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The economics of the Syrian refugee crisis in neighboring countries. The case of Lebanon

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Abstract

In this article, we investigate the effects of a massive displacement of workers from a war-torn economy on the economy of a neighboring country. Applying a general equilibrium approach to the Lebanese economy, we explore effects from various components of the crisis on the labor market, the production apparatus, and macroeconomic indicators. Along with previous literature, our findings suggest limited or no adverse effects on high-skilled native workers, but a negative impact on the most vulnerable Lebanese workers is found. When aid takes the form of investment subsidies, significantly better growth and labor market prospects arise, recalling the necessity of complementing humanitarian aid with development aid to succeed in achieving long-term objectives. This may however not be politically viable in a context where refugees are considered as temporary.

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Keywords: labor markets, macroeconomic impacts of refugees, Syrian crisis, Lebanon.

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1. Introduction

The Syrian refugees' crisis is one of the major challenges faced by the World in this second decade of the twenty-first century. While its humanitarian aspects and its consequences on Eurasian politics have been widely discussed, much less attention has been given to its economic consequences on Syria and on neighboring countries. This could be understandable given the uncertainties of a complex war and the difficulty of obtaining the data needed for good quality research. But these are not the only reasons. Economists give little attention to the economics of wartime and, according to Betts and Collier (2017), they often forget that refugees are “consumers, producers, buyers, sellers, borrowers, lenders and entrepreneurs”, and not just a humanitarian matter. The objective of this article is to highlight, through the Lebanese case, the main issues raised by the conflict for neighboring countries and to address them through an economy-wide analysis

The impact of refugees is different from that of migrants in terms of timing of arrival and of flow composition (Docquier and Machado, 2015). While migrants arrive at a slower pace, obey to market and administrative selection criteria and have the time to integrate into the host society, refugees' arrivals are much more important in numbers, they happen over shorter periods of time and they are generally perceived and treated as being transitory.

Some recent papers have started to address the impact of Syrian refugees on prices and local labor market outcomes in Turkey (Akgündüz et al., 2015; Del Carpio and Wagner, 2015). However, these issues are not the only aspects at stake. In a country like Lebanon where refugees represent more than 40% of the resident nationals, the Syrian conflict will have profound and long-lasting effects on the economy.

We can subdivide the impact on neighboring countries in three broad categories, namely economic, social and political.

We focus here on the two first aspects. Economic issues are considered in their macro and sectoral dimensions. How will the Syrian conflict affect medium term growth in Lebanon? What will be the impact on foreign trade and investment. What are the consequences on unemployment and labor income of Lebanese? What can be expected in terms of sectoral reallocations? How will humanitarian assistance interfere with these phenomena? What about development aid?

Regarding the social dimension we first focus on labor market conditions by dealing with the competition between refugees and local workers. This competition depends on the issue of formality, on the extent to which Syrians were already integrated in Lebanese labor markets (especially workers living on the border) and on the interference of foreign assistance. The second aspect considered is the income of refugees and also the income of poor Lebanese, who may suffer the drawbacks of increased competition while at the same time being unable to benefit from foreign aid.

Given the economy-wide perspective adopted in this article, a dynamic general equilibrium framework seems the most relevant methodological tool. The model we develop has some distinguishing features that allow it to capture the main issues raised above. First, the labor market is segmented: labor demand is decomposed in a formal and an informal bundle; second, firms distinguish between skills and workers' origin (local, migrant and refugee). Finally wages do not clear labor markets.

An original database has been built for refugees based on different United Nations sources. These have been consolidated with data on Lebanese workers and migrants from the last available national labor force survey, a recent social accounting matrix built for this research project and other standard economic and financial data. We also have access to an estimation of refugees' consumption profiles, enabling us to take their impact on the production structure into account.

The first set of experiments conducted consists in assessing the impact of the Syrian crisis on international trade and tourism in Lebanon. The second set evaluates the impact of the arrival of displaced Syrians along with the arrival of foreign humanitarian aid. The third set evaluates the impact of aid under its various forms (humanitarian, development) and the fourth set analyses the long run impact of refugees' consumption pattern.

The rest of the article is organized as follows. Section two presents a literature review encompassing recent papers on the Syrian conflict as well as a less recent literature dealing with various migrant crises in the twentieth century; section three discusses the current context; section four presents the model and the database; section five is devoted to the experiments and results and section six concludes.

2. Literature review

According to Gates et al. (2012), a medium-sized conflict (2500 battle deaths) on average increases undernourishment by 3.3% and child mortality by 10%, while depriving an additional 1.8% of the population from access to potable water. In August 2015, the UN had estimated that the Syrian civil war had caused 250 000 battle deaths, i.e. 100 times those of a medium-sized conflict, leading us to believe that the effects on the Syrian population would be far more severe and long-lasting than those estimated by Gates et al. (2012).

In the economic literature, the seminal study on the impact of refugees on local labor markets of Card (1990) uses the case of Miami and the Mariel Boatlift as a natural experiment. He analyzes the labor market impact of a massive inflow of migrants, showing that in the medium term, the arrival of Cuban refugees had no impact on the unemployment and the wages in Miami. Recently, Borjas (2015) revisits the study and finds a decrease in wages, but Clemens and Hunt (2017) point out flaws in his analysis and conclude on a lack of impact on labor market conditions. Other studies adopt a historical perspective in order to measure the impact of massive arrivals of population on the host communities, but find different results. Hunt (1992) looks at the impact of the 1962 repatriates from Algeria on the French labor market and finds that in 1968 the unemployment rate of non-repatriated French had increased and their annual salaries had declined. Similarly, Braun and Mahmoud (2014) find that the mass arrival of German expellees had a negative effect on natives' employment in post-war Germany. In the case of Colombia, Calderon-Mejia and Ibanez (2015) also find negative effects on the labor market outcomes of natives being associated with the arrival of displaced populations.

