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Economywide Effects of International Remittances:

A Computable General Equilibrium Assessment for Vietnam

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Abstract

This research investigates economywide effects of international remittances on the source countries, where Vietnam is taken as a case study. By using computable general equilibrium (CGE) modeling techniques, we investigate, for the first time, the effects of international remittances on the Vietnamese economy as a whole. Findings from the paper strengthen the view that effects of remittances on developing countries are mixed and complicated. The results show that in the context of Vietnam, where the growing remittance inflows are combined with the economy's increasing integration into the international markets, all factor prices tend to rise, and industrial sectors are strongly influenced and tend to contract. This implies that the long-run effects of remittances may be negative on the supply side, and may offset their short-run positive effects on the demand side.

Keywords: remittances, computable general equilibrium, macroeconomics, financial flows, Vietnam

JEL Classification Numbers: F22, F24, F31, F40, D58

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Introduction

International remittance flows have become increasingly important to developing countries. Consequently, numerous empirical studies on the effects of remittances have been conducted. However, there is limited research using computable general equilibrium (CGE) models to examine the economywide impact of remittances. A strong point of CGE models is that they enable us to assess the impact on various aspects of the economy simultaneously. For that reason, this chapter aims to contribute to the literature by employing a CGE model to investigate effects of remittances on the Vietnamese economy.

The paper is organized as follows. The next section provides an overview of the current situation of remittance flows into Vietnam and the literature related to the issue. Section 3 reviews the state of the debate on macroeconomic impacts of remittances. Section 4 presents a CGE model for Vietnam. The model is then used to explore effects of remittances on the Vietnamese economy. Simulation results are analyzed in Section 5. The last section concludes.

An Overview of International Remittances to Vietnam

Due to historical as well as economic reasons, there are currently more than three million Vietnamese people (3.5% of its population) living abroad, of which 80 percent are residing in developed industrial countries. These people have been annually remitting to Vietnam a considerable amount of money. In this study, the money sent back by Vietnamese people who have been residing abroad for more than one year is considered as remittances. In 2000, the total value of remittances was reported to reach USD 1.757 billion. The value doubled in 2005 and nearly equaled 7% of the country's GDP. Table 1 presents data in remittances and other economic indicators of Vietnam during 1999-2005.

It is evident that the amount of remittances has been growing steadily over recent years. While the total value of remittance flows before 1999 was still smaller than that of FDI and ODA, in 2002 it surpassed both of them, and in recent years the gaps between them have even become increasingly larger.

Year	1999	2000	2001	2002	2003	2004	2005
Remittances*[(a)]	1,200	1,757	1,754	2,067	2,631	3,000**	3,500**
Net private transfer	1,050	1,340	1,100	1,767	2,100	2,310	3,150
GDP	28,300	29,626	31,938	34,865	39,300	45,447	52,800
Exports	11,540	14,449	15,027	16,706	20,149	26,458	32,442
Trade balance	1,080	378	627	-1,054	-2,582	-2,287	-838
FDI [(b)]	2,253	2,181	---	2,023	1,894	1,878	1,972
ODA[(c)]	970	1,361	958	1,073	1,258	1,394	1,432
REER[(d)]	103.0	100.0	100.1	98.3	90.6	89.3	93.2

Table 1. Remittances and selected economic aggregates, Vietnam 1999-2005 (current price, USD million)

*: transferred through the Vietnamese banking system, estimated by the State Bank of Vietnam (SBV)
**: roughly estimated from current daily newspapers by the author
(a): from Hernández-Coss (2005)
(b): pre-2001 is proxied by total FDI disbursement (Table 29, IMF 2003), 2002 onward by gross FDI inflows in the balance of payment (Table 3, IMF 2006).
(c): pre-2002 is from IMF (2003), Table 24, 2002 onward is from IMF (2006), Table 3.
(d): period average, from IMF (2006) except 1999 from IMF (2003).
Source: Hernández-Coss (2005), IMF (2003, 2006)

By its visible significance remittances have become an issue drawing the public and authorities' attention. As a result, more researchers have become interested in the theme (Dang Nguyen Anh 2005, Hernández-Coss 2005, Nguyen Thi Thuy Linh 2006, Pfau and Long (2006)).

Dang Nguyen Anh (2005) discusses the importance of the Vietnamese diasporas overseas as active sources of remittances and investment, as well as human capital and technology. He finds that, besides the attraction from an economy increasingly progressing and being liberalized, government policies that have facilitated the transfer and use of remittances have brought about a surge in the remittance flows into the country.

In examining the Canada-Vietnam remittance corridor, Hernández-Coss (2005) presents a good resource for understanding not only how money is remitted from Canada, but also, to some extent, the Vietnamese remittance transfer system in general. According to the author, the informal funds transfer system is playing an important role, and, thanks to its "perceived reliability, reasonable fees, speed and cultural familiarity," can effectively compete against the formal system which is still in early development. Hernández-Coss's research also provides a useful up-to-date review of the Vietnamese regulations over remittances.

However, despite the magnitude of remittances, there are a few quantitative studies that allow us to fully understand the sources and destinations of remittances, and, more importantly, how they are used and how they affect the economy.

Pfau and Long (2006) approach these questions by examining the results in different Vietnam Living Standard Surveys (VLSS 1992/93, 1997/98, 2002, and 2004). They find that most of the remittances are from the United States and other industrial countries. During the 1990s, there was a strong reduction of remittances from the Eastern Europe, where many Vietnamese used to work. Remittances from the United States had increased significantly, from around 40% of the total in the early 1990s to almost 60% near the end of the decade (Table 2).

	1992/93	**1997/98**
By country		
Laos	0.0	0.0
Cambodia	0.2	0.0
Thailand	0.3	0.4
China	0.2	0.2
Hong Kong	0.0	1.1
Taiwan	n/a	0.8
Australia	7.3	8.6
France	2.8	4.0
Western Europe	9.9	7.7
Former Soviet Union	3.4	3.2
Eastern Europe	9.3	3.9
United States	41.1	57.7
Canada	6.2	6.1
Others	19.2	6.5
By region		
North America	47.3	63.8
Europe	20.0	15.6
Australia	7.3	8.6
Asia	4.2	5.6
Others	19.2	6.5

Table 2. Sources of remittances by country (%)

Source: Pfau and Long (2006)

Table 3 shows the distribution of remittances throughout the country. Geographically, the Red River delta (the location of the national capital, Hanoi) and the South East (with Hochiminh City as its center) are the two major regions leading in all criteria: population, remittances received, and the density of people receiving remittances. In the early 1990s, these two regions, which accounted for 38 percent of the population, received almost three quarters of total remittances to the country. However, there has been an obvious shift in

the distribution of remittances, with declines in share of the two poles and improvements in all other regions, notably the North Central Coast and Mekong River Delta. This shift may reflect the fact that during the last decade, the sources for migrant workers had moved away from the two big urban regions to neighboring regions.

