Implications of different factor market conditions in CGE: an application to Palestinian employment in Israel and its impact on the West Bank's economy

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Abstract

The sensitivity of simulation results is a well-known challenge to CGE modellers. While there is an extensive documentation on the role of macroeconomic closure conditions and the effect of parameter values, especially trade elasticities, little is known about the implications of different factor market clearing conditions. This paper aims at investigating the implications of different factor market conditions and quantifying the biases of limiting the analysis of simulation results to what happens within the production boundary. The paper uses the case study of the West Bank's labour markets to quantify the effects and implications of different specifications of the labour markets on the simulation results.

Key words: Production boundary, welfare analysis, labour leisure trade-off, Palestine

1. Introduction

The sensitivity of simulation results is a well known challenge to CGE modellers. While there is an extensive documentation on the role of macroeconomic closure conditions and the effect of parameter values, especially trade elasticities, little is known about the implications of different factor market clearing conditions (McDonald, 2018). A starting point in the discussion of the implications of different factor market clearing conditions is the definition of a production boundary. The production boundary set the demarcation between the economic activities that are included in the CGE model and those that are excluded. In price-driven whole economy models, like CGE models, the production and consumption boundaries follow the approach adopted by the System of National Accounts (SNA). Accordingly, production and consumption decisions relating to goods and services take place within the boundary only if those goods and services can have uniquely determines prices. Subsequently, the activities within the production boundary are the ones using inputs and that are controlled and organized by institutions (SNA, 2008).

Activities producing goods and services for sale on the markets satisfy the SNA condition that the prices can be uniquely defines, whether or not they are actually sold (McDonald, 2018). By contrast, activities undertaken by household members to produce services that are consumed by the households at home are excluded from the SNA definition. Those services do not satisfy the condition that their prices be determined in a unique way, because there are no suitable market prices to value such services. The main input for the production of services by the household for its own use that is excluded from the SNA accounting is labour.

The definition of the production boundary has important implications for the definition of the macroeconomic aggregates and the welfare analysis. By convention, macroeconomic aggregates such as absorption and GDP are defined with reference to goods and services produced and consumed within the SNA boundary. However, it is evident that household derive utility not only from the consumption of goods and services purchasable from the market, but also from services produced outwith the SNA boundary. Hence, for a full accountability of the welfare effects, changes within and outwith the boundary need to be reported. This is especially important when there are transfers of labour across the boundary. When a policy shock leads to increases in wage rates within the production boundary, households allocate more labour to the market activities at the expense of the activities outwith the boundary. Consequently, absorption increases and welfare gains are realised within the boundary. But as labour is reallocated away from activities outwith the production boundary, welfare losses take place outwith the boundary. Therefore, there are positive and negative welfare effects occurring, and limiting the analysis to what happens within the production boundary is prone to biases.

This paper aims at investigating the implications of different factor market conditions and quantifying the biases of limiting the analysis of simulation results to what happens within the production boundary. Four stylized specifications of the labour market conditions are considered: i) fixed supply, ii) surplus labour, iii) upward sloping labour curve, and iv) labour leisure trade-off. The next section, section two, presents the theoretical foundations and implications of the four

stylized specifications of the labour markets. Section three provides some background information on the West Bank's labour markets, which are used as a case study in this paper to quantify the effects and implications of different specifications of the labour markets on the simulation results. Section four describes the data used as benchmark, the model, macroeconomic closures and factor market clearing conditions in each of the model specifications. Section five describes the simulation implemented. Section six analyses the main results, while section seven draws on the main conclusions and policy implications of the case study.

2. Stylized specifications of the labour market conditions

Conventionally one of the two extreme specifications of the labour markets is used in CGE models. Either the supply of labour is assumed perfectly inelastic (fixed supply) or perfectly inelastic (surplus labour). In recent years an intermediate solution with an upward sloping labour supply curve has been included in several models. Finally a fourth way of specifying the labour markets has emerged with the labour leisure trade-offs. This section discusses these four stylized specifications of the labour market conditions and provides the theoretical implications of the different specifications for the welfare analysis.

The fixed labour supply formulation considers the time allocated by households to activities within the SNA boundary and asserts the labour supply to be fixed at that level. Households are assumed the active agents in the labour markets, but their decisions are indifferent to changes in the price of labour. Accordingly, the labour supply curve is perfectly inelastic. This formulation implies a strong separability between the uses of labour within and outwith the boundary. Hence, this treatment is neutral with respect to the welfare generated outwith the boundary, since there is no transfer of labour across the boundary. Despite its merit of neutrality to welfare generated ouwith the boundary and its consistency with standard economic theories that consider households to be the active agents in the operation of the labour markets, the strong separability between uses of labour within and outwith the boundary is open to challenges, even in economies with no involuntary unemployment. In fact, it is reasonable to assume that households' decisions in the labour markets are influences by changes in real wages.

The surplus labour formulation recognizes the potential for involuntary unemployment. It derives from the assumption that there is a spare capacity of labour, which can be drawn into employment within the production boundary at zero marginal cost. Accordingly, employment in the market activities can be increased, while keeping the real wages fixed. This assumption is open to challenges, as there is empirical evidence that changes in the levels of employment are correlated with changes in the real wage rates (Blanchflower). The surplus labour formulation is neutral to changes in welfare generated outwith the boundary, by assuming that labour has zero opportunity cost outwith the production boundary. But this apparent neutrality renders the labour surplus formulation open to challenges, as labour outwith the boundary is often engaged in activities producing services for the use of the households. This is particularly the case in developing countries, where there are no unemployment benefits and labour not employed within the

production boundary is often engaged in low-productivity activities producing services for the entire household (Aragie, 2017). An additional criticism of the surplus labour is that it presumes factors to be the active agents making decisions in the operation of the markets. In standard economic theories, the decision-making agents are the owners of the factors, i.e. households (McDonald, 2018).

The upward sloping curve formulation derives from the empirical evidence that changes in the wage rates influence the supply of labour within the production boundary. This treatment considers that labour enter the production boundary at a positive marginal cost. However, it implicitly assumes that the opportunity cost of labour outwith the production boundary to be zero. Hence, this formulation is not neutral with respect to welfare generated outwith the boundary. When a transfer across the boundary takes place, the utility forgone outwith the boundary is presumed to be zero, while absorption increases as activities within the boundary pay a positive price for the additional labour supplied, which increases labour and household income. Subsequently, part of the increases in the measured absorption is realised from the reduction of welfare generated outwith the boundary (McDonald, 2018). Finally, the theoretical and behavioural foundations of the upward sloping curve are not supported by standard economic theories. Its use can only be rationalized with non-competitive theories of the labour market such as the union bargaining power, efficiency wage and labour contract analytical frameworks (Blanchflower and Oswald, 1995). It implicitly assumes households to be passive agents in the operation of the labour markets, which also runs counter standard economic theories.

