

# Globalization and the Polish economy: stylized facts and simulations using a Computable General Equilibrium Model

Gradzewicz, Michał; Hagemejer, Jan and Zbigniew, Żółkiewski
National Bank of Poland

08. November 2007

# Globalization and the Polish Economy:

# Stylized Facts and Simulations using a Computable General Equilibrium Model

Michał Gradzewicz, Jan Hagemejer, Zbigniew Żółkiewski

National Bank of Poland*

**Abstract**

The aim of the paper is to quantitatively assess the impact of globalization on the economy of Poland in the medium term. Four channels of impact of globalization are distinguished: (i) trade openness, (ii) productivity improvement, (iii) labour migrations, (iv) liberalization of the services sector. First, we discuss stylized facts on adjustment of the Polish economy to globalization. Then we will present and discuss model-based simulations. As a modelling tool we use a computable general equilibrium model with multiple industries, labour markets, households and imperfect competition features.

Our results show positive and quite significant effects of globalization on the performance of the Polish economy. The strongest positive impact comes from productivity acceleration. Liberalization of services has also a considerable positive impact on GDP and especially on employment. The sizeable expected migrations result in negative effects of globalization by decreasing growth potential and causing upward pressure on wages. At the sectoral level, globalization is in particular beneficial to some exporting sectors and skilled segments of the labour market.

JEL classification: C68 F15 F22

keywords: globalization, computable general equilibrium, labour migrations, trade liberalization

* The views presented in this paper are those of the authors and not the institution they represent. Corresponding author: jan.hagemejer@mail.nbp.pl

## Introduction

Over the last decades, global processes have gained a great deal of significance as a factor important for the growth of Poland ‘s economy. We believe that it was, in fact, the coincidence of two major developments. First, what is now called ‘globalization’ in the economic literature, should be more precisely named ‘acceleration of globalization’ since, as pointed out and analysed, eg. in Denis et al. (2006) it is the last 1 – 2 decades that have witnessed a speeding up of the already ongoing ‘secular globalization’ process. Second, Poland broke off the communist system and introduced market reforms, leading, among others, to a rapid opening of the economy in 1989 and subsequent years, ie. the time when the globalization processes were gaining momentum. Then, with further strengthening of market economy mechanism, progressing integration with the European Union and finally, the accession to the EU in 2004, the Polish economy has become subject to global economy influence – similarly as other medium-income countries of the region. The global factors’ influence on Poland’s economy manifests itself through the following channels: trade and capital flows, liberalization, increasing foreign competition, innovation absorption, intensive outward and inward labour migrations, growing importance of global factors in the process of shaping the domestic inflation. While the impact of particular global processes on the Polish economy have been analyzed and quantified (eg. benefits of Poland’s accession to EU – Centrum Europejskie Natolin, 2003; Hagemejer & Michalek, 2007; cost and benefits of accession to Euro area  NBP, 2004; Orłowski, 2003; impact of globalization on inflation – Allard, 2006), there has been scarce, if any, research aimed at a quantitative assessment of how globalization, understood as a variety of interconnected

processes, affects the Polish economy[1]. The aim of this paper is to fill that gap with a quantitative assessment of the impact of key globalization processes on the Polish economy in the long run, using the comprehensive methodological framework of a computable general equilibrium model.

The paper is organized as follows. In the first section we review related literature and discuss the channels through which globalization affects the economy of Poland. In the subsequent section, we describe the simulations experiments and discuss their results. The last section concludes.

## Review of literature and stylized facts on globalization for Poland

### Review of literature

Given the fact that "globalization" is one of the most popular words in contemporary economic publications, a review of only the most important contributions would be beyond the scope of this paper. A review of recent literature focused on globalization and its impact on economies of the European Union (EU15), together with an interesting quantitative assessment of potential future effects of global processes on growth of the EU-15 in the long-run may be found in Denis et. al. 2006. Authors adopt a standard notion of globalization, resulting in an increased importance of trade and capital flows, international R&D flows and migrations. Then, using relevant indicators, they assess the impact of globalization on the EU-15 economy in the past (since 1820). They further present a model-based[2] quantitative estimate of potential future macro benefits and costs of globalization for the EU in the long run (1990 – 2050).

