The Effects of China Performance on World Economic Growth, an Empirical Approach

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Abstract

The impressive growth of Chinese economy has become a global issue for the study of the world development. Since the 2009 economic crisis, China has gained more attention in developed countries, as the impacts caused by the crisis on China's economy have been imperceptible, and instead its economic strengths are being an important dynamic for the global economic growth. Applying cointegrated and autoregressive vectors, the present study shows that Chinese economy has a positive causal relationship on United States, Canada, European Union and Japan on selected economics variables, such as employment, economic growth and productivity. Nevertheless, in the Mexican case the relationship is negative, which is consistent with other researches that show the existence of competition between both countries.

Keywords: economic growth, employment, productivity, cointegration, Granger causality.

JEL classification: C32, F43, O11.

I. Introduction

The recession of 2009, which affected the global economy, had consequences which put the ability of developed countries to take a path of vigorous and stable growth in doubt. The severity and extent of the crisis has been greater than observed in previous recessions; a situation which affected goods, services, labour and financial markets (Hurd and Rodhwedder, 2010). The financial imbalance which provoked the recession is closely linked with the unsustainable increase of credit granted in the years preceding the crisis and, equally, the inefficient regulation of the financial markets (Bordo and Meissner, 2005), particularly for those associated with derivative instruments and incorrect risk assessment. Boz and Mendoza (2010) indicate the growth of credit and the indiscriminate utilisation of authorised financial engineering since the beginning of 1980s, as an essential part of the credit boom, which caused the collapse of the North American financial system. This forced the intervention of the government and the Federal Reserve (Cecchetti, 2009; Mishkin, 2010).

As part of the strategy implemented to prevent a possible depression, a significant portion of developed countries have created support and rescue programs for financial sector companies. This injection of resources implied an important effort which while helping to avoid greater systemic damage also contributed in the short term to a compromise of the old fiscal equilibrium that some governments maintained prior to the start of the crisis. Nevertheless, despite the bank crisis and credit bubbles were the product of private debt, in order to evade a greater crisis, the developed governments incurred in new fiscal deficits, which negatively affected their spending capacity and consequently their capability of improving their economic growth.

The levels of external debt in proportion to Gross Domestic Product (GDP) reached are worrying. That the external debit of Great Britain has come to represent 391% of the GDP, France's is 208% and that of Ireland a staggering 1,120% of its GDP can be used as examples of this. Furthermore, one cannot avoid the fact that such a problem remains closely linked with prevalent fiscal disequilibrium. Even if the aforementioned does not qualify as a new behavioural pattern, this does restrict the capacity for recovery in the global economy in current times. The cases of Italy, Japan, Ireland and the United States constitute some of the more symbolic examples in which public debt makes it unlikely that unsustainable spending habits can be maintained. In other words, this suggests that finance will be generated through tributary income before additional debt is considered.

As a consequence, during the coming years, public debt in developed economies will impede the application of expansive fiscal policy. The problem is considerable; this is fundamentally due to the fact that the combined debt of the developed nations has reached levels not previously seen since the Second World War (Reinhart and Rogoff, 2011). In Europe, for example, the level of public debt has obligated diverse governments to implement programs of adjustment to their spending. This strategy, aside from slowing their economies, will provoke a crash in certain production sectors of countries to which they find themselves closely linked.

The uncertainty of the future performance of the North American financial system (Hatzious et al., 2010) and the global economy in general, is a contributory factor as to why we question the capability of developed economies to re-emerge as catalysts for economic growth in the coming years. The permanence of the negative effects of the crisis; which include high unemployment rates, a possibility for an increase in interest rate on behalf of the central banks, particularly in the case of the Federal Reserve and the burden of public debt, limits the chance of economic recuperation. The aforementioned, specifically affects the finance received by the private sector, which has not yet recuperated the level it held prior to the financial collapse. Given that part of domestic consumption has been achieved through the use of credit, the reduction of the same, limits the possibility to achieve sustainable economic growth. The lack of finance can be observed in sectors such as housing and construction, where weak performance, similar to that achieved during the harshest period of the crisis, still persists.

Therefore, a scene is faced in which it is important to question the role other countries could play in order to propel economic growth. These countries include those catalogued as "emergent", and China is one that stands out from the group. The rate at which China has raised its productive capacity, increased the size of its economy and population, constructed strategic alliances with overseas companies and applied policies in order to position itself as one of the greatest global economies, make this Asian country an important case of study. This analysis is divided into the following subheadings: II Strengths of the Chinese economy, III Methodology and data IV Results and V. Conclusions.