However, refugees can also represent a valuable inflow of human capital. Crisp et al (2009) highlight the involvement of highly-educated Iraqi refugees in hospitals, universities and local businesses in Jordan.

Focusing on the current refugee crisis, Del Carpio and Wagner (2015) show that informal Syrian refugees, who overwhelmingly do not have work permits, entail negative developments for some Turkish workers, particularly those working in informal sector, those working in the agricultural sector, the low-educated and female workers. However, the inflow of refugees also creates higher-wage formal jobs, allowing for occupational upgrading of Turkish workers. Their findings suggest that average Turkish wages increased as a consequence of a change in the composition of employment.

Ceritoglu et al. (2015) conclude that immigration of refugees has considerably affected the employment outcomes of natives in Turkey while its impact on wage outcomes has been negligible. Their estimates suggest notable employment losses among Turkish informal workers due to the inflow of refugees. As a consequence, Balkan and Tumen (2016) find a significant decline in consumer prices in the regions where refugees arrive. They use the regional variation in the inflow of Syrian refugees as a natural experiment and highlight that the lower prices are the consequence of the labor cost advantages created by the additional supply of informal workers. Akgündüz et al (2015) also find that, in the case of Turkey, despite a slight increase in housing and food prices, employment rates of natives in various skill groups are largely unaffected by the arrival of Syrian refugees.

Using a VAR model, Fasih and Ibrahim (2016) find that the arrival of Syrian refugees had no impact on employment rates and labor market participation in Jordan. However, they mention that the lack of a relationship between the inflow of Syrian refugees and the Jordanian labor market outcomes can be explained by factors such as additional measures taken by the host country in order to prohibit firms from hiring refugees, a higher probability for refugees to be working in the informal sector, where work permits are not required, or a skill mismatch between refugees and available jobs.

Alix-Garcia and Saah (2010) studied the impact of Rwandan refugees in Tanzania and found a significant increase in the price of certain agricultural goods such as cooking bananas, beans and milk and a decrease in the price of aid-delivered goods such as maize. This had a positive impact on Tanzanian farmers through the increase of the local markets, but not only. The host population living near refugee camps experienced a significant increase in welfare indicators such as access to electricity and ownership of television and refrigerators (Whitaker, 2002). Ruiz and Vargas-Silva (2015) find that the large inflow of refugees in Tanzania resulted in an increased likelihood of informal employment for Tanzanians. Also in the case of Tanzania, Maystadt and Verwimp (2014) show that the arrival of refugees benefits the part of the host population that is relatively well off, while further marginalizing those who lack access to local resources. The arrival of refugees often represents an inflow of cheap labor and Maystadt and Verwimp (2014) point out that this can benefit local entrepreneurs.

In terms of housing, Schmeidl (1997) shows that the arrival of refugees or expatriate aid personnel in Peshawar, Pakistan has positive effects on the incomes of local property owners, but increased the difficulty for poorer Pakistanis to rent a house. This competition between refugees and less well-off local population tends to lead to social tensions, especially when humanitarian assistance is directed solely to refugees, thus creating inequalities (Betts, 2009).

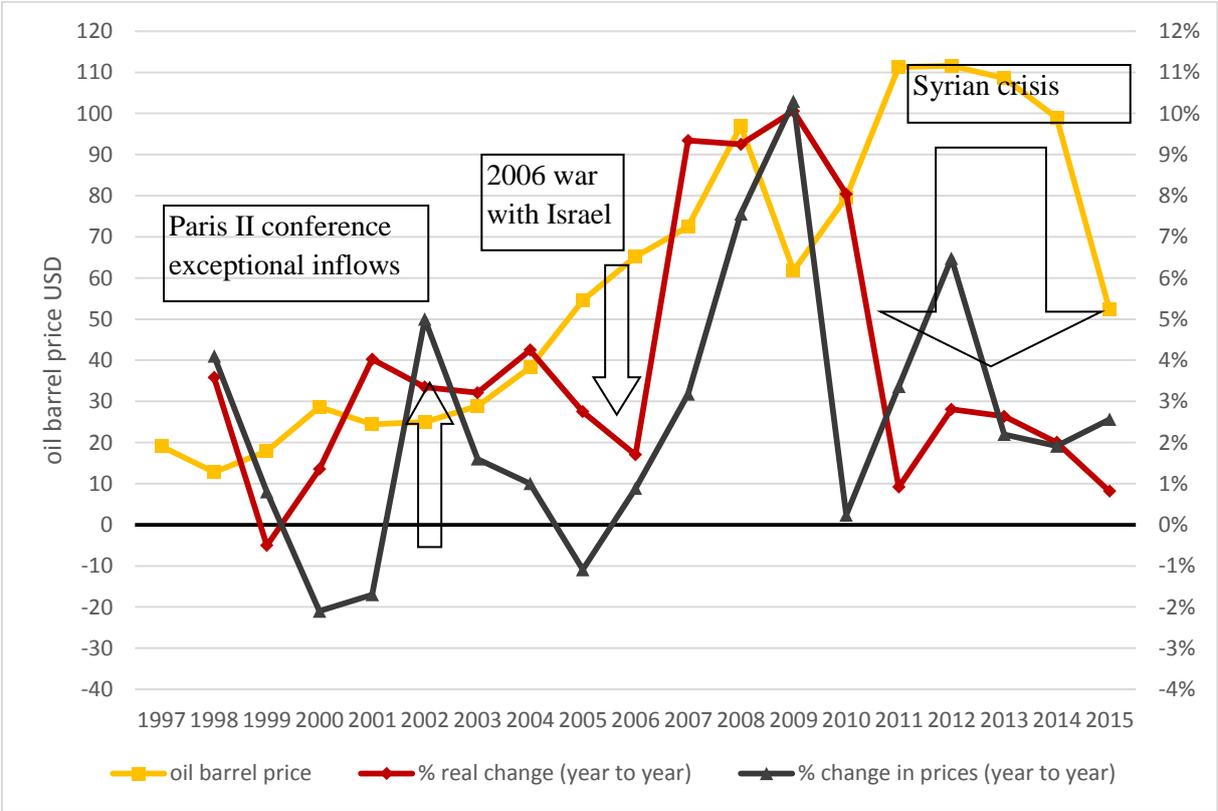
The importance of addressing both refugees' and host communities' needs is also highlighted by the Lebanese Government's official approach that links relief with local development. However, Longuenesse (2015) puts in perspective the stakes at play concerning the labor market status of Syrian refugees in Lebanon and highlights the danger of exploitation mechanisms of labor confined to forms of employment without rights and without protection. Dahi (2014) draws attention to the importance of increasing development spending in Lebanon in order to face the challenges brought about by the