Authors conclude that globalization have led to an increase of living standards in EU-15 by about 20% over the period of 1950-2002 due to EU's growing integration into the world's

[1] The comprehensive discussion on globalization, with special emphasis on global imbalances and implications for monetary policy, may be found in Rybinski, 2006 (in Polish only).
[2] An international macro model (QUEST) has been used as the simulation tool.

economy (trade openness effect). They stress that international spillover effects of total factor productivity (TFP) are important and predict that productivity growth in Europe over the period 1950-2000 would be about 30% lower without openness, even without the link between capital accumulation and TFP. The simulated long run effect of globalization is an additional welfare gain of 8% of GDP per capita. Authors note that real gains from globalization are dynamic in nature and they result from restructuring and innovation, induced by an increase in competition and technology spillover effects and skill transfers.

The other studies offering quantitative assessments of globalization usually focus on specific global processes, typically trade liberalisation. Various trade liberalization processes are believed to have had a significant effect on the volume of the world GDP – e.g. the estimated total effect of the Urugway round is an annual increase in the world GDP growth by 1pp (for a review see e.g. Krugman & Obstfeld, 2005, p. 335). Effects of the current Doha round of the WTO are yet unknown since the negotiations are still in progress, however, the recent study by Francois, van Meijl & van Tongeren, 2005, estimates the static gains to be equal to 0.5% of the world GDP .The estimated increase in the world trade due to the (unfinished) Doha round in services amounts to 12%, while merchandise exports of the developing countries to the EU are expected to increase by 16%. Previously heavily protected global trade in selected goods is believed to increase considerably, eg. 41% (processed foods), 34% (textiles and clothing) and 16% (sugar).

There are several papers estimating effects of the Polish accession to the European Union and the Single Market. A recent one, by Hagemejer & Michalek (2007), estimates the GDP increase resulting from the removal of non-tariff barriers at the level of 1-1.2% (short-long run) and the total welfare effect at the level of 0.5-0.7% of GDP.

**Stylized facts on globalization effects in Poland**

Since the beginning of 1990s, the Polish economy has deepened its integration with the world economy. For instance, trade openness, measured by the ratio of exports and imports to GDP increased from 49% in 1991 to 82.9% in 2006. The stock of foreign direct investment in Poland increased from virtually null in the beginning of 1990s (2.83 bill. USD) to over 92 bill. USD in 2005 (ie. about 31% of GDP). Inward FDIs have been important not only as a source of financing investment (additional to domestic savings), but also as a powerful engine of the increase in productivity. The inflow of foreign capital and imports of machinery and equipment have been major sources behind the productivity growth in Poland, given the low intensity of domestic R&D activities[3],. The impact of FDIs, imports, and other global economy spillovers on the total factor productivity growth in Poland is documented e.g. in Kolasa & Żółkiewski (2004), Kolasa (2005), Piatkowski & Van Ark (2005) and Clarke (2003). FDIs contribute significantly to the increasing openness of the Polish economy, through increasing both the export potential and the propensity to imports. According to IKCHZ (2006), enterprises with foreign capital were responsible for 66% of total Polish exports in 2006 vs. 57% in 2004. Since a large number of exporters use imported subcomponents in their activity, more than 86% of importers are exporters at the same time (NBP, 2007).

Globalization processes, and in particular accession to European Union in 2004, have affected the labour market in Poland considerably. Due to wage differentials and large pool of unemployed[4] and inactive people, migrations accelerated after May 1, 2004 to the level important for both the Polish labour market and the countries receiving Polish émigrés (mainly Great Britain and Ireland). There are different estimates of the actual size and duration of outward

[3] Expenditures on R&D amounted to 0.57% of GDP in 2005 that is one of the lowest records in EU25. However, it is even lower than in 1995 (0.63% of GDP).

[4] Unemployment rate is still relatively high in Poland (about 13% by the end of 2006) even if it has been decreasing fast over the last quarters (almost 17% by the end of 2005).

migrations since accession. The Centre for Migrations Research of University of Warsaw (Okólski, 2006) estimates the outward migrations at 3% of labour force, which is substantial. Moreover, double of that may still emigrate. Shrinking domestic labour force affects the domestic labour market, especially that migrants are relatively better educated than the population on average (Kaczmarczyk, 2006[5]). This is one of the major reasons for increasing shortages of skilled workers as perceived by enterprises. For instance, according to the National Bank of Poland survey of enterprises, as of first quarter of 2007, firms reported the shortage of skilled labour as a second major barrier to growth while this barrier was perceived among the least important only a year earlier[6].