II. Strengths of the Chinese economy.

Economic history has focused its efforts on the explanation and the understanding of strengths or determining factors for growth and development in countries which are in favour of satisfying needs in addition to guaranteeing the administration and distribution of scarce resources, which is possible through economically oriented policies, with the population's welfare as the key objective. For their effective fulfilment to be achieved, it is essential to carry out strategic planning over the long term. This planning allows a global project to be visualised in which economic agencies can work with commitment and motivation to a goal of reaching their established intentions.

Over time, it has been possible to evaluate the instrumentation of these policies and examine the stories of economic success and failure as they present themselves. As such, China has consolidated itself as one of the most economically successful nations. China's leadership has been notorious since 1979 due to the implementation of economic reform and the growth achieved due to the creation of its free market and market opening under the strict government leadership and supervision. These strategies are the cornerstone of China's becoming a key nation on the world stage in terms of growth and development. The structural changes carried out in China show the presence of clear and measured objectives on a national scale, which constitute tactical and operative planning such as a political and economic model. The latter boasts strong domestic and external markets, which has been a fundamental pillar in its transformation into the great regional power. China's economic influence originates not only from its productivity but also due to its levels of innovation and development implemented as a result of an internal and external analysis, which was focused on both areas (Tamames, 2001).

These measures have taken China's population to higher living standards with a greater distribution and a growing Gross National Product per capita. Thus, China has an ever increasing middle class and a considerable reduction of poverty. If we are to recognize that China does not yet meet the living standards of other developed countries, we must also accept the fact that the economic advances achieved in the country over the last three decades have allowed it to position itself as a second global economy with the propensity to become a developed country by the middle of the current century. China's restructuring has been a task of more than three decades: maintaining an average rate of growth of 16% per capita since 1982 and its complete incorporation into the international economic system.

Three important sources which explain China's vigorous economic growth have been specifically identified by Hu and Khan (1997): the accumulation of capital, productivity and global integration. In terms of the first factor, it is presented as a phase of accumulation of capital between 1952 and 1978 (Perkins, 1988 and 1989; chow, 1993), after which reforms could be implemented which were directed towards a market economic system with expansion in the private sector, as represented by the second growth factor. Finally, the opening policies, which incorporate global integration, are responsible for the high levels of external trade and the extraordinary quantity of international reserves. In terms of the first aspect, China is now the primary exporter on a global level with its international reserves surpassing two billion dollars in 2010. These are important factors. Differing studies identify them as fundamental elements in economic progress. Solow (1956) presents an exogenous model of growth, through the analysis of the relationship of variables, which have an impact on it in the long term, outlining the accumulation of capital as a determinant for economic growth. As such, the Chinese policies which favour this mechanism deem to explain part of its extraordinary economic expansion.

At the same time, the market opening benefits the macroeconomic environment of a nation. In the specific case of China, the profit from the international market arises due to the diversity of its export products (Feenstra and Kee, 2007). This profit translates to higher levels of productivity and foreign direct investment, which affect not only one sector of the economy but various. This implies an ulterior development on a global level as opposed to being centralized, as much on a sector level as a regional one. At the same time, the expansion of the private sector had positive implications for productivity and, thus, for economic growth, through the notable increase in total productivity of the factors, with better levels of efficiency and technology (Liangke Xia, 2009).

Similarly, Elwell and Labonte (2003) identify three fundamental causes in order to understand China's accelerated growth: 1) investment and savings, which originates in an important time, from which the accumulation of capital permitted the financing of economic reforms. 2) Foreign direct investment, which arose from the decentralization of production and has been an important source of capital growth. Finally, 3) the growth of productivity, which accompanied by continuous policies and, in agreement with Goldman Sachs (2004), has significantly reduced the inefficiencies of the system.

These factors remain in line with those purported by Hu and Khan (1997) because, as mentioned, the accumulation of capital through saving and investment represents a source of economic growth. However, as mentioned by Solow (1956), this is a source of growth, which explains 20% of it. The other 80% is due to the increase in efficiency or productivity, with which said capital is utilized. Equally, foreign direct investment has positive effects on the economy. This works as a conduit for technology from developed countries to those on track to development (Balasubramanyam et al., 1996; Borensztein et al., 1998) and, at the same time, makes possible the establishment of technology and innovation, as keys to economic growth (Romer, 1990).

