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On behavioral macroeconomics, globalization, and economic growth

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Abstract. We assess theoretically the effect of forming a free trade union on the total production of a nation, where such effects are caused by the absorption of technologies through different channels. A popular metaphor describes the people as crabs in a bucket because when one crab tries to scape, the others pull it down avoiding a possible way out for all of them. Given this knowledge, posteriorly and independently of the income inequality levels, we extend our analyses to consider the effect of envy in a macroeconomic level on the total production, and draw the implications which this phenomenon has on the formation of free trade unions. We make strategic policy recommendations to allow the achievement of a globalization that benefits each member nation, where we show that the great trade union might have to start in certain order, with gradual and charitable subregional agreements, seasoned with education promotion and possibly a non restricted ideas employment.
Keywords. Trade agreements; Behavioral Macroeconomics; Economic Growth; Policy Design.
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1. Introduction

The relation between international trade and economic growth has been the object of many theoretical and empirical works. Lal & Rajapatirana (1987) focus their attention on understanding the theoretical relationship between economic growth and trade for developing economies by testing empirical data. Kilic (2015) tests the effects of economic, social and political globalization on the growth levels of developing countries and causality relationship between the variables by using fixed effects least squares method and Granger causality, test for 74 developing countries between 1981-2011 period, finding that such growth levels were positively affected by the economic and political globalization, whereas social globalization affected economic growth negatively. Moreover, his test results of causality put forward two way causality relationship between political and social globalization an the economic growth and one way causality relationship between social globalization and economic growth.

Grossman & Helpman (1990) argue that the local knowledge is likely to vary positively with the extent of contact between domestic agents and their counterparts in the international research and business communities, and that the level of such contacts increases with the level of comertial exchange, deriving that this relationship depends on parameters.

Vamvakidis (1998) addresses questions that concern the relationship between economic integration and growth by testing the robustness of this relation, and find that it seems to be that a main reason for nations not to grow faster when this kind of agreements are done is that are closed, small, and developing economies. However, are thesethe only factors that influence this

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relation? If not, which aspects of the foreign countries should a nation look at when it comes to the search for forming a free trade union? Is there an ideal strategy to form these unions?

In the present work we assess theoretically the effect of forming this kind of unions on the total production of a nation, considering how also the behavior or conduct of the nations' population matters, which allows us to get policy strategies to achieve the best possible globalization regime in termsof the broadly relevant index named economic growth.

2. Freetrade unions, and economic growth

The technological level of a nation i is composed by two factors, the locally distinctive technology x_i and the standard technology B_i such that $x_i + B_i = A_i$. What differences B_i from x_i is that B_i contains technology which is also present in other nations[1].

Therefore the total production can be represented with a function $F_i(K_i)$that depends positively on the technological level A_i. We consider a production function that has constant marginal returns of the capital, where the capital is as usually treated like an homogenius good that is compounded by all the kinds of capital such that the nation i has the total production $Y_i = A_i K_i$.

When there is a free trade union, the members adapt and absorb the technology of the other ones, which happens throughout buying capital goods, implementation, or other channels, and we denote the union of free trade between two nations i and $j$by $i \cup j$. Moreover, the total production of a union $i \cup j$ is denoted by $F_i(K_i) \cup F_j(K_j)$.

Unlike Grossman & Helpman (1990) who obtained a dependency of the change of knowledge capital on certain parameters, the present work takes into account how the interactions that take place in trade unions also derive in a sort of imitation or homologation process. There are two kinds of technological absorptions, the absorption of standard technologies and the one of locally distinctive technologies. The standard technology of a nation after the union $i \cup j$ is given by $B_{i\cup j}$=$B_i + B_j - b_{i\cup j}$, where $b_{i\cup j} = B_i \cap B_j$and $B_j \geq b_{i\cup j} \leq B_i$. The locally distinctive technology of a union is given by $x_{i\cup j} = x_i + x_j$. Therefore we get that the technological level of a union is given by $A_{i\cup j} = B_{i\cup j} + x_{i\cup j}$.[2]