Increasing wage inequalities between skilled and unskilled workers may also be attributed to globalization. In sectors with intensive import penetration, FDI and exports, the wage inequalities considerably increased (eg. food products – the ratio of skilled to unskilled labour wages increased from 1.8 in 1997 to 2.3 in 2004, motor vehicles - from 1.5 to 2.0, office machinery - from 1.1 to 2.5). On the other hand, in industries relatively well sheltered from the global economy impact, like electricity, gas and water, the wage inequalities hardly changed over the analysed period.

While, by its very nature, globalization primarily affects the tradable sector of the economy, it is also important for the non-tradable activities, eg. through capital inflows changing both the market structure (the competition effect) and boosting modernization (the productivity effect). This is of particular importance for the service sector of the Polish economy, which is partially overregulated and protected. In particular, this refers to telecommunications (excessive

[5] However, this author clearly states that there is no ground for declaring "exodus" of highly skilled specialists or "brain drain" as sometimes proclaimed in public discussion.

[6] It was a barrier for 10.7% of the firms surveyed as of the first quarter of 2007 while only 1.8% reported this problem in the first quarter of 2006.

fixed line telephony and internet access charges), financial services (relatively expensive and underdeveloped, e.g., with respect to financing of small and medium entreprises), network industries (like transport or energy generation and supplies) where state ownership with its typical inefficiencies dominates. According to Gradzewicz and Hagemejer (2007a), particularly high monopoly markups are observed in transport, post and telecommunications, real estate and business services. In the case of telecommunications, fixed line telecom market is highly monopolized – in 2005 the incumbent operator had a 85 percent market share. The mobile segment is operated by an oligopoly of three firms. According to the UKE 2006 (the telecom regulator) report, the costs of total monthly usage for an average retail customer of fixed line telephony were the 6th highest in the enlarged EU in 2005. Similarly, mobile phones were the 2nd most expensive among selected 13 EU countries. High monopoly markups lead to inefficient level of service provision – e.g. Poland had the 2nd lowest rate of broadband internet penetration[7] in the EU-25 in 2005 .

## Simulations of effects of globalization on Poland's economy

### Modelling approach

The impact of globalization on the behaviour of the Polish economy is analyzed using a computable general equilibrium model (for model details consult the appendix[8]) calibrated to the Social Accounting Matrix based on Central Statistical Office (GUS) data for 2002[9]. . Since globalization is expected to have long-run consequences, the authors decided to assess only the long-term impact of globalization. Starting from the basic comparative static version of the

[7] All data come from the UKE (2006).
[8] Full model description is given in Gradzewicz, Griffin, Żółkiewski, 2006
[9] The latest input-output table published by GUS has 2000 as a base year. It is updated to the model base year using the RAS balancing procedure using data coming from the input-output table, households budgets, national accounts and other macroeconomic data for 2002.

model, the long-run has been modelled by an introduction of simplified long-run changes of capital supply. The following two-step procedure has been used to calculate the long run response of the economy to the globalization shocks imposed on the structure of the model, taking into account the capital accumulation. First, the effects of globalization have been calculated subject to a fixed capital stock constraint. In the second step, the investment growth rate from the first step was used to calculate the resulting long run response of capital accumulation to additional investments[10], according to the formula:

$$\frac{\Delta K}{K} = \frac{1}{\delta} \cdot \frac{\Delta I}{K} = \frac{1}{\delta} \cdot \frac{\Delta I}{I} \frac{I}{K},$$

where K is the capital stock, I is the level of investment and δ is the depreciation rate of capital. General equilibrium solution for this "long-run" level of capital is then interpreted as representing long-run equilibrium after the globalization shock has been fully absorbed.