Empirical studies in China, such as that of Berthélemy and Démurger (2000), support the idea and stress the importance of the decisions of foreign investment as a factor in potential growth. In the same way, China's production processes show great strengths in terms of innovation, not only on the level of production but also by incorporating the administration and planning processes acquired due to the innovation, which was brought in through foreign direct investment (Buckley et al., 2007). This theoretical aspect has allowed China to evolve from a manufacturing economy with cheap labour as its prime objective to a production model with greater added value. Complementary to this, two additional factors exist, which have had an important influence on China's economic development, and which seem to be inter-related: human capital and the redistribution of the labour. Therefore, a large part of the workforce has been reassigned from the agricultural sector to the industrial and service sectors, in other words, directing resources into sectors where greater value is added (Woo, 1998; Borensztein and Ostry, 1996; Sachs and Woo, 1997). The reforms to redistribute the labour to more productive areas did not only increase China's efficiency but also, with market reforms, attracted more private investors willing to incorporate more added value in their production processes, with costs still being low, in an environment of constant economic growth.

Similarly, the human capital has had positive effects on workers individual production levels and is a factor in the growth of productivity in China (Fleisher, Li and Zhao, 2007). The authors suggest that the input of human capital has positive effects on the growth of total factor productivity and acts as part of the innovative process in national activities. Furthermore, Wang and Yao (2001) conclude that the incorporation of human capital in China has been vertiginous and has contributed significantly to the growth of a wealthy generation, principally after the reforms implemented in 1979.

In addition, following the 1990s, China has created alliances and investment together with other countries in order to develop its investigation and development sectors (Moris, 2004 and OECD,[1] 2005). In the last 12 years, the development areas linked to technology have maintained an average rate of growth of 60%; constituting an important impulse in its national economy, which creates the possibility that China could, in the coming years, consolidate itself as a power in areas associated with information and communication technology. In consequence, even though it is true that manufactured products maintain their primacy in the attraction of foreign investment, it is also true that, within this dynamic, the sectors associated with technology have also increased their importance in terms of receiving foreign investment (Laudicina and White, 2005).

Throughout this type of behaviour, an important influence originates from the development model followed by China: a substantial State presence in the control of the financial sector, support for government owned companies, a process of imports substitution, high levels of saving along with greater dependency on the export sector as a source of growth (Seung-Wook, 2005). The State's influence on the process of economic reform, which China followed, can be seen in the geographical location of the first stages of the market opening. These locations are concentrated in coastal regions. Together with the aforementioned, the model followed by the Chinese economy has allowed it to remain on the margin of financial events which arrested the growth of other Asian countries between 1997 and 1998. Among the principal characteristics which explain this fortitude, the State's control over capital flow, commercial surplus, continued arrival and growth of FDI and ever increasing international reserves (Lardy, 2000). Equally, the main beneficiaries of bank loans continue to be State owned companies. These companies continue to receive substantial economic support in order to remain competitive both in the domestic market and in the world market (Seung-Wook, 2005)

In this context, we can appreciate that higher level of FDI provides the Chinese economy with a stable income of capital. Aside from this, it is also possible to highlight the business links generated by foreign direct investment which allows for the improvement of management practices, production techniques, marketing and logistics. These are all important aspects in terms of information about the behaviour and development of the world market (Agarwal and Wu, 2004).

Finally, the success of the Chinese strategy has been accompanied by the willingness of other countries to take advantage of their comparative lead. One example of this is Japan, a country which has influenced the selection of its private investors in order to plant FDI in China, a situation which has generated important economic links in certain manufacturing sectors. This is especially apparent in sectors with links to the electronic industry (Lütjhe, 2004, Nanto and Chanlett-Avery, 2006, Alvstam et. al 2009). In the same manner, the National Retail Federation (2005) and Elwell et al. (2007) show that economic growth and the labour market in the United States favour the greater commercial exchange with China. The economic and financial integration of this Asian country with the United States, Japan and the European Union (Huseyin et. al, 2010) means that a greater number of companies have intended to establish production links, which will benefit both parties. In general, 450 of the five hundred biggest companies in the world have already invested in China as have investors from 202 different countries. This makes strong interactions between Chinese producers and the rest of the world possible(Ahearne, Fernald, Loungani y Schindler 2003 y Ianchovichina y Walsmley, 2005). In accordance with this official information, companies founded by foreigners or the Chinese from overseas increased from 26,981 in 2000 to 54,092 in 2005. This substantially raised the productive offering of the country and, in addition, increased its ability to contribute to global economic growth.