arrival of the Syrian refugees. He also raises the question about host governments' resistance to increasing investments due to the fear of a permanent stay of refugees.

While the most recent papers on the impact of the current refugee crisis are focusing on the Turkish case (Del Carpio & Wagner, 2015, Akgündüz et al., 2015), refugees in Turkey only represent 3.3% of the population. Indeed, even though Turkey hosts the largest absolute number of refugees according to the UNHCR, Lebanon is the country where they represent the highest share of the population with recent estimates of this figure reaching an astonishing 30%. The crisis is therefore likely to bring about profound changes to both the structure of the labor force and consumption and savings patterns in Lebanon, inducing shifts in the demand for goods and factors of production. To our knowledge, this is the first article analyzing the impact of the humanitarian crisis on the Lebanese economy and its labor market using a general equilibrium framework. A previous study was conducted by the ILO in 2013 aiming to assess the impact of Syrian refugees in Lebanon and their employment profiles. Although their results show that the Syrian crisis had a negative effect on the economy and the labor market, they emphasize that since the sample size is small, general conclusions cannot be drawn.

3. Context

One of the main characteristics of the Lebanese economy is its high dependence on foreign savings and therefore the continuation of capital inflows. These capital inflows are in turn correlated with the levels of oil prices. They are also directly influenced by the current security and political environment in the region. Both factors thus play a considerable role in the country's growth.



The Lebanese Israeli war in 2006 induced a 5% loss in real growth apart from human and material destructions. From 2007 to 2010, the increase in capital inflows due to the soaring oil prices (along

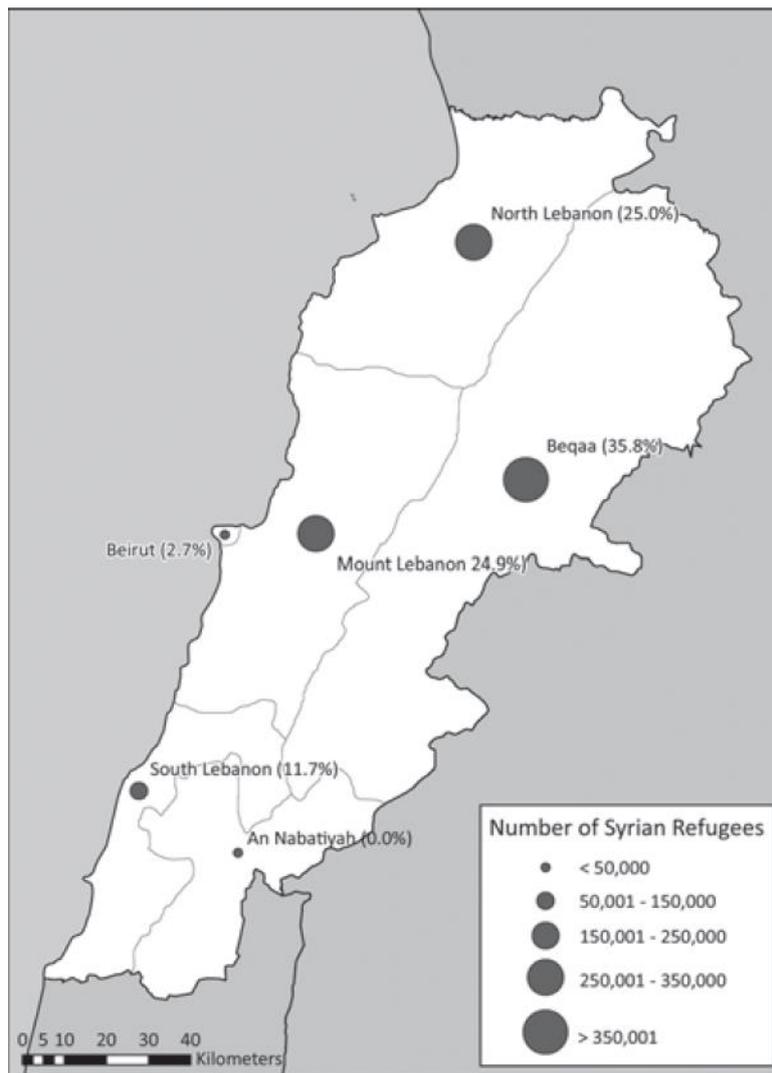
with the dynamism of tourism) put growth on a strong trajectory through the development of bank credit, domestic consumption and construction activities.