Labour market is allowed to freely adjust (in terms of employment and wages) to changes in economic activity, highlighting the long-run consequences of the simulations. Product market is modelled in an imperfectly competitive fashion. Following the empirical evidence (Gradzewicz and Hagemejer, 2007b), authors assumed that in case of most industries, companies are operating in an oligopolistic setting (Bertrand) with scale economies stemming from fixed costs of production. Additionally, authors introduced firm-level product differentiation, which is based on Dixit-Stiglitz (1977) love-for-variety formulation. Initial markups and the number of firms in the model are calibrated using results of Gradzewicz and Hagemejer (2007a).

**Assumptions of the globalization simulations**

[10] In other words, the procedure assures that additional capital accumulation/decumulation originates only in investments triggered by globalization changes. The investments arising from capital accumulation do not augment its stock in the long run. We assumed the long run depreciation rate to be 8% percent on the basis of the literature review.

In our simulations, we distinguish four channels of the impact of globalization on the Polish economy. These channels include: trade liberalization, productivity improvement, labour migrations and liberalization of services.

The merchandise trade liberalization is assumed to have a direct effect on the prices of imported goods. The liberalization of trade with the EU involves the removal of only the non-tariff barriers (except agriculture), because a majority of tariffs on manufactured goods are effectively zero since 2000. For non-EU imports, the scope of liberalization due to both completing of the Urugway Round and the future commitments in the Doha Round of the WTO is higher. Following Hoffman (2001) and Harrison, Rutherford & Tarr's (1996) estimates of the impact of the NTB removal due to Single Market Programme, it is assumed that prices of imports from the EU go down by 2.5 percent. The prices of imports from the rest of the world fall by 10 percent. This number is based on the National Bank of Poland internal statistics on price behaviour[11]. It is also assumed that due to the liberalization of the EU imports from the rest of the world, prices of goods imported from the EU fall by an additional 1 percent[12].

In our simulations we assume that an increased foreign direct investment inflow combined with a surge in imports increase the total factor productivity. The overall TFP change in the economy increases by 1 percent[13], however, the exact size of sectoral imposed changes is proportional to the relation of FDI inflow to the sector's production[14].

---

[11] For instance, the price of the basket of goods mostly affected by globalization (mostly, clothes, shoes, electronics and computer equipment) falls over 2006 by about 7% (over 2005 – 2006, by about 12%).

[12] This additional effect is assumed to be caused by falling intermediate goods prices faced by EU producers. This number is a "guesstimate".

[13] The size of TFP shock is calibrated to roughly match results obtained by Denis et. al (2006) estimating the growth effects of globalization for the EU-15 economy. Taking into account the technology gap, we assume the impact on Poland to be double of that estimate.

[14] One of the referees pointed out that we ignore the capital flows that are an important channel of globalization. Our model, does not explicitly model foreign direct investment nor does it have a financial market. Thus we assume the productivity shock to incorporate the productivity effects of increased capital inflow to Poland resulting from foreign direct investment.

The opening of most of the EU-15 labour markets to workers from new member states (entering the EU in mid-2004) triggered an intense outflow of labour force, mainly due to substantial wage differentials. The total migration effect from Poland is estimated to be between 0.5-0.6 million workers (Okólski, 2006), which constitutes over 3% of labour force. This phenomenon is apparent especially among skilled people, which allow the authors to assume that globalization affects only workers with tertiary and secondary education. Part of the income earned abroad by migrating workers is transferred back to the home country. Such remittances amount to roughly 12 billion PLN (about 1.2% of GDP) according to official balance of payment statistics (official private foreign transfer statistics report a 3 billion PLN inflow in the 1st quarter of the 2006 alone). It is assumed that these transfers affect only households where members are assumed to migrate (employees and self-employed).

Liberalization of trade in services is believed to be different from merchandise trade liberalization. One of its forms entails the establishment of service providing enterprises in the host country that directly compete with incumbent firms. Globalization is therefore assumed to cause an inflow of firms into the service sectors (where entry was previously barred) that drives the profits to zero. Profits are calibrated in such a way, that it requires a 20 percent increase in the number of firms for the economy to reach this long run equilibrium. In other words, when entry barriers are removed, 20% more firms have to enter the market in order to reach the zero-profit equilibrium[15].