III. Methodology and data

Given the purpose of proving the Granger's (1969) causal relationship between Chinese variables and Canadian, European Union, Japanese, Mexican and American economic performance, the present analysis attempts to provide enough positive evidence by using three different time series methodologies. Causality is understood in the Granger's sense (1969). Following Ghartey (1993), the null hypothesis "Y does not cause X, given other variables" is tested via a standard F-test. Nevertheless, Toda and Phillips (1993a, 1993b) showed analytically that levels of auto regression are unreliable for estimating any causal relationship. In this way, Sims, Stock and Watson (1990) affirm that asymptotical distributions cannot be used to test restrictions in a VAR model if the variables are integrated.

[1]Organisation for Economic Co-operation and Development.

If sets of two or more variables, in a VAR, have common stochastic trends, they are cointegrated and exhibit a long-run economic relationship. A system of reduced forms with cointegrated variables may be estimated in two different ways: a VAR in levels (Toda and Yamamoto, 1995) or as a VEC. According to Engle and Yoo (1987), Lin and Tsay (1996) and Naka and Tufte (1997), there are some long-run advantages of using a VEC, specially because the results of the constrained model fit better to the expectations at longer horizons. Nevertheless Naka and Tufte (1997) also had shown the absence of a statistically relevant difference in the short-run. In order to solve those problems, firstly it applies Gunduz and Hatemi-J (2005) proposal, which has two relevant aspects: the application of the information criterion introduced by Hatemi-J (2003) to determine the optimal lag order in a VAR, and the Toda and Yamamoto´s (1995) procedure to elaborate a VAR in levels. The previous method produces reliable outcomes when time series are cointegrated. Also, but using the Hatemi-J lag's test in order to estimate the correct VAR's order, the Liu Song and Romilly's (1997) VEC methodology is applied to test if any causal relationship between cointegrated series exists. Finally, when the times series don't have a long run relationship, a VAR model is elaborated.

Regardless which time series approach is applied, the first step ii to test if the times series are stationary. A univariate Augmented Dickey-Fuller (ADF) and Kwiatkowski, Phillips and Shin (KPSS) unit root tests were run for each variable in order to determine the existence and number of such roots. In this sense, the decision tree process proposed by Charemza and Deadman (1992) testing for the significance of trend and drift together with non-stationary was applied. Secondly, the Johansen (1988) and Johansen and Juselius (1990) cointegration analysis was implemented. The cointegration test applies maximum likelihood to a VAR model assuming that the errors are Gaussian.

In the case of Toda and Yamamoto's (1995) procedure, the authors propose an augmented VAR (p+d) model for testing causality, if the variables are integrated (p is the VAR's lag order and d is the integrations order of the variables). Consequently, the following VAR (p), in levels, is used:

$$y_t = \nu + A_1 y_{t-1} + ...A_p y_{t-p} + \varepsilon_t \qquad (1)$$

Where ν is a vector of intercepts, y_t is the number of variables [I (d)] and ε is the vector of errors terms. In the Toda and Yamamoto's proposal, the causal relationship test does not include the additional lag(s), i.e. d . Toda y Yamamoto (1995) also introduced a modified Wald (MWALD) statistic for testing the null hypothesis of non-Granger causality (see appendix).

The VEC analysis procedure applied in this paper was developed by Liu, Song and Romilly (1997), Chandana and Paratab (2002) and Liu, Burridge and Sinclair (2002), in the causality analysis for cointegrated series. Mainly, testing the existence of some log-run relationship requires a pth-order structural and dynamic VAR model. The VEC model is defined by means of equation 2

$$\Delta y_t^* = J_k^*(L)\Delta y_{t-1}^* + \Pi y_{t-1}^* + \varepsilon_t \qquad (2)$$

$$J_k^*(L) = \sum_{1}^{k-1} J_i^* L^{i-1} \qquad (3)$$

$$J_i^* = -\sum_{l=i+1}^{p} J_l \qquad (4)$$

$$\Pi = \alpha\beta^{'} \qquad (5)$$

The VEC avoids the inconsistencies within the findings of causality in a bivariate environment such as: a) the resulting bias of omitting relevant variables, and b) the unreliable result as a consequence of estimation with non-stationary variables. Therefore, the proposed methodology can be resumed in the construction of a VAR of n variables and p lags.

The main objective here is the study of the statistical significance of the higher-order lagged coefficients in the VECM's. The methodology applied the Wald test over each variable in turn. If those coefficients are significant, the existence of causality is proved and it is possible to obtain the direction of every causal relationship.