	1992/93			1997/98			2002			2004		
	share of total pop	share of total remittances	ratio of remittances received to pop	share of total pop	share of total remittances	ratio of remittances received to pop	share of total pop	share of total remittances	ratio of remittances received to pop	share of total pop	share of total remittances	ratio of remittances received to pop
Region												
Red River delta	20.9	30.9	1.5	19.6	15.8	0.8	21.9	9.5	0.4	22.1	19.5	0.9
North East	14.2	3.0	0.2	15.1	2.8	0.2	11.9	5.7	0.5	11.6	3.9	0.3
North West	2.6	0.2	0.1	2.9	0.0	0.0	2.7	1.0	0.4	3.0	0.7	0.2
North Central Coast	12.8	1.2	0.1	13.8	6.9	0.5	13.4	9.5	0.7	13.1	10.9	0.8
South Central Coast	9.5	8.0	0.8	8.5	9.9	1.2	8.5	9.8	1.2	8.7	9.9	1.1
Central Highlands	2.3	0.7	0.3	2.8	0.3	0.1	5.8	2.8	0.5	5.0	1.8	0.3
South East	15.9	42.6	2.7	15.9	49.1	3.1	14.6	29.2	2.0	16.2	31.6	2.0
Mekong River Delta	22.5	13.3	0.6	21.5	15.3	0.7	21.3	32.5	1.5	20.4	21.8	1.1
Urban/Rural												
Rural	80.0	20.9	0.3	77.6	25.2	0.3	76.8	49.0	0.6	74.1	49.9	0.7
Urban	20.0	79.1	4.0	22.4	74.8	3.3	23.2	51.0	2.2	25.9	50.1	1.9

Table 3. Reception of remittances to Vietnam by region (%)

Source: Pfau and Long (2006)

There was also a shift between urban and rural areas in general. Figure 1 illustrates this trend. While the share of rural population has tended to fall gradually (Table 3), its share in total remittances tended to rise steadily. It is probably because at an early stage, opportunities to go to work abroad might fall more to urban people who normally have advantages in accessing information about employment abroad. But over time, on one hand the supply of urban labor might decline, and on the other hand the information might spread more extensively, leading to an increase in the number of migrant workers from rural areas.

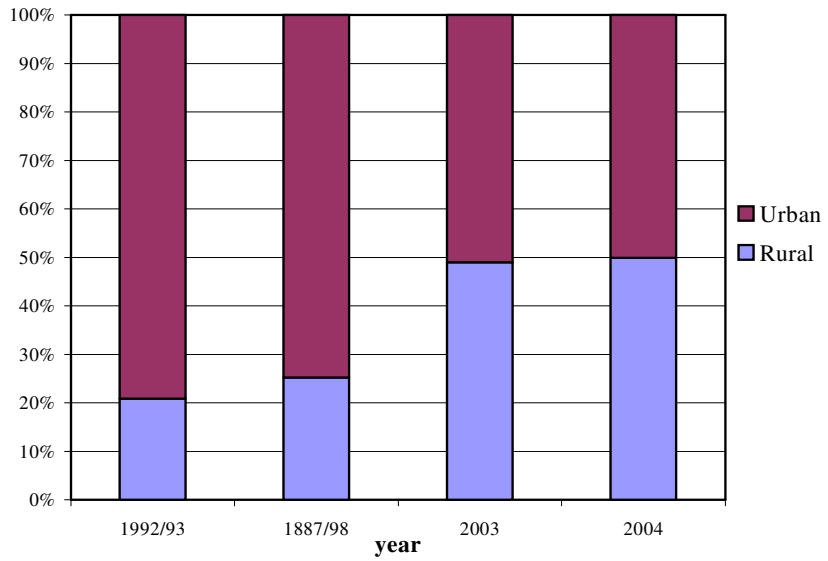

Figure 1. Distribution of remittances by area

Source: Pfau and Long (2006)

An issue of high importance but also much ambiguity is the way in which remittances are used. An accurate answer for this question may shed a light on the debate over the real effects of remittances. Table 4 reports that 73 percent of remittances were allocated to immediate consumption, while 14 percent were saved for "household construction" and only around 6 percent for "investment."

	Consumption	Household construction	Non-farm investment	Others[(a)]
Share of funds received	73.0	14.4	6.0	6.6

Table 4. Use of remittances (%)

(a): including education and farm investment.
Source: Pfau and Long (2006)

For a more detailed understanding of household consumption, Nguyen Thi Thuy Linh (2006) provides a number of findings. By examining the VLSS 2002, the author investigates the effects of remittances (both international and internal) on expenditure patterns of the Vietnamese households. She finds that households that receive international remittances tend to spend a larger share in additional incomes for house construction. The spending is most evident in the cases of poorest and richest household groups. She then argues that while the former group spends on their needs, the latter tends to spend as investments in real estate. From this point of view, it is rather difficult to clearly distinguish household construction and investment as in Table 4.

By reviewing the previous works, one may come to note that, despite its rapid evolution and widespread public awareness of the topic, the remittance issue in Vietnam has been still inadequately studied and understood. This study, therefore, is an attempt to make a contribution to the theme.

The Macroeconomics of Remittances

The growing body of theoretical and empirical studies on remittances has shaped the economics of remittances. As Bouhga-Hagbe (2004) observes: "the literature on remittances can be divided in two segments, one focusing on the causes and uses of remittances, and the other on the macroeconomic impact of remittances." In this section, we mainly concentrate on the macroeconomics of remittances.

For the literature up to the end of the 1990s, Taylor (1999) provides a useful review. He points out that current development in the field has moved toward the developmental significance of remittances in and to developing countries, whose financial markets are usually imperfect. Therefore, remittances play a role in helping to release credit constraints. The changing vision in remittances' role may shift the conventional view on labor migration, constituting what he calls the "new economics of labor migration" (a term originated from Stark and Bloom (1985)).

