. of obs.	150		160	160
	Wald chi2(10) = 3170.21***		Serial corr. (Rho) = 0.91	adj. R-squared= 0.85
Mean VIF (Variance Inflation Factor)			1.82	
The Sargant test	H0:overidentifying restrictions are valid			116.08***
Arellano-Bond test for zero autocorrelation in first-differenced errors				
Level 1	-1.8738**			
Level 2	1.4523***			
	H0: no autocorrelation			

The symbols *, **, *** stand for the 10%, 5% and 1% significant.

Table 5: The relationship direction between the variables, in the econometric results.

Variables	**Exports**	**FDI**
Lagged exports	+	**-**
Lagged FDI	**-**	+
Openness	+	+
Similarity	+	+
Relative endowments	+	+
Bilateral exchange rate	+	+
GDP growth	+	+
Distance	**-**	**-**
Economic Freedom Index (EFI).	+	+