**Simulation results**

[15]We based our estimate of markups over marginal costs on Gradzewicz and Hagemejer (2007b). However, a reliable estimate of scale elasticity for the service sector is not available. Thus, as an alternative to assume a certain pure profit rate for each sector we assumed that the entry is barred and that the arbitrarily chosen number of firm (20%) has to enter service industries in order to bring profits to zero. This assumes that the rate of pure profits varies, depending on the level of estimated markups. Specifically, it is 12% in telecommunications but 5.5% in business services and 1% in retail and wholesale trade which is close to the estimates of pure profits obtained using standard accounting data (Gradzewicz and Hagemejer, 2007a).

***Trade liberalization***

The drop in import prices[16] directly affects the level of consumption of final and intermediate goods. The total increase in imports is 3.7% (macroeconomic results for all simulations are given in Table 6). Total exports also increase (by 1.9%) due to lower costs of production, resulting from a drop in prices of imported intermediate inputs. With a domestic demand increase of about 1.5% (consumption by 1.4% and investment by 1.6% - see table 6) trade liberalization results in an rise of GDP by 0.6% and 0.2% in employment.

**Table 1**
**Simulated sectoral changes resulting from trade liberalization**

| | Production | Costs | Export | Import | Employment |
|---|---|---|---|---|---|
| Agriculture | -0.5 | -0.5 | -2.0 | 1.0 | -0.7 |
| Mining | -0.6 | -0.3 | -0.8 | 0.7 | -0.5 |
| Manufacturing | 0.8 | -1.0 | 3.1 | 4.3 | 0.0 |
| Construction | 1.4 | -0.8 | 1.3 | 1.5 | 1.3 |
| Market services | 0.5 | -0.3 | -0.3 | 1.5 | 0.3 |
| Non-market services | 0.3 | 0.0 | 0.0 | 1.7 | 0.1 |

Source: Own CGE model simulations

Imports of manufactures increase by 4.3% and exports by 3.1%. (Table 1). The latter is due to a cost reduction resulting from a drop in prices of imported intermediate goods (by 1%). Production of manufactured goods increases by 0.8%. The growth of investment demand increases the supply of construction services, which goes up by 1.4%.

The largest increase in imports takes place in the food sector (11.7%), followed by intermediate light (5.9%) and light (4.9%) industries[17]. Food sector, having only a small share of imported intermediates in production costs, experiences a decline in exports. On the other hand, motor vehicles production, where the share of imported intermediates is higher than the share of domestic intermediates, experiences a surge in exports amounting to 11.2 percent.

***Productivity increase***

[16] We also assume that due to the import competition, the prices of manufactures go down in the UE which directly affects the prices of Polish exports.
[17] Detailed sectoral results are not given here to save space. They can be, however, requested from the authors.

In reaction to an increase of multifactor productivity by an average of 1% (resulting from increased FDI inflow and increased imports of technologically advanced goods from EU), GDP is higher by 3.4% in the long run (mainly due to capital accumulation). The expansion of the economy and the increase in output shift the labour demand curve up – in consequence employment level is higher by 1%. Increased labour demand, combined with an increase of labour productivity boosts wages, which are 3.3% higher in the long-run. Relative abundance of capital pushes its price down by 0.35%. Increased income from labour and renting capital to production activities results in faster growth of disposable income of households and an 3% increase of consumption.

Table 2 shows changes in the structural development of the economy after the TFP increase. As the manufacturing and market services sectors[18] are mostly affected by the increase in productivity, the costs of production in these industries decline. On the other hand, in other industries like mining and non-market services, the costs of production increase considerably. High investment demand pushes up the output in the construction industry. The increasing costs in agriculture, mining and non-market activities drive down the growth of exports in these industries, but simultaneously induce relatively high increase of imports, strengthened by an appreciation of the currency. The considerable increase in production in manufacturing, market services and construction results in a higher than average increase of demand for labour in these sectors. The increase of employment in agriculture[19], mining and non-market activities is moderate.

[18] The highest productivity increases include: food, tobacco, light (wearing apparel, etc), motor vehicles, post and telecommunication and financial services.

[19] Since labour input is measured here in time units, increase of employment does not necessarily mean more farmers. Given low productivity of labour in agriculture, increase of employment resulting from simulations should be interpreted rather as more hours worked by existing (or even smaller) number of farmers than as enlargement of the population of farmers. The same applies to other industries.