For a more detailed and updated overview of the field, Rapoport and Docquier (2005)'s synthesized work is an excellent reference. On the macroeconomics of remittances, the authors distinguish between short-run and long-run approaches. The short-run effects of remittances can be most easily considered in a simple closed-economy Keynesian framework, where an injection of remittances into the economy acts as an expenditure shock in traditional models. However, in an open economy context, where a simple Mundel-Flemming model with fixed prices and a single composite good may be applied, the outcome turns out not so simple. It is shown that the overall effect of any demand shock (including a shock induced by remittances) depends on the degree of capital mobility and on the exchange-rate regime. In the case of perfect capital mobility and a pure flexible exchange-rate regime, the equilibrium level of output is totally determined by the money market and therefore is unaffected by international transfers.

Taking a longer perspective, the role of remittances in development has been a controversial topic for decades. A key point is that whether the receiver uses remittances

for immediate consumption or for future production. Rapoport and Docquier (2005) show that besides pessimistic views on the nonproductive use of remittances, there are reasons to believe that international migration and remittances can help to untie a number of scarce resource constraints such as financial credits, human capital, and entrepreneurship. That remittances may reduce inequality and therefore contribute to economic growth and development is also discussed.

As in other branches in economics, the macroeconomics of remittances is developed through a rich body of literature interwoven with empirical and theoretical studies. Among diversified views and attentions, one may roughly classify three groups of views. The first group includes those who are optimistic on the role of remittances. For example, Adams and Page (2003) find that both the scale of international migration (as measured by the share of a country's population that is living abroad) and international remittances (defined as the share of remittances in GDP) have significant impact on reducing poverty in the developing world. Ratha (2003) recognizes remittances as a large, stable (less pro-cyclical) and growing source of finance. For these authors, remittances are expected to be an effective financial source for development. The World Bank (2003, 2004, 2006) generally shares this view. Giuliano and Ruiz-Arranz (2005) theorize that remittances can promote economic growth by acting as a substitute for financial credits in domestic markets. Their empirical work finds that the growth effect of remittances is most significant in economies where financial markets are less developed. Bugamelli and Paternò (2005) argue that the inflow of remittances can help to stabilize the current account of emerging economies, and help to reduce the probability of sudden flight of foreign capital. León-Ledesma and Piracha (2004) develop a model to study the positive effect of remittances on the labor market (as remittances may be used for new investment and then create new jobs), and investigate how remittances are used in a number of Central and Eastern European countries. Their results show that "remittances are used for investment and consumption in a similar way as other income, although biased more toward investment." (p. 77). Therefore, remittances have positive effects on labor markets and the economy as a whole.

The second group, however, challenges the above optimistic views from almost every direction. Lucas (2004) summarizes the core arguments of this group who argue that: "the negative side [of remittances] is the potential for diminished labor supply and effort

induced by higher transfers, together with a Dutch disease-like effect in keeping the exchange rate high and discouraging domestic production of tradeable goods" (p. 9). Furthermore, Bracking (2003) argues that one of remittances' harmful effects is that those who do not receive remittances will find themselves relatively and even absolutely poorer as the inflationary effect generated by those who receive remittances increases aggregate consumption. In other words, households receiving remittances undermine the purchasing power of those households without migrating members.

Chami, Fullenkamp and Jahjah (2005) contend that since remittance flows are not profit-driven (like FDI), their effect on growth may not be positive as commonly alleged. Their argument is based on a microeconomic model that allows one to predict the behavior of households receiving remittances. They use a panel of 113 countries during 19 years to test their hypothesis. Their estimation results reveal evidence that remittances tend to be negatively correlated with GDP growth. The authors argue that remittances do not seem to serve as capital for economic development, but as compensation for poor economic performance.

Even the conventional belief that remittance flows are usually countercyclical and can therefore act as a "stabilizer" is challenged by the second group. By employing a panel data set including 87 developing countries, for which information was generally available from 1970 to 2000, Buch and Kuckulenz (2004) find that remittances share similarities with the two other types of capital flows (FDI and ODA), but that remittance flows are generally more stable. Additionally, Sayan (2006) shows that there is no clear-cut evidence for this hypothesis. By investigating a group of 12 countries receiving remittances, his empirical work shows that the results are mixed. Some countries seem to begin to receive more remittances when a recession has happened, but some countries do not. Remittance behavior seems again dependent on the individual characteristics of each country.

Even if remittance flows are countercyclical, Chami et al. (2006) point out that their effects are rather complicated. They use a stochastic dynamic general equilibrium model to investigate the influence of countercyclical remittances on the conduct of fiscal and monetary policy, and to trace their effects on real and nominal variables in a business cycle setting. It is shown that remittances raise disposable income and consumption, and insure against income shocks, thereby raising household welfare. However, remittances

increase the correlation between labor and output, thereby producing a more volatile business cycle and increasing output and labor market risk. Therefore, it is suggested that optimal monetary policy in the presence of remittances deviates from the Friedman rule, and highlights the need for independent government policy instruments.

The third group of studies consists of those who argue the effects of remittances are mixed. For example, Glytsos (2002a) discusses the diverse impacts of remittances on the balance of payments, saving-investment balance and structural change of selected Mediterranean countries. In a subsequent study, Glytsos (2002b) develops a Keynesian model to investigate the macroeconomic effects of remittances. It is found that the effects are mixed and dependent on countries' characteristics. Kapur (2003) discusses the various possible effects of remittances, both economically and politically. Concerning economic effects, he notes the different possible effects, both negative and positive, at different levels (household, community and national). Drinkwater et al. (2003) assess the impact of remittances on labor market by combining two opposite effects: the first is the Dutch disease-like effect (the hypothesis that remittances act as unemployment insurance that causes the unemployment rate to rise), while the second is the allegedly positive role of remittances (which release credit constraints and thus create more job opportunities). The ultimate impact depends on which of these two effects that outweighs the other.

In summary, the role of remittances is still an interesting theme for debate. It is hard to conclude whether remittances are purely beneficial or detrimental to the economy. Therefore, empirical studies are of great importance for each concrete case. In the next section, we will approach the issue by using a CGE model applied to the Vietnamese economy.

A CGE Model for Vietnam

CGE Modeling and Its Applications

Computable general equilibrium modeling is one of today's standard tools for economic policy analysis (Arrow 2004). Developed by generations of economists, CGE modeling techniques have been flourishing into numerous directions with diversified practical applications. Brief reviews of this development can be seen, for example, in Chumacero and Schmidt-Hebbel (2004) and Robinson (2003). Devarajan and Robinson (2005) discuss extensive influences of CGE analysis in policy assessment.