The Syrian crisis, since 2011, seemingly induced a significant loss in potential growth. According to the IMF (2015), tourism was particularly badly hit with the GCC countries' advisories against travel to Lebanon. The decrease in oil prices in 2015 and the surge in regional military expenditures reduced capital inflows. Analysis from international financial and development institutions such as the IMF and AFD highlight that the Syrian crisis and the subsequent deterioration of the internal political situation generated uncertainty detrimental to investment and weakened economic activity: parliamentary elections were cancelled twice, Lebanon has been without a President from May 2014 to October 2016 and clan-related and communitarian divisions tend to exacerbate tensions. Since 2011, the average annual increase is capped at 2% and the outlooks remain uncertain in the absence of a solution to the Syrian crisis.

At this stage, the main technical factors of internal stability of the Lebanese economic pattern – fixed peg of the pound to the dollar, high levels of gross foreign exchange reserves, liquidity in the financial system - are maintained, even at huge fiscal costs (financial engineering operations by the Central Bank serving this purpose cost 6 billion USD in 2015, or 15% of GDP). The macro-financial vulnerabilities are thereby reinforced. The high deficit in the current account (25% of GDP) induces a strong need for external financing, the state remains one of the most indebted in the world (133% of GDP) and its debt is in a bullish momentum.

The labor situation was also deeply impacted by the Syrian crisis, with 1.06 million refugees having been registered by February 2016. Although, formal camps have not been established in the country, refugees mainly concentrate in the Bekaa valley and the north of the country, two already vulnerable regions (Verme et al., 2016).

Figure 1. Syrian refugees in Lebanon



Source: Verme et al. (2016)

According to an ILO survey in 2014, the activity rate among Syrian refugees in Lebanon is less than 47%, with refugees in the North of the country recording a lower activity than those in the South (ESCWA, 2015). A work permit is required in order to have access to legal employment and although an agreement exists between Lebanon and Syria allowing for free movement and seasonal employment of nationals for both countries, the Lebanese Government is reluctant to issue work permits, thus pushing Syrian refugees to work illegally. The high frequency of informality among Syrian refugees also translates into significantly lower wages than those of Lebanese nationals (ILO, 2014).

According to our data, the unemployment rate of Lebanese nationals was 11% in 2011 (Table 1), while, in 2014, the unemployment rate of the Syrian refugees is of nearly 60%. The involvement of Syrian displaced in economic activity has since significantly increased.

Table 1. Labor participation of various resident profiles

Profile	Total Population	Workers	Unemployed	Active Population	Unemployment Rate
Lebanese (2011)	3,500,000	974,222	120,409	1,094,631	11%
Foreigners (2011)	700,000	476,889	9,185	486,074	2%
Syrian displaced (2014)	1,200,000	104,580	151,892	256,472	59%
Total	5,400,000	1,555,691	281,486	1,837,177	15%

The three categories here correspond to Lebanese nationals (termed *Lebanese*), other foreign nationals who arrived before the Syrian crisis such as Palestinians (termed *Foreigners*), etc.) and *Displaced Syrians* related to the recent Syrian conflict.

In terms of skill distribution, almost half of the working population is low-skilled. This reflects the low quality of jobs created by the Lebanese economy and its low productivity. The share of low-skill workers is lowest among the Lebanese (32%) and reaches 54% among Syrian displaced and is almost double among foreign workers (68%). Indeed, while the share of Lebanese workers reaches 90% in the high-skill category, it drops to 45% in the low-skill category, i.e. half of the low-skill category is Lebanese and the other half foreign. This shows that the substitution effect that is expected from the arrival of the large number of Syrian displaced workers tends to be concentrated in the low-skill category (because most of the displaced belong to this category) and to affect similarly low skilled Lebanese and foreigners.

4. The general equilibrium framework

The analysis is based on a multi-sector, dynamic general equilibrium model. Since one of the main issues of the paper lies in the interactions between migratory flows and the Lebanese labor market, special attention is given to modeling this nexus. Thus, one of the key features of the model is a detailed description of the labor market, distinguishing formal and informal jobs, and workers of three skill levels and three origins. The model features 9 sectors^v, and sectoral indices are omitted in the following for better readability.

i. The production structure

The production structure is a nested one, with value added in each sector being a constant elasticity of substitution function of a capital and a various types of labor. We follow the Fallon-Layard (1975) hypothesis and model capital and high-skilled labor as a separate bundle. Value added is thus produced by three inputs: high-skilled workers and capital, medium-skilled labor and low-skilled labor. Each labor bundle is disaggregated into a formal and an informal labor bundle. Finally, at the lowest nest, each labor input is a combination of workers of three origins: Lebanese workers, Immigrants who arrived before the onset of the Syrian crisis (2011)^{vi}, and Syrian refugees. Formally, we have:

^v Agriculture, Energy, Industry, Construction, Transport, Health, Services, Communications and Administration.

^{vi} The three main origin countries of the non-refugee migrant population in 2013 were the State of Palestine (549 341), Iraq (148 470) and Egypt (102 507) (DESA Population Division, available at <https://esa.un.org/migmgprofiles/indicators/indicators.htm>)

$$X_t = A_t \left(\alpha_{KHS} * KHS_t^{1-\frac{1}{\sigma_1}} + \alpha_{MS} * MS_t^{1-\frac{1}{\sigma_1}} + \alpha_{LS} * LS_t^{1-\frac{1}{\sigma_1}} \right)^{\frac{1}{\sigma_1}}$$

Where X is production, A a productivity parameter, KHS a capital and high-skilled labor bundle, MS and LS medium- and low-skilled sectoral labor and σ the elasticity of substitution between the different inputs.