The labour leisure trade-off explicitly accounts for household use of time within and outwith the production boundary. Opportunity cost of labour outwith the boundary is explicitly provided in the model. Its value equals the wage rate in effect within the production boundary. Since the price of labour across activities either within or outwith the boundary is the same, the labour leisure formulation complies with the Law of one Price, which is presumed to hold in any price driven whole economy model. Household utility is defined at full consumption with the reciogfnition that households do not only derive utility from the consumption of goods and services purchasable from the markets, but also from services they produce for their own use outwith the production boundary. The services produced outwith the boundary are referred to by the generic term leisure. By defining household labour at full time endowment as well as their utility at full consumption, this model formulation captures the trade-off facing households in the decision of allocating time within and outwith the production boundary and links their consumption outcomes to the decisions made in the labour markets. This model specification measures the welfare generated on both sides of the production boundary. When transfers of labour occur, the positive and negative welfare effects on both sides of the boundary are recorded. The model specification is consistent with standard economic theories and assumes households and activities to be the active decision making agents in the operation of the labour markets. A critical point of the labour leisure trade-off is its inconsistency with involuntary unemployment, as labour can always be employed either within or outwith the boundary.

3. The West Bank's labour markets and Palestinian employment in Israel

The labour market in the West Bank is a prototype of a dual market, with employment in both the internal market and in the Israeli market. Palestinian employment in Israel is essentially demand driven. The large wage premium offered in Israel provides incentives to Palestinian workers to to seek employment in Israel, even for relatively highly skilled Palestinians. The work permit and quota policy as well as the frequent closure of the entry points into Israel for Palestinian workers effectively limit the number of Palestinians in the Israeli economy and prevent the adjustment mechanism that would have led to the equalization of Palestinian wages in the domestic and Israeli markets should there be no restriction on labour mobility.

In 2011, some 14 percent of the employed persons in the West Bank were employed in Israel and accounted for some 22 percent of all labour income realised by West Bank workers (Arnon and Bamya, 2007). West Bank workers are a relatively cheap source of labour to the Israeli economy, although competition between West Bank and Israeli labour is limited; West Bank employees in Israel are largely confined to the low-skill and manual sectors of construction, agriculture, and some low-tech industries and services (Miaari and Sauer, 2011; Angrist, 1996), where the domestic Israeli labour supply falls short of demand (Rosenhek, 2006).

Israel has imposed tight restrictions on the free movement of people, goods and services between the Israeli and Palestinian territories since 1991 and the Gulf war (Aranki, 2006). Access to the Israeli labour market for Palestinians is controlled by individual work permits that are issued in response to requests from Israeli employers and are conditional upon the personal status of the Palestinian individuals. However, the demand for Palestinian labour in Israel, and the Israeli settlements in the West Bank, exceeds the supply of labour permits; hence it is estimated that between 2005 and 2015 an average 38% of Palestinian workers in Israel and its West Bank settlements did not have permits (PCBS, 2016).

The labour market in Israel for Palestinians is an administered market, the operation of which is subject to political decisions taken in Israel over which the Palestinian National Authority (PNA) has little or no control. Thus, the West Bank labour market and economy experiences substantial fluctuations when access for Palestinians to the Israeli labour market is changed by legislative fiat. This study explores the implications for the West Bank economy consequent upon a return of Palestinian employment in Israel to its pre-*intifada* level, under the different specifications of the labour market conditions.

4. The Model and Data

4.1.Data

Few SAMs have been developed for the Palestinian territories. A common feature of the previous SAMs developed by Astrup and Dessus (2001), Bayar (2013), and Missaglia and Valensisi (2014) is that they are highly aggregated, especially with regard to the number of household, factor and activity accounts. The nature of the interaction between the Palestinian and Israeli economies and the complexity of labour and commodity movements between them require a SAM with detailed representation of labour and household as well as production sector and commodity accounts to depict the implications of labour movement policies on the Palestinian economy.

Accordingly, the SAM used in this study addresses the shortcomings of the previous SAMs for Palestine and has several distinctive features. It focuses exclusively on the West Bank economy, which is currently the only Palestinian territory with workers employed in Israel. The SAM is extensively disaggregated, and comprises 189 accounts. It has a multiple product-activity set up with 48 commodity groups produced by 36 activities. Two foreign accounts are included for Israel and the rest of the world to depict the customs envelope between Palestine and Israel and the interdependency of their labour markets. The SAM encompasses 33 production factor accounts, among which 31 are labour groups, besides two accounts for capital and land. Foreign labour is separated from the domestic labour, which is further disaggregated based on skill level and gender. Male workers who represent the quasi totality of Palestinian labour in Israel are further categorized based on eligibility for a work permit in Israel. Three levels of eligibility are considered based on social characteristics such as age and marital status: ineligible, weakly and highly eligible. There are 20 household groups classified based on income quintile (measured as expenditure per adult equivalent), and socioeconomic characteristics of their active members. The SAM is fully documented in Agbahey et al. (2016).

This database is used to calibrate the models with fixed supply, surplus labour and upward-sloping curve specifications. For the model specification with labour leisure trade-off a few changes to the database are required to incorporate leisure activities and commodities. Each representative household is paired with a unique activity that uses the household's own time as input to produce leisure that is consumed only by that household. The factor ownership matrix also has to be extended to account for labour each household uses to produce leisure, in addition to the labour that is supplied to the market. For comparability of the results of this model specification with the results of the other specifications, the time available to households as leisure time is limited to the time endowment for their members who are not employed within the production boundary. Accordingly, the unit of labour either in employment within the boundary or outwith the boundary is kept in physical number of persons. Table 1 summarizes the employment data in the baseline in the four model specifications.

Table 1. Baseline employment data (unit = physical person)

		Fixed Supply (Model FS)	Surplus labour (Model SL)	Upward-sloping curve (Model WC)	Labour leisure trade-off (Model LLTO)
Employment within the SNA boundary	Domestic market activities	519,148	519,148	519,148	519,148
	Foreign market activities	74,814	74,814	74,814	74,814
Unemployment/ Employment outwith the SNA boundary		0	123,892	123,892	123,892
Total		593,962	717,854	717,854	717,854

4.2.Model

The model used in this study is an adjusted version of the standard STAGE-2 model (McDonald and Thierfelder, 2013). STAGE-2 belongs to a suite of single-country SAM-based CGE models. Households are assumed to maximize utility represented by a single-stage Stone-Geary linear expenditure system. Firms maximize profits subject to a production cost structure. For this study, the standard STAGE-2 model is modified to depict some special features of the Palestinian economy and its interaction with the rest of the world. First, a multiple trade partner specification is introduced to separate Israel from the other trade partners. This model extension is set up in a generalized way that can support more than two trade partners. Second, the domestic production module is modified to accommodate a seven-level production process that reflects the composition of the labour force in the West Bank. Each level of the production process involves Constant Elasticity of Substitution (CES) functions.

A mobility function is incorporated in the model and is activated by changes in relative wages. The intensity of mobility is governed by a response elasticity, which is defined for each pair of market segments and captures the influence of structural features such as transaction costs and efficient factor markets on the labour mobility. By allowing labour to be mobile, the standard assumption of labour income be distributed to households in fixed proportions is no longer valid. Accordingly, the matrix of share coefficients controlling the functional distribution of income is replaced by a matrix of variables that tracks changes in the supply of labour in each sector and makes the labour income distribution endogenous.