Finally, the present paper estimates if the cointegration relationships obtained remains constant during the time period's sample. Hansen (1992), Tanaka (1993), Quintos and Phillips (1993) and Quintos (1997, 1998) developed different tests to study the constancy in the cointegration rank. Basically, the constancy cointegration test shows if the number of the long-run relationships remains stable during the time period's sample. If the cointegration rank remains stable, it is possible to affirm that a structural change does not exist, and the outcomes will be more robust. This paper uses the results obtained by Quintos and Phillips (1993), and Quintos (1997, 1998). To analyse the constancy rank, Quintos applies a Likelihood Ratio (LR) test to compare the possibility of existence of more cointegration relationships and a Lagrange Multipliers (LM) test for fewer relationships. The results obtained must be compared with the tables that present the critical values developed by Quintos (1997) and Mackinnon, Haug, and Michelis (1999).

All variables are in a yearly basis. The time period covers since 1989 to 2010. Potential GDP, CPI index, productivity index and total employment of Canada, Japan, Mexico, the European Union and the United States are obtainable from Organisation for Economic Co-operation and Development (OCDE). Chinese exports to Canada and United States are available in Statistics Canada and the U.S. Census Bureau respectively, Mexican data was obtained from the Mexican Central Bank's (Banxico). Japanese trade series is reachable in the Trade Statistics of Japan. Total Chinese expenditure data is accessible OCDE databases.

IV. Results

Before the causality analysis, the KPSS and Augmented Dickey-Fuller (ADF) tests for unit roots are performed over the natural logarithm of each series. Tables A.1 to A.6 (see appendix) report the outcomes for these tests. The results for the KPSS and the ADF tests indicate that the series are not stationary. The next step is to examine whether each variable becomes stationary after taking the first difference. In general, Tables A.1 to A.6 reveal that each variable contains one unit root at maximum. Prior to testing causality, the optimal lag order is chosen. The information criteria indicated was used. Before the vector is developed, it is necessary to apply the Johansen's cointegration test to prove if the series have a long run relationship. In some cases, the obtained results generate enough quantitative evidence to prove the existence of long-run relationships among variables (as shown in Tables A.7 to A.12 in the appendix). Consequently we proceeded to develop a VEC or a VAR in order to estimate the causality relations as shown in Tables A.7 to A.12 in the appendix.

The estimations carried out make it possible to establish that the total domestic spending of China has an important positive causal effect on economic growth on Canada, the European Union and the United States. The statistical results for the European Union imply a long run relationship with China; despite of these findings, the Chinese domestic market is also a factor in the growth of some of the principal economies in the world. In this aspect, the results are consistent with the findings of other studies carried out, in which the existence of greater integration of the sited economies can be seen. However, in this case, it is possible to specify that the Chinese domestic growth is important to the increase of the potential capacity of some other developed economies. The aforementioned occurs due to the fact that transnational companies have a greater vested interest in establishing themselves in China, not only in order to export to third party countries but also in order to take advantage of the prosperity enjoyed in certain cities and regions of this Asian country.

In the case of Mexico, long term interaction is negative. This result is consistent with the fact that the economic relationship between the two countries exist due to the increase in exports from China into the Mexican market. In the absence of a significant commercial or financial flow from Mexico into this Asian country implies that the former does not have the capacity to take advantage of China's outstanding performance. The primary limiter to this is the fact that the exporting companies established in Mexico tend to have, as an objective, the United States economy and in a second place the Canada or the European Union´s markets. Therefore, the development of new commercial opportunities does not appear in Mexico's strategic planning.

At the same time, there is a direct negative causality of the Chinese exports on Mexican potential GDP. Although there are no causal effects on the employment or productivity of the labour force in Mexico, the determined negative relationship implies that an increase in Chinese exports has caused deterioration of Mexico's productive capacity. Given that the model, on which the said link is based, is a VEC, it can be said that, in the long term, Mexico's potential GDP has not been benefitted by the purchase of Chinese goods, even though these Chinese products have a lower cost for the consumer.

Taking into account that the domestic spending of China has a negative effect on the Mexican economy and that, in accordance with the previously cited investigations, China has displaced Mexico from the markets of the United States and Canada. It can be argued, therefore, that competition exists between China and Mexico; these results are consistent with the studies shown by De la Cruz, Ivanova and Ruiz-Porras (2008) as well as those proposed by Feenstra and Kee (2007).

On the other hand, the estimated effect that Chinese exports have on Canada show the existence of an interesting process of integration. There is a positive causal effect of Chinese exports on Canadian potential GDP and productivity, even though this does not occur in a cointegrated environment. However, the estimations show that the established economic process between Canada and China is favourable for both nations, as much in the fact that exports of the latter country favour the increase of Canada's supply capacity as the fact that Canada benefits from the development of China's domestic spending. In the case of employment and the Canadian CPI, no significant statistical evidence exists, which allows us to believe that a positive interaction between the two economies is present. In addition, there is no evidence to support the argument that exist any negative effect on Canada from the significant increase of China's exports to the country.