The first order conditions imply the following factor demands:

$$KHS_t = A_t^{\sigma_1-1} * X_t * \left(\frac{\alpha_K V A_t}{P KHS_t} \right)^{\sigma_1}$$

$$MS_t = A_t^{\sigma_1-1} * X_t * \left(\frac{\alpha_L P V A_t}{P MS_t} \right)^{\sigma_1}$$

$$LS_t = A_t^{\sigma_1-1} * X_t * \left(\frac{\alpha_L P V A_t}{P LS_t} \right)^{\sigma_1}$$

At the following nest, KHS is decomposed into two bundles containing capital (K) and workers of high skills (HS):

$$KHS_t = \left(\alpha_K * K_t^{1-\frac{1}{\sigma_2}} + \alpha_{HS} * HS_t^{1-\frac{1}{\sigma_2}} \right)^{\frac{1}{\sigma_2}}$$

Each labor bundle is a CES aggregate of informal and formal labor ($i \in \{form, info\}$):

$$MS_t = \left[\sum_i \beta_i LD_{MS,i,t}^{1-\frac{1}{\sigma_3}} \right]^{\frac{1}{\sigma_3}}$$

$$LS_t = \left[\sum_i \beta_i LD_{LS,i,t}^{1-\frac{1}{\sigma_3}} \right]^{\frac{1}{\sigma_3}}$$

Finally, at the bottom nest of the production structure formal and informal labor are decomposed into labor of different origins. The subscript f denotes the three different skill levels:

$$LD_{f,form,t} = \left[\sum_{origs} \gamma_{origs} LD_{f,form,origs,t}^{1-\frac{1}{\sigma_4}} \right]^{\frac{1}{\sigma_4}}$$

$$LD_{f,info,t} = \left[\sum_{orig} \gamma_{orig} LD_{f,info,orig,t}^{1-\frac{1}{\sigma_5}} \right]^{\frac{1}{\sigma_5}}$$

Since Syrian refugees only work informally, the formal labor bundle contains only Lebanese and Foreigners ($origs$ being a subset of $orig$, excluding displaced Syrians).

The elasticities used reflect complementarity between skills, as well as between capital and high-skilled labor. As such, we have set σ_1 and σ_2 to equal 0.3. We however consider formal and informal labor to be substitutes, and that for a given skill level and formality status, workers of different origins are strong substitutes. The elasticity of substitution between formal and informal workers (σ_3) is set to equal 2. The elasticities of substitution between workers of different origins (σ_4 for formal workers, σ_5 for informal workers) are set to 3 and 8 respectively.

ii. Labor force

The previous equations thus give labor demand at each nest, the trade-offs between factors being determined by the elasticities of substitution used. Turning to the labor force evolution, it is governed by both exogenous and endogenous factors. An educational module provides the potential local labor force, modeling student movement through the educational system using pass rates, repetition rates and dropout rates provided by the Ministry of Education^{vii}.

The dynamics of labor supply for locals are the following: workers disappear from the labor force according to exogenous mortality and retirement rates, as well as endogenous emigration. New workers are added from the education system. Graduates from a given cycle who choose not to pursue further education are added to the workforce at the skill level corresponding to their education. Dropouts from a grade are added to the workforce at the skill level corresponding to their last achieved educational cycle.

The variation of immigrant labor present since before the onset of the crisis is determined exogenously, as is that of Syrian refugees.

Finally, each year, a number of Lebanese emigrate, according to the relative evolution of wages (the evolution of foreign wages is assumed constant, such that a relative degradation of wages in Lebanon will push locals to migrate).

iii Wage setting

The model assumes that labor markets do not clear, and wages are modeled as a function of unemployment, public wages and the minimum wage (extended wage curve) in the following way:

$$\begin{aligned} \log afw_{f,origs,t} &= \beta_{1,f,origs} + \beta_{2,f} \log Ur_{f,origs,form,t} + \beta_{3,f} \log wf_{Adm,f,origs,t} \\ &+ \beta_{4,f} \log wmin_{f,t} \end{aligned}$$

The same holds for the informal sector where unemployment, public wages and the minimum wage influence wages. Influences from a formal minimum wage on the informal wage (a *lighthouse* effect) have been found in Latin America by Maloney & Mendez (2004), and Lemos (2009).

For informal and formal labor alike, sectoral wages respectively (w_i and w_f) are modeled as exogenous deviations (fw_{dist}) from the average wage (W_f) in the following fashion:

$$wf_{AC,f,origs,t} = afw_{f,origs,t} * fw_{dist}_{AC,f,origs}$$

^{vii} See Lofgren et al. (2013) for a detailed presentation of education modules in applied general equilibrium models.

$$w_{AC,f,orig,t} = a_i w_{f,orig,t} * f_{wdist_{AC,f,orig}}$$

iv. Closures and dynamics

The model runs sequentially, solving each year and updating the main variables in between solves. Capital accumulation is sectoral: every year the capital stock in a given sector is updated taking into account new investment and capital depreciation. Sectoral investment is modeled as a function of the sectoral stocks of capital, returns to capital and capital acquisition costs. The potential labor supply evolves exogenously within the education block, and debt ratios evolve according to the net deficits of Government and foreign savings.