4.3.Macroeconomic Closure Conditions

The reality of the West Bank being a small player in the world market is depicted with the small country assumption, which implies that the West Bank is a price taker. The model is investment-driven as investments in the Palestinian economy are largely exogenous. The share of investments

in final demand is fixed. To keep the balance between savings and investments, household and enterprise savings rates vary equiproportionately. Government savings are fixed and the direct tax rate adjusts multiplicatively to maintain the balance. Government consumption is a fixed share of final demand. As the Israeli Shekel is the main currency in the West Bank and given that Israel is West Bank's main trading partner, a fixed exchange rate is considered. To avoid future consumption effects, the current account balance is fixed. The CPI is fixed and serves as numeraire, meaning that transfers and wages are in real terms.

The factor market closures common to all four model specifications are such that capital and land are fully employed and mobile across sectors and their prices are flexible. Labour is assumed mobile across sectors within each market segment, but immobile across market segments. Labour can move from agricultural sector to secondary and construction sectors; from secondary sector to construction and tertiary sectors and from construction sector to tertiary sectors.

The closures governing the shape of the labour supply function are distinct across the model specifications. In the fixed supply specification, labour market is also at full employment. Hence, the supply function is perfectly inelastic (vertical). In the labour leisure trade-off specification, the labour markets are also at full employment, as labour can always be employed either in the activities within the production boundary or outwith the boundary. In contrast to the fixed supply specification, the supply of labour to the activities within the boundary is not perfectly inelastic, since the labour leisure trade-off allows transfers across the boundary.

In the surplus labour and upward-sloping curve specifications, explicit unemployment of labour is considered. The size of the pool of unemployment in each labour market segment is determined based on the official data provided by the Palestinian Central Office of Statistics (PCBS, 2012). In the surplus labour specification, a switching regime is considered. Accordingly, the labour supply function has two segments, a perfectly elastic (horizontal) one implying that additional workers can move into production at fixed real wages as long as there is unemployed labour; and a perfectly inelastic (vertical) one reflecting full employment. The choice of the switching regime allows wages to change in the domestic market, such that the model is compatible with the mobility function.

For the models specification with upward sloping curve, the curve elasticity is derived from empirical panel data of wages and unemployment rates in the West Bank's Bank governorates between 2000 and 2015 (PCBS, 2017a; PCBS, 2017b). The variability between regions is controlled with the fixed effects estimation procedure. The estimated model is shown in Equation [1], where $\ln(w_f)$ is the logarithm of the wage, $\ln(urate_f)$ the logarithm of the unemployment rate, and ε stands for the fixed effects. As both the local unemployment and wage rates are entered as logarithms, the coefficient of the unemployment rate represents a proportional change and can be read off as an elasticity. The model estimates are statistically significant at the 1% level.

$$ln(w_f) = -0.072\, ln(urate_f) + \varepsilon \qquad [1]$$

4.4.Factor Market Clearing Conditions

The initial factor market clearing condition is modified to reflect the employment of Palestinian labour in the domestic market activities and in the Israeli market. The new factor market conditions are distinct across model specifications. In the model with fixed supply, a new parameter $fd\_w(f,w)$ is created to capture the demand of factor f in foreign region w. As a parameter, which value is set exogenously, it ensures that the model takes up the envisaged shock of increased Palestinian employment in Israel. This mechanism reflects the empirical evidence that Palestinian employment in Israel is demand-driven. The new factor market clearing condition in Equation [2]:

$$FS(f) = \sum_{a} FD(f,a) + \sum_{w} fd\_w(f,w) \qquad [2]$$

Where $FS(f)$ is the total supply of factor f, $FD(f,a)$ is the demand of factor f by activity a within the production boundary of the domestic market, and $fd\_w(f,w)$ is the demand for factor f in foreign region w.

In the surplus labour and upward-sloping curve specifications, a variable is added to the market clearing condition to capture the pool of factor not employed within the production boundary

$$FS(f) = \sum_{a} FD(f,a) + UNEMP(f) + \sum_{w} fd\_w(f,w) \qquad [3]$$

Where $UNEMP(f)$ is the pool of the unemployed factor f. In the labour surplus specification, unemployment is defined as an inequality, which allows the unemployment of each factor to change subject to the condition that unemployment cannot be negative and that if there is unemployment of a factor then the real wage rate for that factor is fixed (Equation [4])

$$UNEMP(f) > 0 \qquad [4]$$

In the upward-sloping curve specification, unemployment is defined by a log-linear equation (Equation [5]), which implies the unemployment of each factor to change subject to changes in real wages and to the pre-determined supply elasticity.

$$ln\left(\frac{WF_f*(1-TYF_f)}{CPI}\right) = \alpha_0 + \alpha_1\, ln\left(\frac{UNEMP_f}{FS_f}\right) \qquad [5]$$

where TYF are factor taxes, CPI the consumer price index, $\boldsymbol{\alpha_0}$ the intercept of the function and $\boldsymbol{\alpha_1}$ the wage curve elasticity for Palestine (-0.072).

In the labour leisure trade-off specification, the market clearing condition is further modified to reflect the use of labour in activities outwith the boundary, as shown in Equation [6].

$$FS_f = \sum_{alein} FD_{f,a} + \sum_{w} fd\_w_{f,w} + \sum_{insw} FSIE_{insw,f} \qquad \forall alein_a \; and \; f_{ff} \qquad [6]$$

Where factor demand $FD_{f,a}$ is only aggregated over the set $alein$, which refers to activities within the production boundary of the domestic market. $FSIE_{insw,f}$ is the pool of factor f supplied by institution insw to activities outwith the boundary. The demand of labour in activities outwith the

production boundary is defined in the Equation [7], where the mapping (map_hh_alei) pairs the leisure activities $alei$ with households (hh), while the set $alei$ refers to leisure activities.

$$FSIE_{insw,f} = \sum_{a\$map\_hh\_alei(insw,a)} FD_{f,a} \quad \forall alei_a \; and \; f_{ff} \qquad [7]$$

5. Simulations

After assuring that the model replicates the original data that represents the economy in 2011, which is called "base" scenario, a counterfactual scenario of a return to the pre-intifada level of Palestinian employment in Israel is introduced. In 1999, before the second Palestinian uprising, the number of Palestinians from the West Bank employed in Israel amounted to 99,974 workers. It could be argued that the two economies have grown over time and that for economic reasons both the demand and supply of Palestinian workers in Israel surpass this pre-intifada absolute number. However, a group of Palestinian and Israeli officials and researchers acknowledge that for political reasons it is unlikely that the number of Palestinians permitted to work in Israel in the future exceed the pre-2000 levels (Aix Group, 2004). Therefore, the 1999 absolute number of Palestinians working in Israel serves as the reference.

The shock keeps the composition of Palestinian labour in Israel unchanged compared to the baseline. Table 2 summarizes the number of Palestinian workers in Israel in the baseline in physical units and in the scenario as percentage change compared to the base. Note that the factor income from Israel for each labour group is increased in the same proportions as their numbers.