Theorem:

$$F_i(K_i) + F_j(K_j) < F_i\,(K_i) \cup F_j(K_j).$$

*Proof:*In order to get the total production of a union $F_i\,(K_i) \cup F_j(K_j)$ we must take into account the absorption of the technologies. Therefore we can just compare the total products as it follows

$$A_i K_i + A_j K_j \leq A_{i\cup j} K_i + A_{i\cup j} K_j$$

and since $A_{i\cup j} > A_i$ and $A_{i\cup j} > A_j$, surprisingly we can get that $F_i(K_i) + F_j(K_j) > F_i\,(K_i) \cup F_j(K_j)$.

This theorem means that unions are always beneficial with its members in terms of the total production.

*Conjecture:*The union is super additive in the sense that for n existing nations $\cup_{i=1}^{n} F_i(K_i) > \sum_i^n F_i(K_i)$.

This can easily be shown by following the steps of the proof of the theorem for the n nations.

If the unions are always beneficial for its members, why does it take so long for the world to tend to the great trade union? In the following we show some cases which illustrate how such benefits may not be clear for a country.

*Case 1:*When x_i is slightly positive and $b_{i\cup j} \approx B_i \leq B_j$, and there is a union between i and j where x_j is meaningfully positive, we say that j is making a charitable agreement. Since we are dealing with macroeconomics, small variations on the total output are not meaningful, and it can be observed that $A_j \approx A_{i\cup j}$. However in this case the difference $A_{i\cup j} - A_i$ is meaningful and so as the benefits from this union for the nation i.

*Case 2:*When x_i and x_j are slightly positive, and $b_{i\cup j} \approx B_i \approx B_j$, then the union $i \cup j$ will not have significative gains or benefits for any of its members.

From these cases we get that the strategies for making unions matter, because the order in which a nation could form a trade agreement can result more beneficial to another nation if it decides to join. This is $i \cup j$ could not be meaningfully beneficial for j while it is for i, and the union $z \cup i$ could be mutually beneficial for z and i, with the union $z \cup i \cup j$ being beneficial for all of its members.

Moreover, there could be other factors that influence economic growth and the formation of these commercial regimes, that could explain why some nations may choose not to form them independently of the levels of inequality. In the following we explain how a behavioral factor which affects the total production could be a reason for avoiding the formation of some free trade unions among nations.

3. Envy and economic growth (Crabs in a Bucket)

A popular metaphor describes the people as crabs in a bucket because when one crab tries toscape, the others pull it down avoiding a possible way out for all of them.In this section we get in to the field of behavioral macroeconomics to explain a possible factor which is usually ignored by theories of economic growth.

When the individuals invest to produce, other agents of the economy develop a feeling popularly known as envy. We represent how the agents do investments motivated by envy to affect negatively the income of the individuals surrounding them, because the increasing gains of the others make them unhappy.

As in Solow (1956), there is an exogenous propensity to save s. The savings are not equal to the capital investments because we consider how part of the savings are utilized to destroy capital. This is $s = e + i$, where e is the effect of the propensity of spending motivated by envy and i is the effective propensity to invest on capital[3]. e is exogenously given and is the static result or equilibrium of a behavioral dynamic as the one modeled by evolutive game theory, where the agents interact learning from the others and the pay back of acting with the strategy in question increases when these acts are more common among the population[4].

This means that what builds the behavioral macroeconomics is that `unlike before' it takes into account the micro individual tendencies of behavior to resume them in overall indexes affecting the broad economic life picture.

We use a neoclassic production function. The capital is such that the acquired land is also part of it, and its change equation is the following

$$\dot{k} = (i + e)Ak^{\alpha} - \delta k$$

The steady levels are the following

$$k^* = \left(\frac{(i+e)A}{\delta}\right)^{\frac{1}{1-\alpha}}$$

$$y^* = A^{\frac{1}{1-\alpha}}\left(\frac{(i-e)}{\delta}\right)^{\frac{\alpha}{(1-\alpha)}}$$

as we can see the effect of the propensity to spend on capital destruction motivated by envy $e$affects the steady levels. Finally, given this knowledge, notice that although there can be insecurity, on the data which is collected to observe how high is the envy for a country, this macroeconomic behaviour can always be accounted by looking at the amounts of these investments, and at the destroyed capital within an economy.