The model has four closures. First, a savings-driven macro closure: households' marginal propensity to save is exogenous, implying that the total level of investment in the economy is determined by the total level of available savings (including foreign savings). Second, a government closure whereupon government expenditures are fixed as a constant share of GDP and tax rates, leaving the government budget deficit endogenous. Third, the exchange rate is fixed such that the current account is endogenous. Finally, the wage curve ensures closure for the labor market through the joint determination of wages and unemployment.

v. Data

The Social Accounting Matrix was built based on an Input-Output table for 2011 provided by the Central Administration of Statistics (CAS) and complementary data from the Central Bank and Ministry of Finance. GDP Growth rates projections are from IMF and World Bank sources. Employment and wage data by category (sector, skill, age, formal/informal) for local and foreign workers have been provided by CAS and the Living Conditions Survey of 2007. The information on Lebanese emigration comes from Kasparian (2009). Data on education has been provided by the Ministry of Education and Higher Education (MEHE).

We built a database on refugees based on different United Nations sources (UNHCR, UNDP, UNICEF and WFP), namely using information on population inflows, labor force and employment characteristics (including by education level). Data on income and transfers has been compiled from the different UN agencies, as well as consumption per product, reclassified according to the Lebanese national account categories.

5. Economic and social impacts of the Syrian conflict

a. Experiments

Our three sets of experiments are intended to capture three aspects of the Syrian crisis and its effects on Lebanon. First, three simulations representing the consequences of the Syrian conflict between 2011 and 2018 are compared with a counterfactual reference scenario, where no conflict existed. Second, two counterfactual policy simulations are run, one which considers the introduction of development aid through investment and the second one considering a situation where aid would increase in its current humanitarian form. The last scenario simulates the impact of refugees' consumption patterns through aligning their product consumption shares to the ones of the Lebanese population.

The first simulation considers the consequences of sharing borders with a country in full scale civil war. Firstly, terrestrially, Lebanon is almost entirely surrounded by Syria, and the possibilities for cross-border trade since the onset of the Syrian crisis have been seriously damaged. The complex political relations with Lebanon's southern neighbor, Israel, imply that most –if not all –of Lebanon's exports leave by air or by sea, at considerably higher cost. Secondly, tourism has taken a hit given the proximity of the conflict that has on several occasions spilled over onto Lebanese soil. The negative consequences of the conflict on Lebanon's foreign trade are simulated through a decrease of 20% in Lebanese exports, including tourism.

Our second simulation aims at capturing the massive influx of refugees that Lebanon has been seeing since 2011. A movement that exploded in 2014, when reportedly 10 000 Syrian refugees were entering the country every week. Relying on labor market participation rates from UNDP data, we add refugees to labor supply in Lebanon, considering that they all work in the informal sector.

In the third simulation, this influx of Syrians is accompanied by foreign aid, notably humanitarian relief provided by UNHCR and other international organizations. This is added as a flow from the rest of the world to Lebanon, affecting the balance of payments. Aid is allotted to refugees who use it to consume according to relative prices and an initial empirical consumption pattern. International aid keeps flowing until the end of the period (2018).

Given the results of the previous scenarios, we add an additional set of simulations to mitigate the negative effects of the Syrian crisis. On the one hand, we simulate an increase in investment through foreign aid. Since investment is endogenously determined in our model, we implement the simulation by introducing a subsidy equivalent to 5% of the investment cost. On the other hand, we inject the same amount in the economy, but through humanitarian aid instead of investment.

Table 2. Summary of the simulations

Scenario	
Trade shock	Demand for exports is reduced by 20% in 2012 and remains at this level throughout the reference period.
Refugee arrival	1.2 million Syrian refugees are integrated into the economy from 2011 to 2015, based on data from the UNHCR. A share of these joins the labor market.
Humanitarian aid	Accompanying the influx of refugees, an annual 1 billion USD are injected to the economy.
Development aid vs. Humanitarian aid	Injecting development aid equivalent to 5% of the total amount of investment in Lebanon.
	Transferring the same amount through humanitarian aid to refugees (targeting consumption).
Consumption patterns	Aligning refugees' consumption pattern to the Lebanese one.

b. Impacts on growth and the real exchange rate

When GDP growth is considered, the scenario of lowered exports yields a decrease in the GDP growth rate by about 8.3 p.p. (relatively to the Reference scenario) between 2011 and 2018. Compared to the 'low exports' scenario, the arrival of Syrian refugees yields a marginally positive impact on growth, reinforced by humanitarian aid flows, as shown by the 'aid' scenario. The GDP growth losses could almost be overcome when aid flows are doubled (the 'large aid' scenario). If, alternatively, the increase of aid is allocated to investment (in the 'investment' scenario), the performance in terms of growth is much higher (by 3 percentage points). This pleads in favor of coupling humanitarian aid with development aid.

As shown in Table 3, apart from investment, the exchange rate is the second driver of the variation in GDP growth.

Table 3. Cumulated variations in growth, investment and exchange rate between 2011 and 2018

	Ref	Exports	Displaced	Aid	Large aid	Investment
GDP Growth	28.3%	20.0%	20.5%	22.0%	23.9%	24.9%
Total investment	96.0%	86.9%	86.9%	88.4%	90.4%	101.3%
Real Exchange rate	-1.6%	-3.7%	-4.0%	-3.3%	-2.3%	-3.3%

When exports fall, the real exchange rate decreases by 3.7 percentage points over the period. Since the model uses a fixed exchange rate closure, the variation in the real exchange rate reflects variations in the numeraire due to sectoral reallocations. Humanitarian aid entails an increase in the real exchange rate ('aid' and 'large' aid scenarios in comparison with the 'displaced' scenario). The resulting price increase triggers a 'Dutch disease' effect, which explains the limited impact on growth of aid flows. When aid takes the form of investment, the 'Dutch disease' effect is absent because most of the investment in Lebanon is in non-tradable goods (mainly construction).

c. Labor market and income

Table 4. Cumulated variations in unemployment and income between 2011 and 2018

	Variation 2011-2018			
	Ref	Exports	Displaced	Aid
Total unemployment	-1.9%	-0.9%	4.1%	3.9%
Lebanese unemployment	-2.5%	-1.0%	0.4%	0.1%
Labor income for Lebanese	39.4%	30.8%	24.9%	25.9%
Income per capita for Lebanese	9.4%	4.1%	3.8%	4.8%

Table 4. shows the evolution of unemployment and labor income for Lebanese under the various historical scenarios. Initially on a downward trend, the unemployment of Lebanese increases by 1.5 percentage points with a shock to exports. With the influx of Syrian refugees, it increases a further 1.4 percentage points. This increase can only be partially compensated by aid flows, as seen in the scenario “Aid”.