Equally, the statistical results show that Japan does not have a long term interaction with the domestic spending of China. This implies that although there is a sizable increase in the number of Japanese companies in Chinese territory, this does not necessarily imply that they are attempting to take advantage of the impressive Chinese domestic market growth. Furthermore, these models, which were created to analyse the relationship of Chinese exports on Japan, indicate that a positive long term influence on the GDP of the receiving country exists. This result is consistent with the fact that there are a growing number of Japanese companies that have moved their operations to China in order to overcome the low labour costs and the facilities on offer for foreign direct investors. The strategy applied by the Japanese industry would be to complement its production processes by carrying out its operations outside of its borders, in order to send intermediate and final products to third party countries as much as to Japan itself. By taking advantage of this interaction in an efficient manner, this favours the increase of productivity in the labour force. Even so, the results do not show the existence of a link over new employment growth. This situation is consistent with the fact that during recent years the Japanese labour market has not experienced a substantial increase in the creation of new labour positions.

Finally, the price index maintains a positive long term interaction based on the purchases that the Japanese economy carries out in China. In European Union case, there are no results that show a significant statistical causality except in the case of productivity of the labour force where the relationship is negative. Thus, it is established that the Chinese exports to European Union countries do not have an impact on their production capacity and do not, as such, favour the creation of jobs. Therefore, the integration between the European Union and China is less than that observed in the case of Canada, mainly due to the fact that there is only a positive impact of the domestic spending of China on the GDP of the EU.

In terms of the United States, a positive causal interrelationship can be seen between the Chinese exports to the country and the GDP. This is similar to the case of Canada and demonstrates that a mutually beneficial interaction exists between the United States and China and that this does not only benefit the development of potential capacity of the former, due to the importation of goods produced in the Asian nation, but also becomes fortified due to previous findings, which show that Chinese domestic spending also propels the North American GDP. Although important statistical results have not been found for the case of total employment, it can be argued that there is neither any evidence to support the fact that there has been a loss of employment sources due to the increase in the importation of Chinese goods. Finally, a positive causal relationship exists between the exportations of China into the American market and the CPI of the latter.

Finally, Tables A.7 to a.12 indicate the existence of stability in the cointegration rank. To test for stability of the rank, r= 1, of the cointegrating relationship, we first apply the test with the null hypothesis that the rank r is constant at 1 over the whole sample period. The alternative hypothesis is that the rank is greater than 1. According to the critical values presented in Quintos (1997), the null hypothesis of rank constancy against the alternative of a rank less than 1 cannot be rejected even at a 5% level of significance. In other words, the long-run links remain stable during the period of sample.

V. Conclusions

The economic process of the market opening initiated by China at the start of the 1980s has positioned it as an eminent country on an international level, not only in terms of its export of manufactured goods but also in terms of its domestic market's rate of growth. In accordance with estimations, the domestic spending of China has a positive impact on developed nations and regions such as Canada, the United States and the European Union. Therefore, it can be argued that Chinese's economic growth generates excellent opportunities for countries which are closely linked with it. The sizable increase in consumption, investment and government spending constitute some of the factors from which it is possible to understand the reason why a larger number of transnational companies divert their production processes to China. This move is not only decided on the basis of exportation to third party countries but also due to the fact that this allows them to take advantage of the business opportunities the flourishing domestic market offers.

Equally, in the case of Canada and the United States of America, it has been seen that Chinese exports to these economies have a positive causal relationship with the GDP and the productivity, which suggests that there is a process of integration between the countries, not simply a competition. This is a fear that was held by the former countries at the start of the process by which China broke into their markets. Given that a substantial part of this commercial exchange comes from transnational companies, which originate from developed companies, it is not surprising that this creates a complementary situation at an ever growing rate, as opposed simply causing displacement. One of the greatest fears was with respect to the labour market. However, no evidence has been found to suggest that Chinese products have caused a loss of jobs for North Americans.

Although, in the case of Japan, there is a positive relationship between its GDP, productivity and Chinese exports, a causal link which ties this with the Chinese domestic market has not been found. Therefore, it can be argued that Japan does not share the same level of integration as Canada and the United States. The same can be said for the European Union; however, in this case, the fundamental of growth comes from Chinese domestic spending.
In addition, the results obtained allow us to say that the dynamic of the Chinese performance is a strategically economic tool for developed countries and although the level of integration is distinct, in general terms, a benefit exists due to an increase in domestic spending and exports carried out. Many of these are manufactured and intermediate goods which favours the production processes and consumption of the receiving countries. Therefore, China can be considered to be playing an important role in the recovery process of the world economy since the recession of 2009. This is particularly due to the fact that developed nations still face financial restriction which is caused by their elevated levels of public debt.