Table 2. Number of Palestinian workers in Israel in the baseline (physical units) and in the scenario (%)

	Baseline (unit = physical person)	Scenario (%)
Low-skilled ineligible males	17,364	35.7%
Low-skilled weakly eligible males	19,065	35.7%
Low-skilled highly eligible males	29,128	35.7%
Low-skilled females	1,162	35.7%
High-skilled ineligible males	3,123	35.7%
High-skilled weakly eligible males	1,254	35.7%
High-skilled highly eligible males	2,559	35.7%
High-skilled females	32	35.7%
Total	73,687	35.7%

6. Results and Analyses

This section starts with a discussion of the effects of the shock in the factors markets across the four models. Afterward it compares the changes in the commodity markets, before discussing the macroeconomic and welfare effects. Due to space contingency, results are displayed for aggregated categories. The full set of results can be obtained from the authors upon request.

6.1.Comparative analysis of effects in the factor markets

The four model specifications respond differently to the shock. In the model with fixed supply (model FS), the additional Palestinian labour demand in Israel is fully drawn out of employment in the domestic West Bank market. By contrast, in the other three models, part of the extra labour demand in Israel is met with labour previously not employed in the domestic market. In the model with surplus labour assumption, almost all the extra Palestinian labour demand in Israel (98%) is met with labour previously not employed in the domestic market. In the model with upward-sloping curve, about three quarters of the extra labour demand in Israel stems from the pool of unemployment in the market activities. Finally, the model with labour leisure trade-off indicates that 8% of the shock is met with labour not employed in the market activities in the previous period. Table 3 summarizes these findings.

Table 3. Origin of Palestinian workers starting employment within the production boundary of the Israeli market

	Model FS		Model LLTO		Model WC		Model SL	
	Number	Share	Number	Share	Number	Share	Number	Share
Out of unemployment	0	0%	2,234	8%	19,551	74%	25,778	98%
Out of domestic labour market	26,287	100%	24,053	92%	6,736	26%	509	2%
Total	26,287	100%	26,287	100%	26,287	100%	26,287	100%

As expected, the model specifications with fixed supply and surplus labour gives the extreme results. The model with fixed supply, by assuming that the time available to households is fully employed in the market activities, provides for no spare capacity from which households can source additional labour. Hence, the shock fully falls on the labour already in employment in the domestic market activities. At the other extreme, the surplus labour assumption by providing households the option to transfer labour across the SNA production boundary into the market activities at zero opportunity cost generates very optimistic results with the shock having little effect on labour already in employment in the domestic market activities.

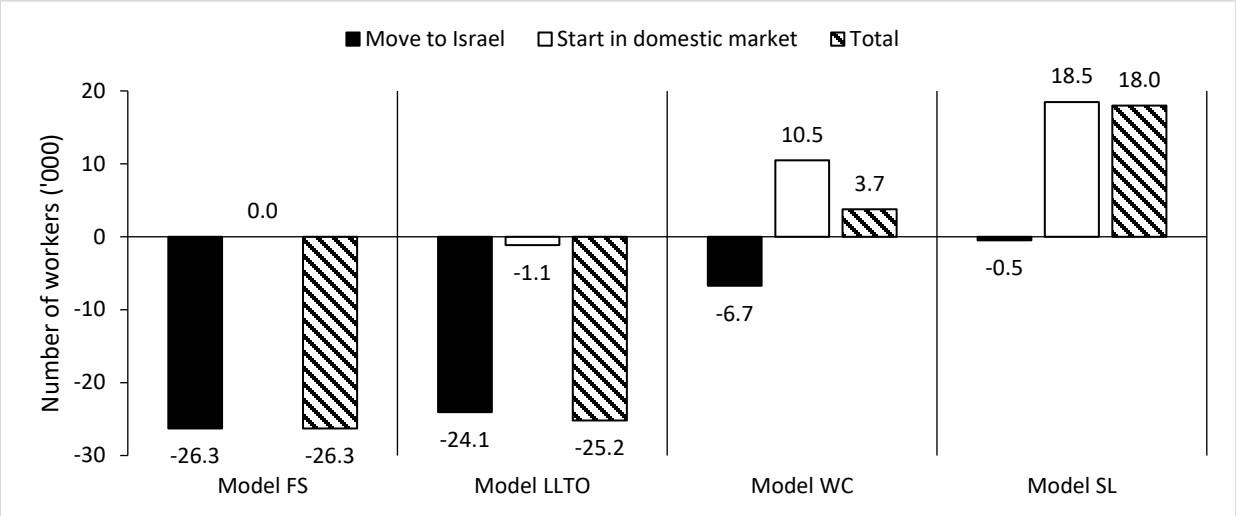
By assuming that labour enters employment in the market activities at a positive price, the upward-sloping curve reduces the amount of labour entering employment in the market activities. Subsequently, compared to the model with surplus labour less workers starting employment in

Israel were previously unemployed in the market activities, while more were previously employed in the domestic market activities.

The labour leisure trade-off assumption. Implying that household members are either employed in the market activities or employed outwith the SNA production boundary, in the production of leisure, also associates a cost to transferring labour across the boundary. The opportunity cost of labour outwith the boundary being equal to the market wage within the boundary attaches a higher cost to the labour transfer across the boundary than does the upward-sloping curve assumption. Households do respond to the shock, by freeing labour out of the production of leisure to start employment in the Israeli market.

Figure 1 shows that while workers are switching out of employment in the domestic market activities to start employment in Israel, depending on the assumption used to model the labour supply, workers are transferred across the production boundary to start in the domestic market.

Figure 1. Movements into and out of employment in the domestic market

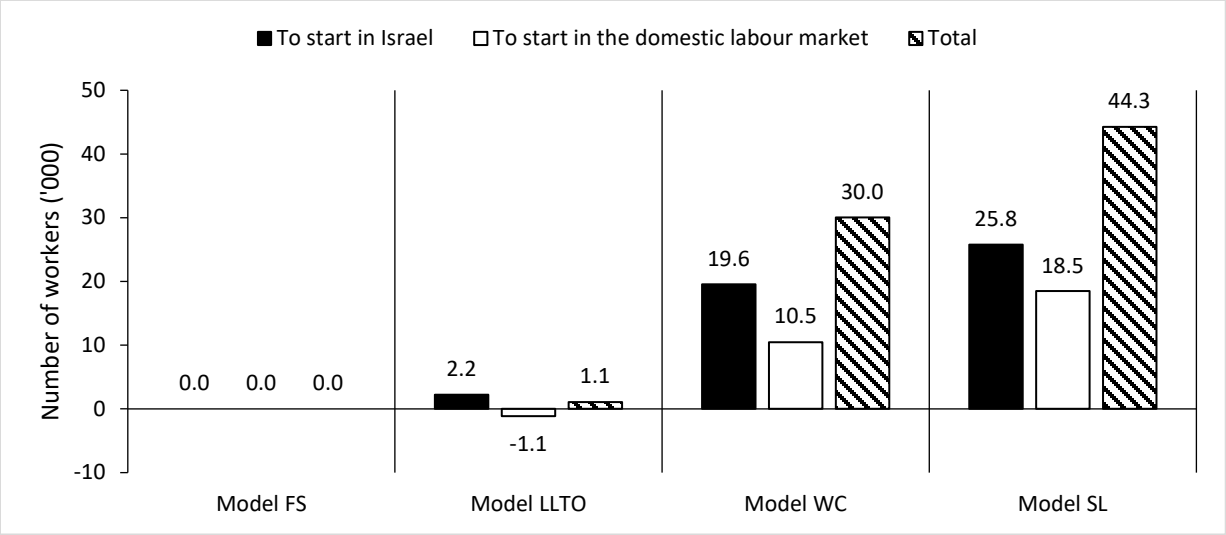


The models with surplus labour and upward-sloping curve show that the number of workers leaving employment in the domestic market activities is overcompensated by new workers who were previously outside the production boundary. As expected, the number of these new workers is significantly more under the surplus labour assumption.