**Table 2**
**Sectoral changes resulting from productivity increase**

| | Production | Costs | Export | Import | Employment |
|---|---|---|---|---|---|
| Agriculture | 2.2 | 0.3 | 0.7 | 3.9 | 1.7 |
| Mining | 1.4 | 1.6 | 0.5 | 3.0 | 0.8 |
| Manufacturing | 4.8 | -0.2 | 6.2 | 4.7 | 3.6 |
| Construction | 5.0 | 0.3 | 4.6 | 5.3 | 4.5 |
| Market services | 3.5 | -0.1 | 3.6 | 2.7 | 2.7 |
| Non-market services | 0.8 | 1.7 | 0.7 | 3.7 | 0.3 |

Source: Own CGE model simulations

***Labour migrations***

The outflow of workers combined with an increase of foreign remittances causes a decrease of GDP by 0.5% . The negative labour supply shock (a direct result of migrations and an additional income effect of increased disposable income of households) pushes the wages up by 2.2% and employment down by 1.4%. The decline of the participation rate leads to a drop of unemployment rate by 3.4%. The increase of labour income and increased transfers from abroad, induce the increase of disposable incomes of households. Consumption is higher by 1.6%.

The demand for domestic currency surges and the currency appreciates by 0.6%, due to the inflow of remittances from abroad. Currency appreciation, combined with the growing costs of production in tradable sectors lead to a drop of exports by 5.9%. That is, to a large extent, an explanation for almost no change of imports.

**Table 3**
**Labour market changes resulting from migrations**

| | Education | | | Total |
|---|---|---|---|---|
| | High | Medium | Basic | |
| Employment | -1.0 | -1.5 | -1.2 | -1.4 |
| Wages | 2.3 | 2.4 | 0.5 | 2.2 |
| Participation | -4.3 | -3.1 | -12.5 | -4.1 |

Source: Own CGE model simulations

Changes in the structure of the labour market are presented in Table 3. The outflow of workers with secondary and tertiary education drives up their the wages by over 2.3%.

Participation rates and employment decline. The relative abundance of work force with basic education together with a declining price of capital (in our model less educated labour is assumed to be relatively substitutable with the capital) limit the increase of wages in this market segment (they increase by only 0.5%). Growing wage differentials between less and better educated work force result in a decline of participation rates among the workers with basic education. As a result, employment in this labour market segment falls.

***Liberalization of services***

The opening of service markets induces entry of new firms. The new long-run equilibrium is where profits are zero. When new firms enter the market, competition drives the level of output of incumbent firms down. Thus, the average cost goes up due to increasing returns to scale and the long run equilibrium occurs when prices equal average cost.

Compared to the benchmark equilibrium, entry of new firms amounts to 19-24% (Table 4). The corresponding drop in firm output is the highest in business services, trade and hotels/restaurants and amounts to 21-24%. Such a large decrease in firm output is due to the relatively high calibrated love-for-variety elasticity of substitution in those sectors (low initial markups), making consumers prefer the increase in the number of varieties offered over the increase in quantity supplied by each firm. The lowest drop in firm output is expected to be experienced in post and telecommunications, where the calibrated elasticity of substitution between varieties is low (high initial markups) and the market can accommodate more large firms.

The resulting decrease in prices varies depending on the initial level of monopolistic markups. It amounts to 13.4% in telecommunications, where initial profits were high (more than 12% of total revenue) and only 3.5% in trade, where initial profits amounted to less then 1 % of total revenue. As a result of a drop in prices, the total output of market services goes up by 4.6%,

the increase being highest in post and telecommunications (8.9%) where the amount of the initial loss of efficiency due to monopoly markups was relatively high, and the lowest in trade where costs to entry were low and market structure was initially relatively competitive.