Unfortunately, not all countries face the same favourable scene. In the Mexican case, estimations allow us to argue that a negative relationship exists as much in terms of Chinese exports as its domestic spending. The aforementioned is more transcendental when we take into account the fact Mexican products have been displaced by those of Chinese origin in the markets of the United States and Canada. Furthermore, we cannot evade the fact that a similar effect has been observe in terms of FDI. Moreover, within the process of global economic growth, in which China remains as a positive determining factor for certain nations, what Mexico will actually face is greater competition.

According to the findings, China's economy has a positive impact on developed economies, both by the strength of its domestic market as its external sector. Therefore, there is a strong integration between China and the major world economies. In this regard, China will be a positive factor for growth while maintaining the high economic performance has shown over the past decades. This is relevant because of the precarious fiscal situation and it's the worrying public debt in developed economies; they hardly exhibit high rates of economic growth in the short term. Consequently, a line of research to develop is linked to the sustainability of Chinese economic model, since global economic growth depends on that.

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Appendix

A.1. Methodology

Gunduz and Hatemi-J, (2005) defined the Toda and Yamamoto test statistic in a compact way,

$$Y = \hat{D}Z + \hat{\delta} \quad (1)$$

Where

$$Y = (y_1, y_2, ..., y_T) \ (n \times T) \text{ matrix} \quad (2)$$

$$D = (\hat{v}, \hat{A}_1, ..., \hat{A}_p ..., \hat{A}_{p+d}) \ (n \times (1+n(p+d))) \text{ matrix}$$

(Â is the estimated parameters matrix)

$$Z = (Z_0, Z_1, ..., Z_{T-1}) \ ((1+n\,(p+d) \times T) \text{ matrix}$$

$$Z'_t = \begin{bmatrix} 1 & y_t & y_{t-1} & \cdot & \cdot & \cdot & y_{t-p+1} \end{bmatrix}$$

$$\hat{\delta} = (\hat{\varepsilon}_1, ..., \hat{\varepsilon}_T) \ (n \times T)$$

$\hat{\varepsilon}_t$ is defined as the estimated error term. Toda and Yamamoto introduced a modified Wald (MWALD) statistic for testing the null hypothesis of non-Granger causality. Following to Gunduz and Hatemi-J (2005), the MWALD test is defined as:

$$MWALD = (C\hat{\beta})'\left[C((Z'Z)^{-1} \otimes S_u)C\right]^{-1}(C\hat{\beta}) \sim \chi^2_p \quad (3)$$

Where C is a $(p \times n(1+n(p+d)))$ selection matrix to indicate if a parameter has a zero value as the null hypothesis of non-Granger causality implied. Su is the estimated variance-covariance matrix of residuals in Equation 2. β =vec(D) where vec means the columns taking operator.

A. 2. Results

Table A.1
Unit root test: GDP

Variable	ADF	Critical value (5%)	KPSS	Critical value (5 %)
L(United States)	-1.76	-3.45	0.197	0.146
L(Canada)	-3.45	-3.67	0.156	0.146
L(European Union)	-3.04	-3.69	0.153	0.146
L(Japan)	-1.67	-3.65	0.189	0.146
L(Mexico)	-0.93	-3.79	0.256	0.146
DL(United States)	-5.38	-3.45	0.053	0.146
DL(Canada)	-4.71	-3.45	0.131	0.146
DL(European Union)	-3.85	-3.45	0.047	0.146
DL(Japan)	-4.91	-3.45	0.134	0.146
DL(Mexico)	-4.83	-3.45	0.011	0.146

Table A.2
Unit root test: Chinese exports

Variable	ADF	Critical value (5%)	KPSS	Critical value (5 %)
L(United States)	-1.37	-3.64	0.163	0.146
L(Canada)	-3.53	-3.69	0.163	0.146
L(European Union)	-3.26	-3.65	0.165	0.146
L(Japan)	-2.60	-3.65	0.152	0.146
L(Mexico)	-0.64	-3.73	0.160	0.146
DL(United States)	-3.95	-3.73	0.060	0.146
DL(Canada)	-3.89	-3.75	0.065	0.146
DL(European Union)	-4.85	-3.71	0.104	0.146
DL(Japan)	-3.77	-3.02	0.083	0.146
DL(Mexico)	-5.49	-3.73	0.138	0.146