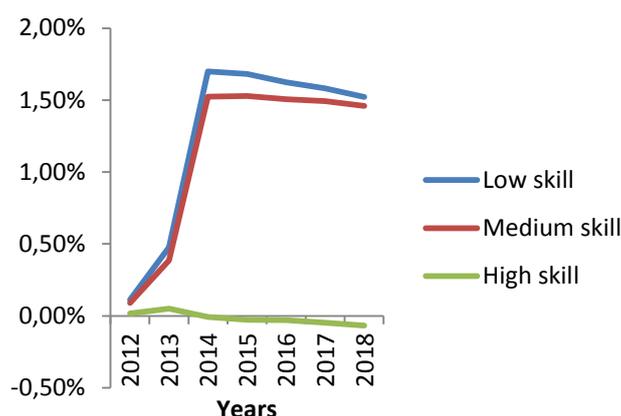
This negative outcome only affects low and medium skilled workers. As seen in Graph 1, which shows the variation in unemployment between scenarios “Displaced” and “Exports”, high skilled workers are unaffected (or even slightly positively affected) by the arrival of Syrian refugees. This heterogeneity stems from the skill composition of refugees, and the fact that workers of different origins are substitutable and workers of different skill groups complementary in production. In addition, low and medium skilled workers have more limited emigration opportunities than their high skilled counterparts, rendering them less able to escape deteriorating employment conditions.

The complementarity between skill groups, and the large influx of mainly low skilled cheap labor, has been studied previously in Özden & Wagner (2015), who find that detrimental effects from immigration in Malaysia are concentrated among the unskilled, workers of secondary education and higher being positively affected at best, and unaffected at worst.

Lebanese labor income decreases by 8.6 p.p. with the shock to exports (Table 4), and an additional 5.9 p.p. with the arrival of displaced Syrians. Similar to unemployment, labor income losses are unevenly distributed among skill groups, with high skilled workers seeing their incomes increase slightly (0.25%), while low and medium skilled see their labor income drop by 8% and 5% respectively.

Total income per capita of Lebanese is unaffected by the arrival of displaced Syrians. Aid flows however increase capital income since they create economic activity through refugees’ consumption.

Graph 1. Unemployment by skill (pp)



Turning to counterfactual simulations in Table 5, we see that an additional \$1bn in international funding would additionally reduce Lebanese unemployment. However, the effect is marginal when humanitarian aid is considered (0.2 p.p.). On the contrary, when these flows take the form of investment (development aid), the negative impact from the arrival of displaced Syrians is absorbed, and only the negative impact from the shock to exports remains.

Table 5. Cumulated variations in unemployment and income between 2011 and 2018

	New ref (Aid)	Investment	Large aid
Total unemployment	3.9%	2.7%	3.6%
Lebanese unemployment	0.1%	-0.9%	-0.1%
Refugees unemployment	34.7%	30.7%	33.6%
Income per capita for Lebanese	4.79%	6.15%	6.11%
Labor income per capita for Lebanese	2.6%	5.0%	3.2%

Turning to income, we see that the additional \$1bn would have increased income of the Lebanese, but channeling it to investment rather than to aid seems not to matter too much. However, when directed toward investment, more jobs are created, raising the labor income per capita more than in the pure aid scenario. However, this gain is mitigated by a decrease in capital income, due to a fall in the rate of return to capital resulting from increases in the capital stock.

d. Structural change

The arrival of Syrian refugees not only has consequences on the labor market and growth. Through modifying labor supply and consumption patterns, as well as by way of aid flows, refugees create

sectoral growth differentials. As time goes by, these sectoral movements contribute to structurally change the Lebanese productive apparatus.

Table 6. Sectoral production variations under various scenarios

	Reference	Variation from reference			Variation from "Aid" scenario		
		Exports	Displaced	Aid	Investment	Large aid	Consumption structure
Agriculture	6.1	-0.8%	4.5%	4.5%	2.3%	2.7%	-3.1%
Industry	38.3	-1.8%	-0.3%	-0.3%	2.6%	-0.3%	0.2%
Energy	8.4	-3.3%	0.7%	0.7%	2.1%	3.3%	-1.9%
Construction	21.4	-2.5%	-0.8%	-0.8%	5.7%	0.3%	0.4%
Communication	20.9	-1.8%	0.6%	0.7%	2.5%	0.5%	-0.7%
Transport	3.1	-0.4%	1.2%	1.2%	-0.1%	0.2%	-0.3%
Health	10.2	-3.3%	-2.7%	-2.7%	1.2%	-0.5%	1.9%
Other services	46.4	-1.8%	-1.0%	-1.0%	2.3%	0.1%	0.8%
Administration	4.2	-0.5%	-0.3%	-0.3%	0.4%	0.1%	

Since displaced Syrians are relatively low-skilled (at least in terms of recognized skills in the Lebanese labor market), their arrival creates a labor supply shock beneficial to sectors that are intensive in informal low-skilled labor. Furthermore, their consumption is one of primarily basic necessities such as food, energy and transportation. Looking at the variation in production volumes in the displaced scenario, as compared to the reference scenario, we see that the overall fall in exports is more than compensated by the arrival of displaced Syrians in the sectors Agriculture, Energy, Communication and Transport. The addition of aid flows does not significantly modify this outcome, since much of aid consists of imported goods. Taking the aid scenario as a reference, one sees that an additional \$1bn of aid benefits the energy sector, construction, other services and administration. Interestingly, when this additional aid consists of investment, the industry, construction, health and other services see their production increase relatively to the humanitarian aid scenario.