Under the fixed supply assumption, there is no additional worker starting employment in the domestic market, since the supply of labour is fixed and fully employed. By contrast, the model with labour leisure trade-off shows that workers are displaced out of employment in the domestic market. In other words, employment in the domestic market is not only reduced by the number of workers switching to employment in Israel, but is further reduced by the number of workers households remove from employment in the domestic market activities to generate more leisure outwith the production boundary.

The insights from Table 3 and Figure 1 show that under the assumptions of surplus labour and upward-sloping curve, part of the labour transferred across the production boundary into the market activities start in the Israeli market, while another part start in the domestic market. Hence, the extra Palestinian labour demand stimulates the domestic economy, with employment in the domestic activities growing thanks to the relative easy transfer of labour across the boundary. By contrast, with the labour leisure trade-off assumption, the amount of labour supplied by households out of the pool of labour previously employed in activities outwith the production boundary is partially offset by the labour withdrawn from employment in the domestic market activities to generate leisure outside the production boundary. Figure 2 summarizes the findings related to the pool of labour used in activities outwith the production boundary.

Figure 2. Movements into and out of the pool of labour outwith the production boundary

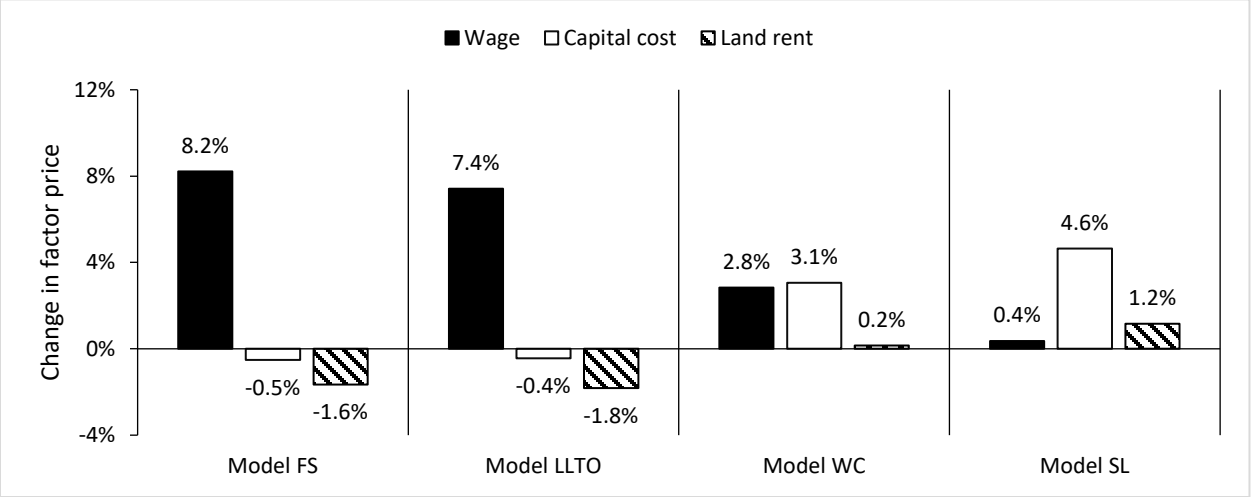


1. Comparative analysis of the outcomes on factor prices, output and demand

The assumption made about the working of the labour market has direct implications for the factor prices. When a fixed labour supply is assumed, the extra Palestinian labour demand in Israel triggers a substantial increase in wages, which increase on average by 8.2%. At the other end of the spectrum, assuming surplus labour barely affects wages, which increase by 0.4% on average. In fact, under a surplus labour assumption with switching regime as implemented here, wages start to increase only when the pool of labour sitting outside the production boundary is fully transferred into employment in the market activities. Between these two extremes, the labour leisure trade-off and upward sloping curves assumptions increase wage, while transferring labour across the boundary. Since the labour leisure trade-off has explicit and high opportunity cost for labour outside the boundary, it is associated with less labour being transferred across the boundary and a higher increase in wages compared to the outcomes of the model with an upward sloping curve. The average wage increases by 7.4% if the labour leisure trade-off assumption is used, and by 2.8% if the upward sloping curve assumption is used.

The price of capital and land increase under surplus labour and upward-sloping curve, while they decrease under the fixed supply and labour leisure trade-off assumptions (Figure 3).

Figure 3. Change in factor prices



Under the surplus labour and wage curve assumptions, the domestic activity is booming and domestic market activities increase demand for production factors. This increased factor demand is reflected in the labour markets by a large number of workers previously outside the production boundary who start employment in the domestic market activities (see Figure 2). While the labour markets are modelled with unemployment, the capital and land markets were assumed in full employment. Subsequently, in these two markets the increased factor demand by the market activities is reflected into factor price increase.

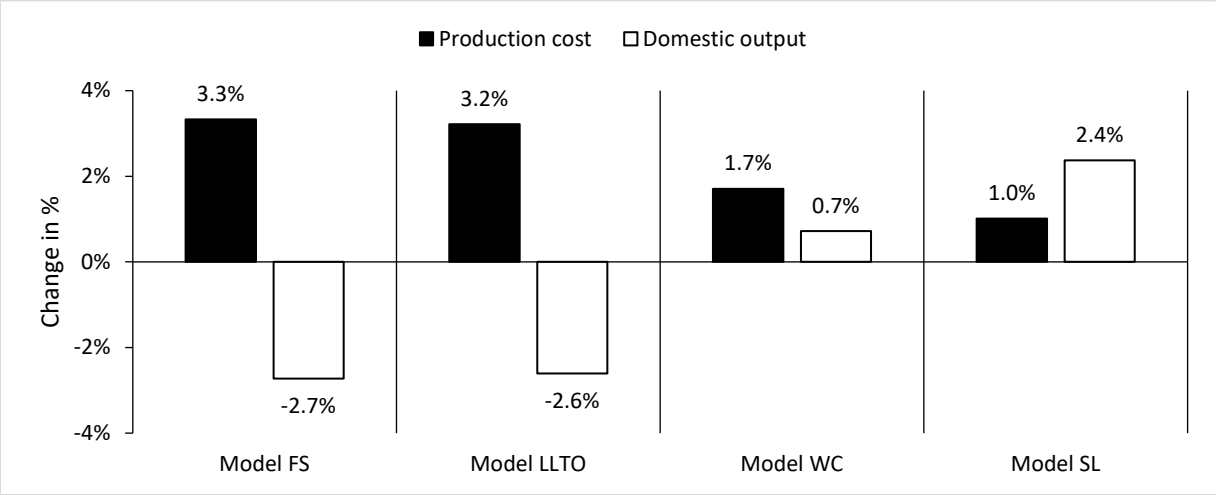
Under the fixed supply and labour leisure trade-off assumptions, the domestic economy slows down. The slowdown under the two assumption is marked with a reduced demand for production factors, which is reflected in the price decrease for capital and land. Under the labour leisure trade-off, the reduced demand for factor is also reflected in the labour markets by a reduction in domestic employment of labour in the market activities (see Figure 2).