Table A.3
Unit root test: Productivity

Variable	ADF	Critical value (5%)	KPSS	Critical value (5 %)
L(United States)	-3.05	-3.65	0.158	0.146
L(Canada)	-0.22	-3.65	0.156	0.146
L(European Union)	-1.06	-3.64	0.197	0.146
L(Japan)	-3.04	-3.64	0.168	0.146
L(Mexico)	-3.24	-3.73	0.195	0.146
DL(United States)	-3.74	-3.65	0.104	0.146
DL(Canada)	-4.11	-3.75	0.095	0.146
DL(European Union)	-4.15	-3.67	0.077	0.146
DL(Japan)	-4.70	-3.67	0.096	0.146
DL(Mexico)	-3.86	-3.73	0.064	0.146

Table A.4
Unit root test: Employment

Variable	ADF	Critical value (5%)	KPSS	Critical value (5 %)
L(United States)	-1.97	-3.65	0.157	0.146
L(Canada)	-3.00	-3.64	0.185	0.146
L(European Union)	-3.56	-3.65	0.161	0.146
L(Japan)	-2.99	-3.65	0.162	0.146
L(Mexico)	-3.14	-3.75	0.234	0.146
DL(United States)	-2.32	-1.95	0.122	0.146
DL(Canada)	-4.01	-3.75	0.131	0.146
DL(European Union)	-3.14	-3.02	0.121	0.146
DL(Japan)	-2.83	-1.95	0.130	0.146
DL(Mexico)	-4.61	-3.73	0.122	0.146

Table A.5
Unit root test: CPI

Variable	ADF	Critical value (5%)	KPSS	Critical value (5 %)
L(United States)	-1.91	-3.64	0.156	0.146
L(Canada)	-1.44	-3.64	0.142	0.146
L(European Union)	-3.27	-3.87	0.153	0.146
L(Japan)	-2.90	-3.65	0.165	0.146
L(Mexico)	-2.85	-3.73	0.147	0.146
DL(United States)	-3.96	-3.65	0.091	0.146
DL(Canada)	-5.71	-3.64	0.099	0.146
DL(European Union)	-3.52	-3.11	0.132	0.146
DL(Japan)	-3.93	-3.65	0.137	0.146
DL(Mexico)	-4.90	-3.73	0.099	0.146

Table A.6
Unit root test: Total China Domestic Expenditure

Variable	ADF	Critical value (5%)	KPSS	Critical value (5 %)
L(Total Domestic Expenditure)	-0.64	-3.65	0.174	0.146
DL(Total Domestic Expenditure)	-3.75	-3.65	0.075	0.146

Table A.7
Effects of total Chinese domestic expenditure

Variable	Probability	Causality	Model
Canadian GDP	0.0000	Positive	VAR
European Union GDP	0.0000	Positive	VEC*
Japanese GDP	0.3162	No causality	VEC*
Mexican GDP	0.0095	Negative	VEC*
United States GDP	0.0124	Positive	VAR

Table A.8
Effects of Chinese exports over Canada

Variable	Probability	Causality	Model
GDP	0.0454	Positive	VAR
Total employment	0.1936	No causality	VAR
Consumer Price Index	0.4886	No causality	VAR
Labour Productivity	0.0128	Positive	VAR

Table A.9
Effects of Chinese exports over the European Union

Variable	Probability	Causality	Model
GDP	0.9585	No causality	VAR
Total employment	0.1466	No causality	VEC*
Labour Productivity	0.0431	Negative	VEC*

Table A.10
Effects of Chinese exports over Japan

Variable	Probability	Causality	Model
GDP	0.0235	Positive	VEC*
Total employment	0.5809	No causality	VEC*
Consumer Price Index	0.0000	Positive	VEC*
Labour Productivity	0.9591	No causality	VEC*

Table A.11
Effects of Chinese exports over Mexico

Variable	Probability	Causality	Model
GDP	0.0000	Negative	VEC*
Total employment	0.2062	No causality	VAR
Consumer Price Index	0.0000	Negative	VEC*
Labour Productivity	0.1207	No causality	VAR

Table A.12
Effects of Chinese exports over United States

Variable	Probability	Causality	Model
GDP	0.0124	Positive	VAR
Total employment	0.5652	No causality	VAR
Consumer Price Index	0.0106	Positive	VAR
Labour Productivity	0.0010	Positive	VEC*

*The cointegration relationships remain constant.