Finally, displaced Syrians have different consumption patterns, affecting local demand for Lebanese products. The last column shows the importance of these patterns in creating the abovementioned structural change. Had the consumption patterns been identical to those of the Lebanese, the impact on Agricultural production would not have been positive but negative (the same goes for Energy, Communications and Transport, see scenario 6 versus scenario 3). Industry, Construction and Health would however have fared better.

e. Sensitivity analysis

General equilibrium models are sensitive to structural modeling decisions, closure rules and parameter values. Among this, elasticities are perhaps the main concern. Lacking micro data from Lebanon, we are unable to estimate elasticities for the model in the fashion of Card & Lemieux (2001) (such estimates are also sensitive to the nesting structure considered).

We therefore conduct a sensitivity analysis, examining how results vary with alternate hypotheses for our five main elasticities (related to the production structure). It is usually accepted that capital and high-skilled labor are complements in production, as are different skills of labor. Formal versus informal labor and labor of different origins are substitutes. These initial hypotheses are maintained in

the two first alternate scenarios, where in scenario 1 we reduce the discrepancy between elasticities, decreasing the level of complementarity between skills and the level of substitutability between origins and formal/informal. In scenario 2, we assume that the substitutability between different origins in the informal sector is the same as in the formal sector.

In scenario 3, we lower the elasticities between formal/informal, as well as between origins in both the formal and the informal sector. In the final scenario, we assume that capital and labor are substitutes, rather than complements, as are labor bundles of different skill types.

Table 7. Alternative values for elasticities in the production structure

Elasticity	Initial values	Alternate values #1	Alternate values #2	Alternate values #3	Alternate values #4
Sigma1	0.3	0.7	0.3	0.3	1.1
Sigma2	0.3	0.7	0.3	0.3	1.1
Sigma3	2	1.5	2	1.5	2
Sigma4	3	2	3	1.8	3
Sigma5	8	3	3	2.5	8

We choose to represent the difference between the large humanitarian aid package and the mixed aid/investment package for this analysis. This amounts to reproducing the difference between columns 4 and 3 of Table 5 for the four alternate elasticity groups shown above.

Table 8. Sensitivity analysis for the differential effect of Investment over extra Aid

	Initial values	A.V. #1	A.V. #2	A.V. #3	A.V. #4
Total unemployment	0.9%	0.3%	0.6%	0.5%	0.1%
Lebanese unemployment	0.8%	0.3%	0.7%	-0.2%	0.1%
Refugees unemployment	2.9%	0.4%	1.2%	0.3%	0.5%
Income per capita for Lebanese	-0.04%	-0.6%	-0.03%	-0.02%	-0.17%
Labor income per capita for Lebanese	-1.8%	-0.1%	-2.1%	-2.2%	-0.2%

As expected, results are sensitive to changes in the elasticity of substitution between bundles in the production structure. They however remain of the same sign in all occasions (except for Lebanese unemployment in scenario 3). Interestingly, the higher-order elasticities (the elasticity of substitution between capital and high-skilled labor for instance) seem to provoke the largest differences from our initial values. We however believe that our initial values are the best approximations of our true values, since these are the ones that produce reasonable figures for the evolution of Syrian refugees' unemployment in the reference scenario. Indeed, for too low values of Sigma3, Sigma4 and Sigma5, the unemployment of refugees converges towards 90% in the medium term, a number that does not fit well with the statistical data we have from 2014. We therefore believe that our figures are reasonable approximations of the counterfactual evolutions pertaining to various policy simulations.

6. Conclusion

The objective of this article was to assess the economic and social impact of the Syrian war on Lebanon. The main channels are the reduction of trade, the surge of the number of displaced and the progressive increase of foreign assistance to these refugees. We also assess the impact of the introduction of development aid through investment and investigate if refugees' consumption patterns affect structural change in Lebanon.

The methodology relied on the development of a dynamic general equilibrium model, able to capture migration issues, discrimination and segmented labor markets.

The main results are that the costs of lower trade and tourism in Lebanon are high given the importance of these sectors for the Lebanese economy. The arrival of Syrian refugees yields a positive impact on growth, slightly reinforced by humanitarian aid flows. An increase of aid allocated to investment would significantly enhance the performance in terms of growth. This confirms the idea of Collier and Betts (2017) of the need of a new partnership between Governments, the aid community and businesses. Of course political obstacles will remain as some nationals fear that the Syrian settle forever given the history of the country and its complex political and confessional equilibria.

The surge of the displaced has a negative impact on unemployment and Lebanese labor income, especially for the lowest segments of the Lebanese workforce. This negative impact can be overcome only through investment development. The massive arrival of displaced Syrians has also an impact on structural change in Lebanon. The two channels are the skill composition of the Syrian workforce (mainly unskilled informal workers) and the different consumption patterns of the displaced households.

Thinking about how to improve refugees' likelihoods and reduce the burden on Lebanon should be accompanied by a reflection on the Syrian-Lebanese economic relationships in the post-conflict period. An extension of this article could consider additional scenarios including a deeper integration of the two countries in a post-war scenario. Other aspects could also be investigated such as capital and entrepreneurship abilities of refugees.

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