4. Trade unions considering the envy of the populations

When a free trade union is done, the individuals interact and the nations can foresee if the local population will learn and imitate from the other nations, or the other nations will end up behaving as the locals in terms of envy, in the same way that can foresee the technological absorption.

The nation j knows that whether its inhabitants imitate or not the envy propensity of the nation z when the union $j \cup z$ is done, depends on the size of the local population L_j, on the size of the population L_z, and on how influential or strong these envy tendencies are.

For simplicity we take for granted that the tendencies of envy expenditures are equally strong or influential in every nation[5]. This is, a greater population will make its propensity more likely to be imitated because more persons will practice such propensity to spend motivated by envy, and the affected individuals will fall in the same behaviour. In this way, if a nation has a greater population than another one, its propensity will be the implemented one. Instead if both of the populations were equal in size, then each nation would preserve its propensity of expenditures motivated by envy without stability[6].

We keep considering the neoclassical production function. In order to make a union each nation projects the effect of the union on its steady state[7]. Therefore, for a nation j it will be beneficial to form a trade union with another one z if

$$\left(\frac{(i-e_{j\cup z})A_{j\cup z}}{\delta}\right)^{\frac{1}{1-\alpha}} > \left(\frac{(i-e_j)A_j}{\delta}\right)^{\frac{1}{1-\alpha}}$$

$$\rightarrow (i-e_{j\cup z})A_{j\cup z} > (i-e_j)A_j$$

$$\rightarrow i(A_{j\cup z} - A_j) > e_{j\cup z}A_{j\cup z} - e_jA_j$$

which means that if the increment on the investments is greater than the increment on the effect of the expenditures motivated by envy, then it will be beneficial for the nation j to form the union[8].

5. Policy implications

As we saw in the previous sections, not all unions are beneficial for the nations, how ever, this can also be understood as how the order for making unions matters. This is, if a nation which has a low propensity of expenditures motivated by envy forms a trade union with another one with a higher propensity of this kind and a lower population, then the lower propensity will be imitated, and a posterior union with countries which have lower populations than the previous union will have the propensity of the previous union. But what would happen if the nation with the lowest propensity (it could be zero) has the lowest population?

*The sub regional agreements:*A regime that looks for getting the highest possible benefits in the long run can look for sub regional trade unions to be done, where after the lowest propensity has been implemented by more people, then posterior unions could be formed such that all nations can tend to the globalized world with the lowest possible (or zero) expenditures which are motivated by envy, and with all the nations being benefited. Moreover, notice that if the nation with the lowest envy propensity has also a technological level such that its benefits from forming a union with any other nation are not meaningful, the great union would have to start with gradual an charitable subregional agreements to reach the best possible globalization for all the countries.

The strategy of gradual sub regional agreements can deal with the bad effects of an aggresive commercial strategy that causes a contagious effect through the supply adjustments to,and a likely sharp down of the income, where independently of the employed run, promoting an increase in education would become the salt, pepper and saffron of the plate due to the already mentioned strength effect. In this way a nation can allow a population to have a new activity or behavior and other technological advantages.

Another ingredient that would allow the dissemination of technologies is one pointed out in Pagano (2007), that the privatization of knowledge would derive in an overall very unequal accumulation of intelectual capital, which may also seriously limit the `biodiversity' of capitalism and imply a global revenge of a new international form of Taylorism. Further, we can always go deeper when looking at the products of an intensified interaction, which is thus a way to refine very specific policy designs.

*Remark:*When a trade union is done, since the agents of all nations can invest anywhere and all the firms can access the same technology, we get that in equilibrium all the nations employ the same capital per worker. This is

$$\alpha A_{i\cup j} k_i^{\alpha-1} = r + \delta = \alpha A_{i\cup j} k_j^{\alpha-1}$$

for any iand j, from which we deduce that $k_j = k_i = k_{i\cup j}$. Moreover, from this we get that inequilibrium the countries in a union will have the same per capita product, which has obvious implications in terms of the propensities i.