While CGE models in the past were typically applied in developed economies whose long tradition of data compilation is an advantage, today they have been extensively applied in developing countries as well. Among a long list of studies, one may name some examples such as Sapkota and Sharma (1998) for Nepal, Lloyd and Zhang (2001) for China, Mujeri and Khondker (2002) for Bangladesh, and Thurlow and Seventer (2002) for South Africa.

CGE models cover a widespread and diversified range of issues, from their traditional realm of assessing tax policy (such as Shoven and Whalley 1992) or trade policy (such as Melo and Tarr, 1992), to other current issues such as the environment (Townsend and Ratnayake 2000) and poverty reduction (Mujeri and Khondker 2002). In the field of remittances, however, there are still few applications of CGE techniques.

Siddiqui and Kemal (2002) use a CGE model to estimate the effect of remittances on poverty reduction in Pakistan's economy within the context of trade liberalization. Remittances to Pakistan have decreased during the research time span, and the authors hypothesize that this reduction will have a negative impact on the poor in the country. The research finds that tariff reduction in the absence of a decline in remittances reduces poverty in both the rural and urban areas of Pakistan. It is shown that the gain in welfare is larger for urban households than for rural households. In a second scenario, where trade liberalization accompanies a decline in remittances, welfare in urban households decreases but that of rural households still tends to increase. This implies that the combined shock is more harmful to households in urban areas than for households in rural areas. However, this welfare gain and reduction in poverty level in rural households is less than the welfare gain and poverty reduction in the presence of trade liberalization only. The research concludes that the decline in remittance inflows is a major determinant of the increase of poverty in Pakistan.

Goce-Dakila and Dakila (2006) assess the impact of overseas Filipino workers' remittances on the Philippines's economy by using an inter-regional CGE model. Their empirical results indicate that, in absolute terms, the main beneficiaries of rising remittances are the middle-income classes across all regions. The second major beneficiaries are the low income households, again for all regions, with the notable exception of the National Capital Region, where high-income households are the second highest beneficiary of remittances.

In an attempt to apply CGE techniques to studying remittance issue of Vietnam, in the following sections we present a CGE model for the country, and then apply it to examine the effects of remittances on the economy.

A CGE Model for Vietnam

The state of CGE modeling in Vietnam

Efforts to use CGE models to study Vietnamese economic issues began in the late 1990s. Receiving supports from John Whalley, Nguyen Chan and his colleagues produced a number of CGE models to investigate the effects of tax policy in Vietnam (Nguyen Chan et al. 1997, 1998, 1999, 2000, 2001, 2002). Some other works were done in collaboration with international economists, such as Ezaki and Son (1997) and ESCAP (1998). Dufournaud et al. (2000) assess forest policy using a CGE approach. Recently, there are more and more young Vietnamese economists becoming interested in applying CGE models to their research (Pham Thi Lan Huong 2000, Nguyen Manh Toan 2006).

The model's structure

Our CGE model consists of a set of simultaneous equations that are able to explain all of the payments recorded in an associated Vietnamese social accounting matrix (SAM). The Vietnamese SAM will be discussed in the next section.

As a benchmark model, we primarily follow a standard structure presented in Lofgren et al. (2002)'s work, a project carried out by International Food Policy Research Institute (IFPRI). The structure is chosen because it includes a number of features designed to reflect the characteristics of developing countries. It also incorporates additional features developed from IFPRI's research experiences. These features, which are important to developing economies, include household consumption of nonmarketed (or home) commodities, explicit treatment of transaction costs for commodities that enter the market, and a separation between production activities and commodities that permits any activity to produce multiple commodities and any commodity to be produced by multiple activities (Lofgren et al. 2002: vi).

To capture the behavior of different actors in the economy, the following sub-sections describe the model's components in major blocks: production and trade, institutions, commodity markets, and macroeconomic balances. A full description may be found in Lofgren et al. (2002).

Production: Each producer (represented by an activity) is assumed to be a profit maximizer. A producer's profit is defined as the difference between the revenue and the cost of primary factors and intermediate inputs. Profits are maximized subject to a production technology, the structure of which is shown in Figure 2. A final commodity (on the top of the figure) is produced by combining value-added and aggregate intermediate inputs. The combination is assumed to follow a constant elasticity of substitution (CES) or Leontief function, dependent on the nature of each production process. The blocks on the left of Figure 2 indicate that value-added is a CES function of primary factors. The blocks on the right shows that aggregate intermediate input is a Leontief function of disaggregated intermediate inputs.