The increase in factor prices, especially wage under the fixed supply and labour leisure trade off assumptions, and capital rent under the surplus labour and upward-sloping curve assumptions generates an increase in production cost in the four models. Production cost increases more under the fixed supply and labour leisure trade-off assumptions than under the surplus labour and upward-sloping curve assumptions. This finding can be analysed in light of labour being the major production input in the West Bank and its price increasing substantially under the fixed supply and labour leisure trade-off assumptions.

Figure 4 shows that the domestic output decreases under the fixed supply and labour leisure trade-off assumptions, while it increases under the surplus labour and upward-sloping curve assumptions. This finding is not only associated with the change in production cost, but also with signals coming from the demand side. In fact, the increased production under the surplus labour

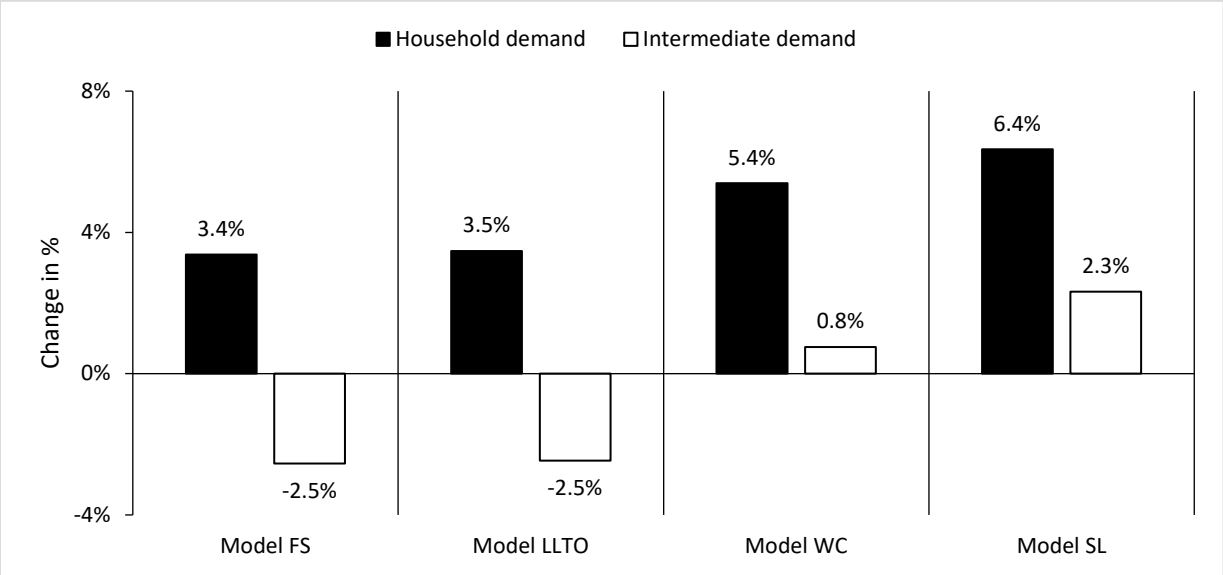
and upward-sloping curve assumptions, despite the increase in the production cost can only be substantiated with the fact that demand in the economy is increasing. Especially, household consumption is surging due to additional income from Israel and additional income generated by household members, previously outside the production boundary and who start employment in the domestic market. By contrast, under the fixed supply and labour leisure trade-off assumptions, household demand is also increasing, but that increase it limited to the additional income from Israel, while income generated within the domestic market decreases. Subsequently, the signals from the demand side are not strong enough to stimulate the domestic production.

Figure 4. Changes in production cost and in domestic output



Across all four model specifications, household consumption of goods and services increases (Figure 5). This finding stems from households deriving after the shock more labour income from Israel. As their income increases, households are able to increase their consumption. In the two model specifications with surplus labour and upward-sloping labour supply curve, household's consumption of goods and services increase substantially more than in the model specifications with fixed labour supply and labour leisure trade-off. In the model specifications with fixed labour supply and labour leisure trade-off, little additional income is generated within the domestic market. Although in these model specifications, wages increase strongly, the labour exiting domestic employment is not replaced. By contrast, in the model specifications with surplus labour and upward-sloping labour supply curve, not only factor prices increase (see Figure 3), but also labour exiting domestic employment is overcompensated and domestic employment increases (see Figure 1). Accordingly, households derive more additional income from employment in the domestic market, and can consume more.

Figure 5. Changes in household consumption and in intermediate input demand



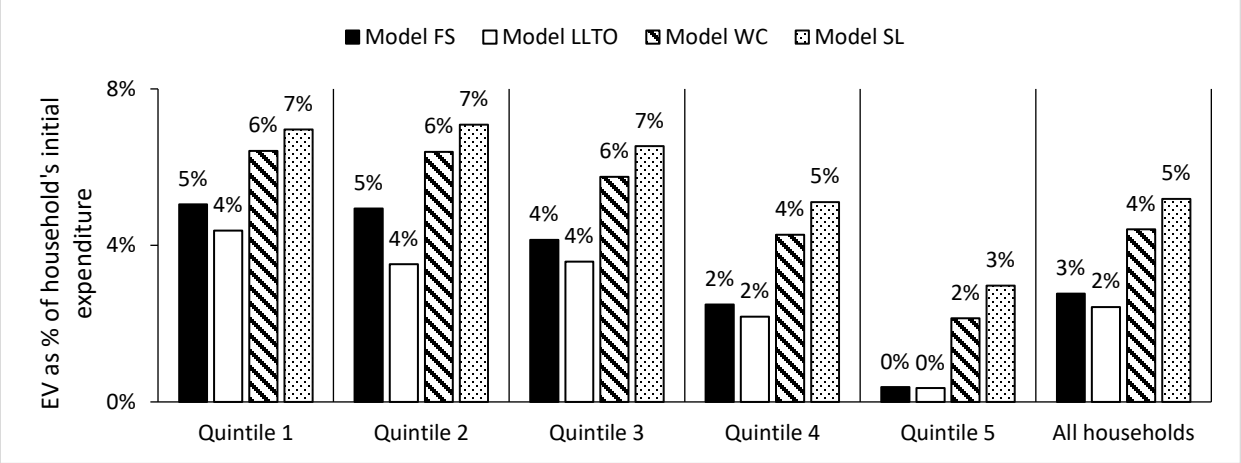
While the change in household's consumption of goods and services produced by the market activities can be captured in all the model specifications, the change in the consumption of services produced outside the production boundary (i.e. leisure) can only be captured by the labour leisure trade-off specification. The model results show that household's consumption of leisure decreases by 1%, which is consistent with the finding in Figure 2 that households supply labour out of the production of leisure to the market activities, especially for employment in Israel.