Madsen (2009), mentions how the productivity of the countries of the OECD converge in an intensified manner since the end of the world war II, and basing us on our theoretical approach, we attribute this obvious, measured, and observed phenomenon, to the increasing subregional agreements between these countries. Durlauf (2003) argues that the right way to test convergence is by specifying to what club a country belongs, which is reinforced by our theory in the sense that the members of a convergence club happen to have integration agreements. In this way our theory has complemented explained visions who allow the identification of particular dynamics of the converging clubs [9], where a part from human capital investments, the formation of strategic unions could be the answer to scape from a divergent dynamic. Moreover, recalling the empirical conjectures of Vamvakidis (1998), we can thus say that the small, closed, and developing economies could have presented an envy propensity which compensated the improvement on the technological levels, or made unions with countries that had similar technological levels and average expenditures motivated by envy.

Fundamentally we do not extend our work to the analysis of monetary policies, because we consider how it is well known in the framework of economic growth, that any kind of change on the monetary mass does not alter the relative prices of the final goods because of perfect competition, which means that although an old shmoo becomes lower or higher than one, the produced goods of an economy are exactly the same, and this means that in practice the important indicators keep being the total production and the income distribution even for economies with perfect discrimination in prices link.

*Example:*A referendum was held on Thursday 23 June, to decide whether the UK should leave or remain in the European Union. Leave won by 52% to 48%. The referendum turnout was 71.8%, with more than 30 million people voting. From this happening two different opinions outstand: That this change is just a political denomination change without consequences in terms of trade tariffs or openness practices, and on the other hand, that instead this happening shall change many daily practices directly related to the functioning of the economic life picture.

What is sure is that because not being part of a place with a common name shows probably an important correlation with social interactions and thus, tech nological transferences, this observed behavior gains relevance independently of other unlikely observed inharmonious practiced correlations.Therefore, leaving safely as a common concern of standard run, the different opinions juxtaposition continuous expectations behavioral tendency.

6. Conclusions

We have shown how the countries are benefited by trade unions and how the behavior of the population is important to be considered in order to form these regimes. Specifically, we have analyzed the effect of macroeconomic envy on the total output and how if such kind of social phenomenon was true for a nation, it could affect the decisions to form trade unions.

More specifically, from the described relationship we draw policy implications and strategies which would allow a globalization that benefits all the countries as much as possible, given the technology and behaviour of these

regions. For example we showed that the great union could have to start with gradual an charitable subregional agreements, seasoned with education promotion and possibly a non restricted ideas employment, to reach the best possible globalization regime forall the countries.

Finally, we can interpret that if all the nations became one union, the resulting region could have a higher per capita income, where the strategies and order for tending to this great union matter, individually of the compositions of the local demands and the local average labor productivities!

Notes

[1] Not necessarily all the nations have the same standard technology.

[2] For simplicity we omit the obvious specification of the equivalence relation between the cardinality of the finite sets of technological aspects of a country i, B_i and x_i, and the real numbers which these variables also represent.

[3] Notice that the difference between consumption and investments is as clear as always.

[4] e.g. Bowles (2006), Accinelli et al. (2010), Barreira da Silva Rocha (2011), Accinelli & Sanchez Carrera (2012) and Sanchez Carrera (2012).

[5] The education or human capital is a factor that could probably play a role in the strength level.

[6] As we have mentioned, this process is the result of the evolution of institutions.

[7] This means that the time which takes for a new behavior to be adapted is not a concern of the policy makers.

[8] It results logic that i remains unchanged, because it does not depend on social interactions, but on the decisions of the locals. In words of Ugo Pagano:*For complex organisms, natural selection can have an `inefficient' stabilising role and can freeze the genotypes of natural species that are not adapting to a changing environment* (Pagano, 2011).

[9] e.g. Howitt & Mayer-Foulkes (2005) and Accinelli et al. (2007).

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