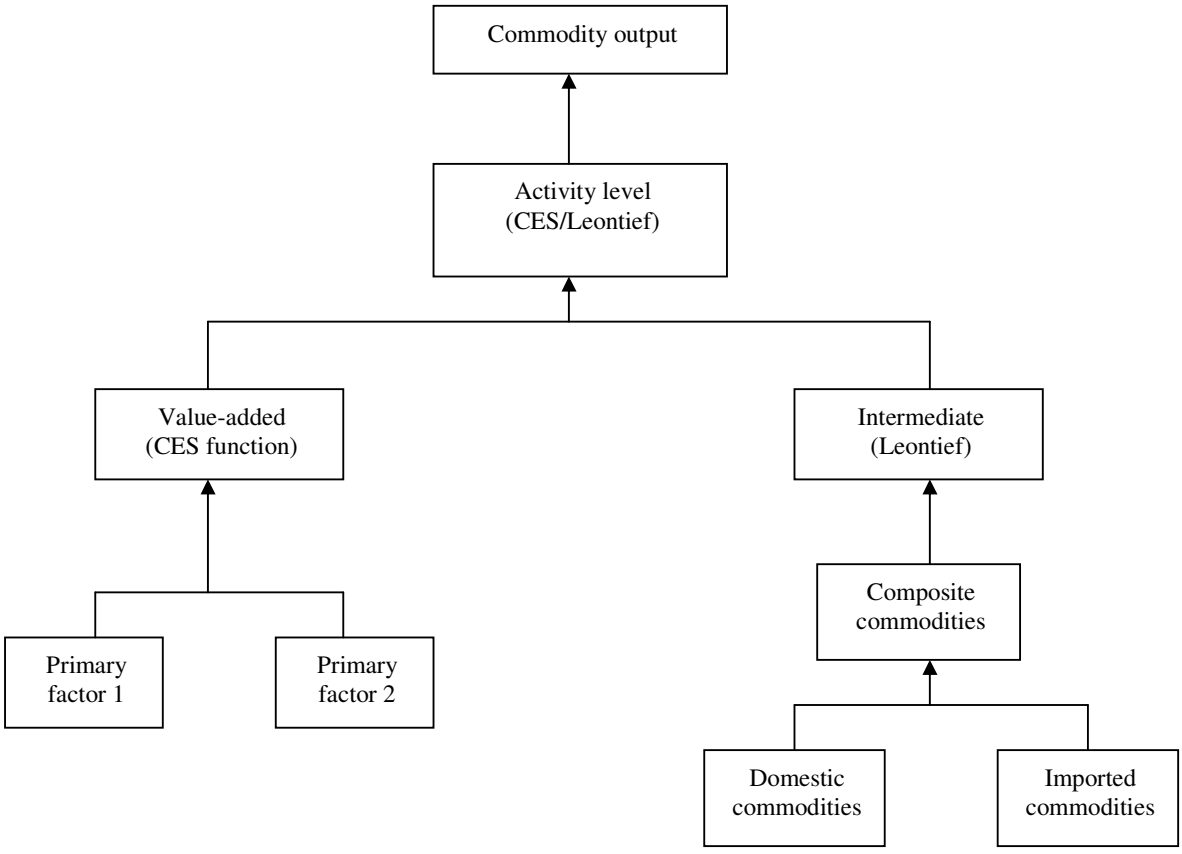

Figure 2. Production technology

Source: Lofgren et al. (2002)

Each activity produces one or more commodities according to fixed yield coefficients, and a commodity may be produced by more than one activity. The revenue of each activity is identified by the level of the activity, yields, and commodity prices at the producer level.

Since the producers maximize their profit, they employ factors up to the point where the marginal revenue product of each factor is equal to its wage (or factor price or rent). Factor wages may vary across activities. The wage differentials are assumed to result from exogenous causes.

Institutions: In the model, institutions consist of households, enterprises, the government, and the rest of the world. Only the households are divided into rural and urban, all others are aggregated as single units.

The households receive income from the factors of production. They also receive transfers from other institutions. Remittances are reflected in the flow from the rest of the world to households and their amounts are assumed to be exogenous in foreign currency unit. The households use their income to pay direct taxes, consume, make transfers to other institutions, and save. The shares of direct taxes and transfers in household income are assumed to be constant. Household consumption includes both home and marketed commodities. Home commodities are purchased at producer prices, while marketed commodities are purchased at market prices. The total consumption is allocated across different commodities according to a linear expenditure system (LES) demand function, which is derived from the maximization of a Stone-Geary utility function. The remainder of household income is for saving.

Enterprises receive profits and factor incomes, and may also receive transfers from other institutions. Enterprise incomes are allocated to direct taxes, savings, and transfers to other institutions. Enterprises do not consume. Apart from this, the payments to and from enterprises are modeled in the same way as the payments to and from households.

The government collects taxes and receives transfers from other institutions. All taxes are at fixed *ad valorem* rates. The government uses its income for two purposes: purchasing commodities for consumption and making transfers to other institutions. Government consumption is fixed in quantity whereas government transfers to domestic institutions (households and enterprises) are fixed in real terms (CPI-indexed). Government savings is the difference between government income and expenditure.

The final institution is the rest of the world. Transfer payments between the rest of the world and domestic institutions and factors are all fixed in foreign currency unit. Foreign

savings (or the current account deficit) is the difference between foreign currency spending and receipts of the economy.

Commodity Markets: As noted, there are two kinds of commodities: home-consumed and marketed. Only home-consumed output does not enter markets. Figure 3 shows the physical flows for marketed commodities along with the corresponding quantity and price variables, which are identified in the model equations described in Appendix 1.

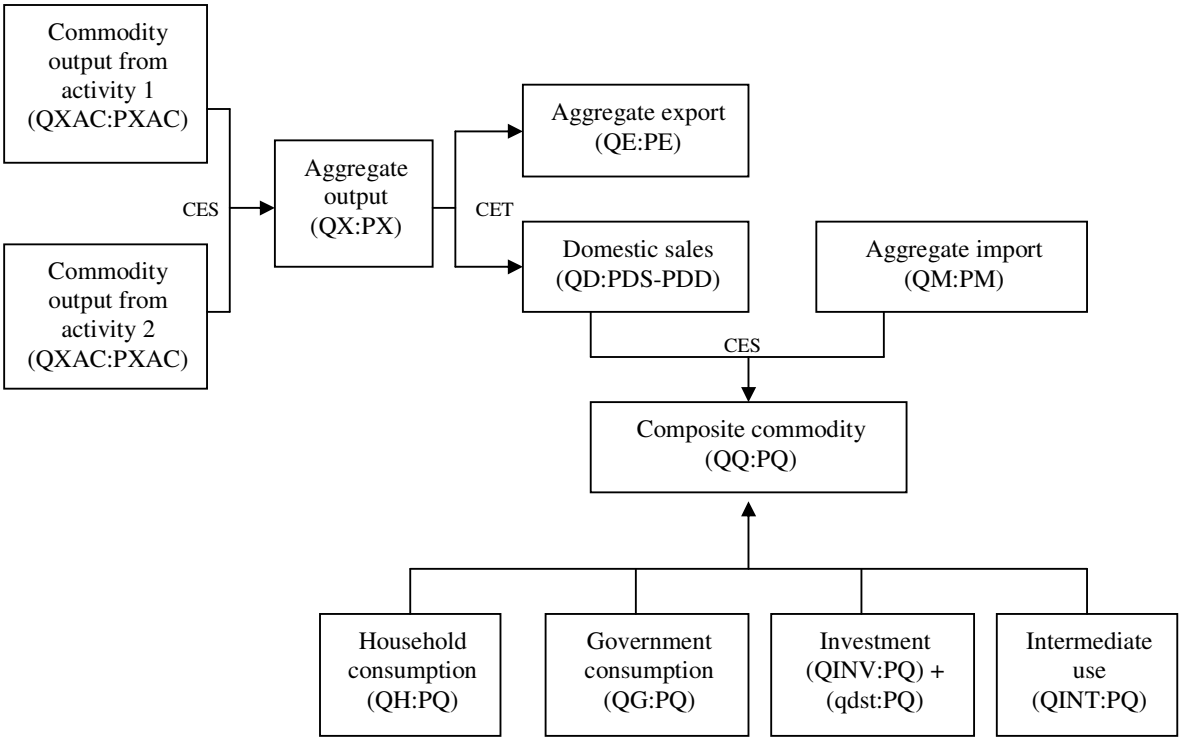

Figure 3. Flows of marketed commodities

Source: Lofgren et al. (2002)

The first stage in the chain (upper left blocks) deals with the issue of how to generate a commodity's aggregated domestic output from the output of different activities, which are imperfectly substitutable. A CES function is used as the aggregation function. The demand for the output of each activity is derived from the optimization problem that minimizes the cost of supplying a given quantity of aggregated output subject to this CES function. Commodity prices serve to clear the market for each disaggregated commodity.