Figure 5 also highlights that demand for intermediate inputs decreases in the model specifications with fixed labour supply and labour leisure trade-off, while it increases in the model specifications with surplus labour and upward-sloping labour supply curve. This finding is related to changes in domestic production. In the model specifications with fixed labour supply and labour leisure trade-off, domestic output decreases (see Figure 4) and accordingly demand for intermediate inputs by productive activities also decreases. The opposite holds for the model specifications with surplus labour and upward-sloping labour supply curve.

6.2.Welfare effects

In the four model specifications, the welfare effects, as measured by the Slutsky Equivalent Variation as a share of household's initial expenditure, are positive for all household groups. This is an indication that additional Palestinian labour demand in Israel improves welfare of Palestinian households. Figure 6 shows that in all the model specifications, welfare gains are higher for the poor households in the lowest quintile than for the rich households in the top quintile. This is also an indication that Palestinian employment in Israel has income distribution effects and can serve as a lever to fight poverty and inequality.

Figure 6. Welfare effects measured in equivalent variation as share of household's initial expenditure



A comparative analysis of the four model specifications show that the model with surplus labour generates the highest welfare gains for the Palestinian households. Knowing that this model specification is associated with the assumptions that labour has zero opportunity cost outside the SNA production boundary and that this labour can enter into employment in the market activities at fixed real wages leads to very optimistic results. The expected biases of this model specification are higher than "correct" estimates of welfare gains by households (McDonald, 2018).

The model specification with upward-sloping curve gives the second highest welfare gains for households. While this model specification acknowledges that labour enters employment in the market activities at a positive price, it considers that labour as having a zero opportunity cost outside the SNA production boundary. Hence, the utility foregone by households when transferring labour across the boundary is zero. Subsequently, the welfare estimates are likely to be higher than "correct".

The model specification with fixed supply assumes a strict separability between the contributions to welfare from activities within and outwith the production boundary (McDonald, 2018). Hence, this treatment is neutral with respect to welfare generated outside the production boundary. Nevertheless, the assumption that there are no trade-offs between uses of labour within and outwith the production boundary is open to challenge and the welfare results are not optimal estimates of the welfare gains by households.

The model specification with labour leisure trade-off generates the most consistent welfare results. As additional Palestinian employment in Israel increases domestic wages, households allocate more labour to the market activities at the expense of the activities outwith the production boundary. This reallocation enables households to generate more income, increase consumption of goods and services, which increases their utility. However, the utility generated by activities outside the production boundary decreases. The outcome is an increase in welfare at the level of

all household groups, which is consistent with theory. The net welfare effects, which include the losses occurring outwith the production boundary, have a lower magnitude than the welfare estimates found in the other model specifications.

6.3.Macroeconomic aggregates

The macroeconomic aggregates show that in all four model specifications, absorption in real terms increases. This increased absorption is met with increased import demand and a partial reallocation of the domestic production towards domestic consumption at the expense of the export market. The export supply falls in all model specifications. This result is consistent with both empirics and theory, since the inflow of labour income from Israel has "Dutch disease" effects, with the real appreciation of the exchange rate and the reduced competitiveness of the Palestinian exports on the world markets. The change in real GDP is contrasted with one side, a real GDP decrease in the model specifications with fixed supply and labour leisure trade-off; and on the other side a real GDP increase in the model specifications with surplus labour and upward-sloping curve (Table 4).

Table 4. Changes in macroeconomic aggregates in real terms

	Model FS	Model LLTO	Model WC	Model SL
Absorption	2.2%	2.3%	4.5%	5.7%
Import demand	2.1%	2.2%	4.2%	5.2%
Export supply	-17.5%	-17.0%	-10.5%	-7.3%
GDP	-1.8%	-1.6%	1.7%	3.4%

The model specification with surplus labour displays the highest increase in absorption. This finding is as expected, because the bias on the results are higher than "correct" changes in absorption. The model specification by assuming that labour has zero opportunity cost outside the production boundary and can enter into employment in the market activities at fixed real wages generates higher than "correct" number of workers who are transferred across the production boundary. These new workers generate higher than "correct" additional income to households, which leads to higher than "correct" changes in absorption. Subsequently, changes in import demand is higher than "correct, changes in export supply are lower than "correct" and changes in real DGP are higher than "correct".

The model with upward sloping curve also generates higher than "correct" changes in absorption. The assumption that the marginal cost of labour outside the production boundary is zero, while that labour enters employment in the market activities at a positive price is not only inconsistent, but it also generates increases in the measured absorption that is at least in part realised from a reduction in the contribution of the welfare derived by households from the activities outside the boundary (McDonald, 2018). Subsequently, the change in real GDP is likely to be higher than "correct".

The model with fixed supply specification has lower than "correct" changes in absorption, because the strict separability between labour uses within and outwith the production boundary causes the full shock to be borne by labour already in employment in the domestic market activities. Subsequently, there is a huge exit from domestic employment, which causes only little additional labour income to be generated within the domestic market thanks to the strong increase in wages. Accordingly, the model estimates are less than "correct" for household's total factor income and hence less than "correct" for absorption and real GDP.

From a theoretical point of view, the model specification with labour leisure trade-off generates the most consistent results. Increased Palestinian labour demand raises domestic wages and households allocate more labour to the market activities, which is consistent with theory. The reallocation generates increases in absorption that is met with increased import demand. Export supply decreases because the large inflows of labour income from Israel causes a real appreciation of exchange rate. Moreover, the "Dutch disease" effects of Palestinian employment in Israel reduces incentives to work in the domestic market activities, with as outcome a decline in domestic output. Ultimately, GDP decreases.

7. Conclusions and Policy Implications

The principal objective of this paper is to analyse the implications of different factor market clearing conditions in CGE. The paper uses the case study of Palestinian employment in Israel. Four model specifications are considered: the fixed labour supply, surplus labour, upward-sloping curve and labour leisure trade-off. The shock implemented in the four model specifications is a return of Palestinian employment in Israel to its pre-*intifada* level of 1999; that is an increase by 36% as compared to its level in the reference year of the social accounting matrix, which is 2011.

The results show some common trends across the four model specifications. First, increased Palestinian labour demand in Israel increases domestic wages. Second, the additional inflow of labour income from Israel improves household's welfare in the West Bank. Third, Palestinian employment in Israel has "Dutch disease" effects, with a real appreciation of the exchange rate, a reduced competitiveness of Palestinian exports and a decline in the export supply.

The model specifications, however, display stark differences in several respects. In the model specification with labour surplus, the estimated change in wage rates is less than "correct" because under this specification, wages start to increase only after the pool of labour outside the production boundary is emptied and all the members of the pool have entered into employment within the boundary. The estimated number of workers transferred across the boundary is also higher than "correct" because the assumption that labour outside the production boundary has zero opportunity cost and can be transferred into employment within the boundary at zero marginal cost is too optimistic. Subsequently, the welfare gains estimated are higher than "correct", absorption and GDP changes are also higher than "correct".