At the next stage, aggregated domestic output is allocated between exports and domestic sales. It is assumed that suppliers maximize sales revenue for any given aggregate output

level, subject to imperfect transformability between exports and domestic sales, expressed by a constant elasticity of transformation (CET) function. We use the small country assumption that world demands for exported commodities are infinite and domestic suppliers take world prices as given. If a commodity is not exported, all of its output is directed to the domestic market.

Domestic demand is the sum of demands for household consumption, government consumption, investment, intermediate inputs, and transactions (trade and transportation) inputs.

Related to imported commodities, the model assumes that all domestic market demands are represented by a composite commodity, which is made up of imports and domestic output. Imported and domestic commodities are imperfect substitutable and captured by a CES aggregation function. The demands for them are derived from the solution of domestic demanders' maximization problem that minimizes cost of obtaining a given quantity of composite commodity subject to the CES function. Commodities that can not be imported are supplied by domestic producers, whereas commodities that can not be supplied by domestic producers are all imported. The demands for imported commodities are met by international supplies that are infinitely elastic at given world prices. The import prices paid by domestic customers include import tariffs and the cost of domestic transaction services, which is a fixed proportion in each import unit. Similarly, the derived demand for domestic output is met by domestic suppliers.

Flexible prices equilibrate demands and supplies of domestically marketed domestic output.

Macroeconomic balances: The model includes three macroeconomic balances: the (current) government balance, the external balance (the current account of the balance of payments), and the savings-investment balance.

For the government balance, it is assumed that government savings is a flexible residual while all tax rates are exogenous.

For the external balance, which is expressed in foreign currency, it is assumed that the real exchange rate is flexible while foreign savings (the current account deficit) is fixed.

Concerning the savings-investment balance, the total value of private savings is assumed to adjust to the investment. Real investment quantities are assumed to be fixed at an

exogenous level. To generate savings that equal the investment demand, the base-year savings rates of selected nongovernment institutions are adjusted by the same number of percentage points. It is also assumed that the private savings is automatically mobilized to fully meet the demand for the investment which is fixed in real terms.

The Consumer Price Index (CPI) is fixed at 1 to act as the numéraire. This means, all prices in the model are adjusted for CPI.

A full mathematic statement of the model is presented in Appendix 2.

Database compilation

For modern CGE models, social accounting matrices (SAM) play the crucial role of a consistent and convenient database to be used for calculation. A SAM is a comprehensive, economywide data framework, typically representing the economy of a country (Lofgren et al. 2002). On the structure and use of a SAM, see Reinert and Roland-Host (1997) or Cohen (2002) for more detailed discussions.

The present research employs the latest SAM of Vietnam. This SAM was constructed by the Central Institute for Economic Management (CIEM) of Vietnam and the Nordic Institute of Asian Studies and formally released in 2004. The SAM is based on the input-output (I/O) table for the year 2000 and other official statistics. Therefore, it is commonly called the 2000 SAM in Vietnam. Those who are interested in the details of the SAM may refer to its documentation by Jensen et. al (2004). In this section we only describe its major characteristics related to the CGE model.

The fully disaggregated version of the 2000 Vietnam SAM is a matrix with dimensions 269x269. There are 112 production activities with 114 counterpart commodities. In addition, there are 14 factors, 16 household groups, three enterprise types, one recurrent state expenditure account and seven tax accounts, one investment/savings account and one balance of payments account referring to foreign trade and capital flows.

Factors include twelve types of labor, one aggregate capital factor and one aggregate land factor. Labor is disaggregated in three dimensions: rural-urban location, gender type and skills (including unskilled, medium-skilled and skilled). Household disaggregation, which is based on categorizing the household head, involves 16 household types, taking account the rural-urban and male-female headed dimensions, which are each sub-divided into self-

employed farmers, self-employed non-farmers, wage-earners and non-employed. Enterprises include state, private (non- state) and foreign-invested companies.

The original SAM is aggregated into several smaller standard SAMs, which are also reported in Jensen et. al (2004). These SAMs are named following the number of aggregated sectors. They include: SAM 31, SAM19 and SAM3 and MacroSAM (SAM1). As an illustration, SAM3 is exhibited in Appendix 1.

For the purpose of this paper, SAM19 has been aggregated into a 7-sector SAM, which we henceforth call SAM7. Our choice of sector aggregation is presented in Table 5. Labels of sectors in SAM7 are also used as sector code in the model's reports appearing in this study.

Sector	**SAM19's Sector Labeling**	**SAM7's Sector Labeling**
Agriculture	01-AGR	01-AGR1
Forestry	02-FOR	01-AGR2
Fishery	03-FISH	
Mining and quarrying	04-MIN	
Manufacturing	05-MANU	03-IND
Electricity, gas and water supply	06-EGW	
Construction	07-CONS	04-CONS
Wholesale and retail trade; repair of transport vehicles, personal and household goods	08-TRADE	05-TRADE
Hotel and restaurant	09-HOTEL	06-SER1
Transportation, storage and telecommunication	10-TRANS	
Financial intermediation	11-BANK	07-SER2
Science and technology	12-SCIEN	
Real estate and consulting	13-REALCON	
Public administration and defense; compulsory social security	14-ADMDEF	
Education and training	15-EDU	
Health and social protection	16-HEALTH	
Recreational, cultural and sport activities	17-CULT	
Activity of the party and associations	18-ASSO	
Community, household and personal services	19-OTHER	

Table 5. Labels of sectors in the aggregated SAM (SAM7)

Other elements in SAM7 are the same as that of SAM19. Their names and labels are reported in Table 6.

Concerning remittance data in the above SAMs, it is noteworthy that we use flows from "rest of the world" to "households," as proxies for remittances. As documented, these flows are in fact "total net transfers" from abroad to households, and cited from Vo Tri Thanh et. al. (2002) as mill. USD 1,340 (which is consistent with the figure provided in Table 1). Using an exchange rate of 14,094 VND = 1 USD gives the figure (bn. VND 18,886) as included in the MacroSAM (Jensen et. al, 2004).

Sector	Label
Rural labor	LABRUR
Urban labor	LABURB
Capital	CAP
Land	LAND
Rural households	HHRUR
Urban households	HHURB
Enterprise	ENT
Direct taxes	YTAX
Indirect taxes	ATAX
Import tariffs	TAR
Government	GOV
Rest of the world	ROW
Saving – investment	S-I

Table 6. Other labels in SAM7

With SAM7 the basic data compilation for the CGE model is complete. However, before proceeding to the calculations, we must specify values of behavioral parameters (elasticities) used in the model.

Parameter specification

Identifying behavioral parameters (elasticities) for CGE model is always a difficult task to modelers, especially in the cases of developing countries.

The preferred method to identify the elasticities is to estimate them directly from an appropriate dataset by using econometric models. Unfortunately, it is usually difficult to obtain time series data that are long enough for running regressions. In some cases it is costly, and in some others it is simply impossible to obtain the necessary data. Therefore, the most commonly suggested methods are searching previous econometric works on similar cases (literature searches) and/or trying to guess the best values (best-guess) (Shoven and Whally 1992).

In the present case, some literature in which values of parameters are available is used as a helpful reference. They are Shoven and Whally (1992), Fossati (1996), Sapkota and Sharma (1998), Townsend and Ratnayake (2000), Zhang (2001), Chan and Dung (2002), and Lofgren et al. (2002). Our choice of elasticities for the CGE model is reported in Appendix 3.

The model in GAMS

To solve for the system of equations, a program is written in the General Algebraic Modeling System (GAMS) software. After having been able to replicate the economy's initial equilibrium, which is identical to the original SAM 2000, we proceed to the simulations under different scenarios. While the calculation procedure is described in Appendix 4, its basic results are analyzed in the next section.

Simulation Results

In order to assess the effects of remittances in Vietnam's current context, two scenarios are designed as follows:

Scenario 1: An increase by 100% of remittances to rural households and 50% increase in remittances to urban households. No change in tax or tariff.

Scenario 2: The same increases of remittances as above and a reduction of tariff by 30%.

The first simulation aims to examine the effects of a significant increase in remittance inflows (as is occurring in Vietnam currently) while other things are kept unchanged. By assuming a difference between the magnitude of remittances flowing into rural and urban areas, we aim to reflect the fact that the share of remittances to rural areas in the total is steadily rising during the years just before and after 2000. This trend has been discussed in Section 2.

The second simulation is an attempt to put the evolution of remittances in a more realistic context, where Vietnam is more deeply integrating into the world economy. Its recent accession into the World Trade Organization is an evidence of this fact.

Table 7 reports the changes in selected macro variables according to the simulation scenarios. As CPI is used as the numéraire, all figures should be considered as the real terms.

Variable	Scenario 1	Scenario 2
Real exchange rate	-0.978	0.034
Producer price index for nontraded (DPI)	0.382	0.588
Government income	0.287	-3.356
Government expenditure	-0.030	0.412
Government savings	1.510	-17.892
Household expenditure- urban	4.483	5.552
Household expenditure- rural	3.006	3.973
Rental price of capital	-0.289	0.668
Rental price of land	0.807	1.938
Wage rate – urban	0.174	1.334
Wage rate – rural	0.162	1.149

Table 7. Percentage changes in selected macro variables

The Effects in Scenario 1

One of the predictable effects is that the Vietnamese currency will become stronger as the supply of foreign currency increases. The model projects that the real foreign exchange rate will fall about 1%.

As shown in Table 8, the total expenditures of households in rural and urban areas increase about 3% and 4.5% respectively. Household consumption of domestic commodities also increases in a similar manner. The imports increase for all commodities, while the exports all fall. This may be due to the appreciation of the domestic currency.

Variable	AGR1	AGR2	IND	CONS	TRADE	SER1	SER2
Production (QX)	0.057	-1.078	-1.185	2.064	-0.317	0.545	0.830
Value added (QVA)	0.260	-0.944	-0.879	2.064	-0.315	0.547	0.845
Fixed investment (QINV)	2.064	2.064	2.064	2.064			
Domestic activity (QA)	0.260	-0.944	-0.879	2.064	-0.315	0.547	0.845
Domestic sale (QD)	0.184	-0.156	-0.521	2.064	-0.311	1.247	0.928
HH cons. (QH) - urban	2.859	2.544	5.023		3.615	4.774	4.422
HH cons. (QH) - rural	1.700	1.575	3.523		2.972	3.507	3.348
Exports (QE)	-0.557	-1.599	-2.324		-1.281	-0.424	-0.204
Imports (QM)	2.356	3.417	3.115		1.545	4.508	3.119

Table 8. Percentage changes by industry, Scenario 1

Domestic sales of industrial products and trade activities tend to decrease, while agriculture, constructions and other services expand. Construction increases the most. These changes imply that an increase in remittances raises domestic demand, and at the same time the VND appreciates, leading to an influx of foreign products, which are now more competitive in tradable goods markets. It is predictable that nontraded goods benefit from this situation (the construction industry in this case).

It is projected that government savings rise (1.5%), as its income grows (0.3%) while its expenditure slightly falls (0.3%).

One issue of great concern is factor prices. It can be seen that they behave differently. The rental price of land increases the most (about 0.8%), while that of capital tends to fall (almost 0.3%). The general wage of labor increases, in which wage in urban areas tends to rise slightly higher than that in rural areas (0.17% and 0.16% respectively). As the model assumes full employment of all factors and their supply are fixed, the incomes of factors change proportionally to their prices.

The Effects in Scenario 2

In this case, a 30% tariff cut for all imports is added to the increase in remittances in Scenario 1. With economic common sense one can predict that the cut will help to depreciate the local currency. The model projects that the combination of remittance influx and tariff cut as proposed leads to a very slight change in real exchange rate (0.034%). This implies that the appreciation effect of remittance inflows has been offset by the depreciation effect of tariff cut.