The model specification with upward sloping curve assumes that labour outside the production boundary has zero opportunity cost, but that this labour enters employment within the boundary at a positive price. Hence, the framework has some inconsistency, and changes in labour supplies are introduced as "manna from heaven" (McDonald, 2018). As Palestinian employment in Israel increases the domestic wages, additional labour is supplied to the activities within the boundary. Increases in absorption take place, but they are in part realised from a reduction of welfare generated outwith the production boundary. Subsequently, the estimated welfare gains are higher than "correct", and changes in absorption and in real GDP are also higher than "correct".

The fixed supply specification assumes a strict separability between labour uses within and outwith the production boundary. Hence, this treatment is neutral to welfare changes occurring outwith the production boundary. However, the presumption that labour supply is inflexible is open to challenge, even in societies with no involuntary unemployment. A consequence of this assumption is tha the full shock of increased demand for Palestinian labour in Israel has to be drawn out of the pool of employment within the production boundary of the domestic West Bank's market. Accordingly, there is a huge exit from domestic employment, such that the estimated changes in wage rates are higher than "correct". The welfare estimates are not optimal. Estimates of changes in absorption and in real GDP are lower than "correct".

The labour leisure trade-off is the most consistent framework to deal with labour transfers across the production boundary. It explicitly attaches an opportunity cost to labour outside the production boundary As increased demand for Palestinian employment in Israel increases domestic wages, households allocates more labour to activities within the production boundary. The reallocation enables households to increase income. Hence, absorption is increased and leads to increased utility and welfare gains. However, as less labour is used in the activities outwith the production boundary, the welfare derived by households from the services produced by these activities decreases. The outcome is nonetheless an increase in welfare for households.

The labour leisure trade-off is the most appealing framework to model the labour markets because it explicitly recognizes the trade-off facing households between consuming more leisure (i.e. services produced by activities outwith the boundary) and supplying more labour to activities within the boundary. This trade-off facing households in the real life is absent from the other specifications. Moreover, the labour leisure trade-off recognizes the households as the active agents in the operation of the labour markets, which allocate labour based on changes in wage rates. While the fixed supply assumption also recognises the households as the active agents, it assumes that they allocate the same amount of labour regardless the wage rates in the market. This assumption is open to challenges. The two specifications of surplus labour and upward-sloping curve implicitly assume the labour to be the active agents, while households are passive in the operation of the labour markets. This behavioural relation runs counter to the theoretical foundations of CGE modelling, where households and activities are the active decision making agents (McDonald, 2018).

While the fixed supply specification assumes a perfectly inelastic labour supply, the surplus labour assumes a perfectly elastic one. The two specifications can be regarded as extreme cases, with the fixed supply representing at best a society with no involuntary unemployment, while the surplus labour represent a society with plenty of involuntary unemployment. The upward sloping curve is commonly seen as an intermediate solution providing some reflection of the empirical evidence that changes in wage rates influence the supply of labour. However, the behavioural and theoretical foundations of the upward-sloping curve are not found in standard economic theories and its use can only be rationalized with non-competitive theories such as the union bargaining theory, the efficiency wage and … theories (Blanchflower, 1995). Moreover, the opportunity costs of changing the quantities of labour provided to the activities within the production boundary are not included in the model, leading to welfare leakages. In this respect, the labour leisure trade-off provides a theoretically consistent framework for reproducing the empirical evidence that changes in wage rates influence households' decisions in the labour markets.

Two problems associated with the use of the labour leisure trade-off that are worth mentioning are first that the framework is inconsistent to represent a society with involuntary unemployment, and second that the definition of price may be subject to criticism. Involuntary unemployment is logically inconsistent with the labour leisure trade-off, since labour can always be employed either in the activities within the production boundary or outwith the boundary. The problem with the price definition first relates to the valuation of the appropriate opportunity cost of labour outwith the production boundary. By default, the market wage rates are used for the valuation of the opportunity cost of labour outwith the boundary. This valuation ignores potential non-monetary benefits of employment, and its value overstates the real opportunity cost of labour outwith the boundary if involuntary unemployment is present in the economy (Prosnett, 1996). In part, the criticisms about the valuation of the opportunity cost of labour are offset by using linear homogenous models, implying that only changes in relative prices determine changes in allocations (McDonald, 2018).

The choice of the relevant framework to use depends on the particularities of the economy under investigation and on the tie horizon of the analysis. In the context of the Palestinian economy, in the short run, several empirical studies show a close correlation between Palestinian employment in Israel and the size of labour outside the production boundary (Bulmer, 2003, Etkes, 2012). The limited number of work permits and the high wage premium offered in Israel creates incentives for Palestinian workers to queue for jobs in Israel instead of looking for employment in the domestic market. Moreover, the small size of the domestic market and the volatility of employment in Israel at times of conflict between the two parties creates a large pool of involuntary unemployment that cannot be absorbed by the domestic market. Since the labour leisure trade-off is inconsistent with depicting an economy with involuntary unemployment, the labour surplus framework is an alternative to representing the labour markets in the West Bank in the short run.

In the long-run if one assumes that Palestinian employment in Israel is stable, and that in the long-run factor markets are fully flexible such that allocation of labour between activities within and

outwith the production boundary are unconstrained by the access to paid employment or self-employment, then the use of the labour leisure trade-off is well suited.

Under such considerations, the short-run analysis with the labour surplus specification shows that the West Bank's economy benefits from increased Palestinian employment in Israel. The unemployment rate decreases as more labour starts employment within the production boundary either in Israel or in the domestic market. Both domestic output and absorption increase. Ultimately, real GDP increases. By contrast, the long-run analysis, using the labour leisure trade-off shows that in the long-term household's supply of labour to the activities within the production boundary is quite stable. Only a few workers are supplied by households out of the production of services outside the boundary. Most of the increased Palestinian employment in Israel is met with workers who are shifted from employment within the production boundary in the domestic market into employment in the Israeli market. This finding stems from the "Dutch disease" effects of Palestinian employment in Israel, which reduces incentives to work within the production boundary by increasing the price of non-traded commodities, of which leisure is the most non-traded. Consequently, domestic output drops and real GDP decreases.

These findings highlight the empirical evidence of short-term benefits of Palestinian employment in Israel and the long-term harm to the West Bank's economy. While in the short-run the large inflows of labour income from Israel boost absorption and the economy as a whole, in the long-run the wage premium in Israel raises the reservation wage in the domestic market and this provides less incentives for investors and domestic employers to invest in the domestic production and hire labour. Moreover, the real appreciation of the exchange rate due to the inflow of labour income from Israel, reduces the competitiveness of the West Bank's export industry. In addressing the challenge of maximizing the benefits of Palestinian employment in Israel for the Wet Bank's economy, while minimizing the negative impact in the long-run, the Palestinian National Authority could introduce a tax on Palestinian labour employed in Israel. The tax revenue will be used to finance policy schemes that incentivize domestic employers in upgrading their production technologies. Such policy schemes will restore the competitiveness of the Palestinian export industry in the world markets, enlarge the size of the domestic market such that it can offer more job opportunities for returning workers displaced from employment in the Israeli market. Moreover, the tax by reducing the wage premium for Palestinians in Israel could gradually reduce the attractiveness of Palestinian employment in Israel, especially for the most skilled Palestinian workers, and reduce the dependency on the Israeli labour markets.

8. References (to be edited)