Variable	AGR1	AGR2	IND	CONS	TRADE	SER1	SER2
Production (QX)	0.050	-0.791	-1.432	0.204	-0.907	1.620	1.202
Value added (QVA)	0.299	-0.647	-1.050	0.204	-0.905	1.621	1.219
Fixed investment (QINV)	0.204	0.204	0.204	0.204			
Domestic activity (QA)	0.299	-0.647	-1.050	0.204	-0.905	1.621	1.219
Domestic sale (QD)	0.147	-0.177	-1.311	0.204	-0.904	1.977	1.266
HH cons. (QH) - urban	3.391	3.113	6.263		4.284	5.724	5.203
HH cons. (QH) - rural	2.103	2.043	4.651		3.667	4.402	4.091
Exports (QE)	-0.419	-1.137	-1.639		-1.399	1.128	0.518
Imports (QM)	3.703	2.843	3.903		0.036	3.615	2.707

Table 9. Percentage changes by industry, Scenario 2

Compared to the first case, household consumption of commodities further increases. In general, consumption rises in both rural and urban areas, from 20% to 40%, dependent on commodities, in comparison with the first case. Consumption of industrial commodities increases the most, around 4.7% for rural households, and 6.3% for urban households (3.5% and 5% respectively in the first case). Similar to Scenario 1, the rise in consumption of agricultural commodities remains the most modest.

As a result of consumption growth, household expenditure increases in a similar manner.

However, increases in consumption and expenditure of households do not mean that domestic production flourishes. In fact, only outputs of services and construction are improved in both domestic and export markets. All others shrink in both domestic and foreign markets. Agriculture shows a slight increase in the domestic market, but a decrease in exports offsets this achievement. The different situation of the construction industry is not a surprise since its outputs are nontraded, and therefore does not suffer from foreign competition.

From the results above, it is not difficult to predict that imports will increase. The model calculates that imports rise by about 3% across the commodities.

In the government sector, tariff cuts act as the major reason to cause government income to shrink considerably (about 3.6%, whereas in the first case government income rises 0.3%). Together with a slight increase in its expenditure (0.4%), the government consequently suffers a substantial reduction in its savings (almost 18%).

In factor markets, prices all rise. The increase in the rental price of land remains the highest (by 1.9%) and is much higher than in the first case (0.8%). Wage of urban labor keeps rising faster than that of rural labor (by 1.3% vs. 1.1%, while in the first case the rises are much smaller: 0.17% vs. 0.16%). Different from the first case, the rental price of capital does not fall but rises (by about 0.7%).

Concluding Remarks

The findings from this paper strengthen the view that effects of remittances on developing countries are mixed and complicated. While households seem to gain from their additional incomes, production sectors are not affected in the same way. Since there is an appreciation pressure on the local currency and an increase in consumption expenditures, final demand is restructured and production factors are relocated. It is shown that in the context of Vietnam, where the growing remittance inflows are combined with the economy's increasing integration to the international markets, all factor prices tend to rise, and industrial sectors are strongly influenced and tend to contract. This implies that the long-run effects of remittances, which do not tend to be driven to productive investments, may be negative on the supply side, and may offset their short-run positive effects on the demand side.

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Appendix 1: 3-Sector SAM 2000

	A01-AGR	A02-IND	A03-SER	C01-AGR	C02-IND	C03-SER	MM	LAB-RUR	LAB-URB	CAPITAL
A01-AGR				149924.7						
A02-IND					497321.7					
A03-SER						255216				
C01-AGR	18886.71	78750.98	2117.232							
C02-IND	32594.5	271862.9	66373.66							
C03-SER	1882.218	15243.32	36288.17				88435.14			
MM				17345.61	71089.53					
LAB-RUR	52855.09	37329.4	35023.35							
LAB-URB	2026.781	34036.24	54502.22							
CAPITAL	18393.19	74859.09	51483.06							
LAND	31585.39									
HH-RUR								125207.8		15705.25
HH-URB									90565.24	22115.33
ENT										97851.8
DTAX										9062.958
ITAX	5606.667	16042.32	10433.02	786.9837	2229.714	859.5582				
IMPTAR				127.3112	13467.43					
GOV										
S-I										
ROW				3886.792	224704.8	25067.05				
TOTAL	163830.5	528124.2	256220.7	172071.4	808813.2	281142.6	88435.14	125207.8	90565.24	144735.3

	LAND	HH-RUR	HH-URB	ENT	DTAX	ITAX	IMPTAR	GOV	S-I	ROW	TOTAL
A01-AGR		12960.71	945.0894								163830.5
A02-IND		28276.74	2525.746								528124.2
A03-SER		797.4548	207.2317								256220.7
C01-AGR		23829.18	18420.68						3288.859	26777.79	172071.4
C02-IND		72311.52	56161.3						128190.6	181318.7	808813.2
C03-SER		30362.68	29565.93					45566.91		33798.26	281142.6
MM											88435.14
LAB-RUR											125207.8
LAB-URB											90565.24
CAPITAL											144735.3
LAND											31585.39
HH-RUR	28517.17			4790.011				13002.31		5524.466	192747
HH-URB	906.1792			9733.287				9755.687		13361.49	146437.2
ENT								3742.09		2607.39	104201.3
DTAX	2162.042	765.8816	1065.118	26112							39168
ITAX											35958.26
IMPTAR											13594.74
GOV					39168	35958.26	13594.74			2028	90749
S-I		23442.88	37546.12	51808.45				18682			131479.5
ROW				11757.53							265416.1
TOTAL	31585.39	192747	146437.2	104201.3	39168	35958.26	13594.74	90749	131479.5	265416.1	

Appendix 2: Behavioral Parameters for the Model

Commodity	SIGMA-Q	SIGMA-T
AGR1	1.50	0.50
AGR2	1.50	0.55
IND	2.50	1.15
CONS	2.00	1.06
TRADE	2.00	1.06
SER1	2.00	1.05
SER2	2.00	1.05

Table A.1. Armington and CET elasticities by commodity

Activity	SIGMA-A
AGR1	0.50
AGR2	0.50
IND	0.50
CONS	0.50
TRADE	0.50
SER1	0.50
SER2	0.50

Table A.2. Elasticities of substitution between factors

Commodity	HHRUR	HHURB
AGR1	0.70	0.80
AGR2	0.70	0.75
IND	1.37	1.35
CONS	1.27	1.26
TRADE	1.17	0.98
SER1	1.42	1.32
SER2	1.32	1.20

Table A.3. Expenditure elasticity of market demand for commodity by household

Parameter	Value
Elasticities of substition between the value added and intermediate commodity for all activities	0.60
Output aggregation elasticites for all commodities	4.00
Frisch parameter	-4.00

Table A.4. Other parameters