**Table 4**
**Firm level changes resulting from liberalization of services**

| | Firm no | Firm output | Output | Prices | Profits |
|---|---|---|---|---|---|
| Trade | 23.6 | -21.0 | 3.5 | -0.5 | -0.9 |
| Hotels and restaurants | 21.8 | -21.3 | 2.2 | -0.4 | -2.4 |
| Transport | 22.6 | -20.0 | 6.8 | -5.8 | -4.7 |
| Post and telecommunications | 19.2 | -15.3 | 8.8 | -13.4 | -12.3 |
| Financial services | 22.1 | -20.1 | 4.2 | -2.2 | -2.2 |
| Business services | 22.5 | -23.6 | 4.6 | -4.8 | -5.5 |

Source: Own CGE model simulations

Liberalization of services is expected to add 3.2% to the level of the real GDP in the long run. Apart from a 10% surge in investment, there is also a considerable increase in consumption (3%) due to the increased variety of goods. Imports and exports increase (by respectively 4.3 and 2.8%), what leads to worsening of current account (ca. -0,52% GDP).

**Table 5**
**Simulated sectoral changes resulting from liberalization of services**

| | Production | Costs | Export | Import | Employment |
|---|---|---|---|---|---|
| Agriculture | 0.7 | 1.3 | -2.1 | 3.8 | 0.4 |
| Mining | 1.1 | 2.3 | -0.1 | 3.1 | 0.5 |
| Manufacturing | 1.9 | 0.8 | 0.9 | 5.1 | 1.3 |
| Construction | 6.0 | 1.2 | 5.5 | 6.4 | 5.6 |
| Market services | 4.6 | 0.6 | 6.8 | -2.2 | 4.1 |
| Non-market services | 0.6 | 2.6 | 0.4 | 3.3 | 0.2 |

Source: Own CGE model simulations

***Overall globalization simulation outcomes***

The overall effect of the shocks imposed on the model is an increase of GDP by 6.7% in the long run (Table 6). This effect is mainly driven by positive effects of services liberalization and an overall increase of productivity, stemming from increased imports and foreign direct investment. The main source of growth is investment demand, which is higher by almost 20% in the long run, while consumption is higher by almost 9%. Increased investment results in a considerable build-up of capital – it is higher by 7.8% in the long run. The increase of

employment is much more moderate – it is higher by less than 2% in the long run. Unemployment drops by over 3.8 percentage points, mainly as a consequence of lower labour participation induced by migrations. All the effects of globalization considered contribute positively to wage growth (the highest contribution comes from liberalization of services and migrations), which are higher by almost 11% in the long run. Although capital supply increases substantially, its price is almost unchanged, and the differential between price of labour and capital increases.

**Table 6**
**Breakdown of overall effects**

| | Services | Migrations | Trade | Productivity | Total |
|---|---|---|---|---|---|
| GDP | 3.3 | -0.6 | 0.6 | 3.4 | 6.7 |
| Consumption | 3.0 | 1.6 | 1.4 | 3.0 | 8.9 |
| Investments | 10.1 | 0.6 | 1.6 | 7.1 | 19.4 |
| Exports | 2.8 | -5.9 | 1.9 | 5.1 | 4.0 |
| Imports | 4.3 | 0.0 | 3.7 | 4.4 | 12.1 |
| Unemployment | -0.3 | -3.4 | 0.0 | -0.2 | -3.8 |
| Employment | 2.1 | -1.4 | 0.2 | 1.0 | 1.9 |
| Wages | 4.9 | 2.2 | 0.7 | 3.3 | 10.9 |
| Capital | 3.6 | 0.2 | 0.5 | 3.4 | 7.8 |
| Price of capital | 3.0 | -2.4 | 0.0 | -0.4 | 0.2 |
| CA/GDP | -0.5 | -0.2 | 0.4 | 0.1 | -0.2 |
| Exchange rate | 0.0 | -0.6 | -0.3 | -0.4 | -1.3 |

Source: Own CGE model simulations

The overall growth of exports is moderate – it amounts to almost 4%. Services liberalization, trade development and productivity improvements contribute positively to exports growth, but their impact is hampered by contraction of exports in reaction to increased transfers from abroad and lower economic activity level induced by migrations (see footnote 2). In turn, almost all channels of globalization considered (except for migrations) affect positively the development of imports. As a consequence imports grow by 12% in the long run. The increase in imports and relatively weak growth of exports is also supported by appreciating exchange rate. In consequence of these trade developments, current account declines in relation to GDP by 0.25% and net exports contribute negatively to GDP growth.

The rapid growth of investment demand induces a shift in the branch structure of the economy – the growth of construction sector is the highest in the long run (Table 6). Construction generates also a considerable growth of new jobs. Supply of market services is also considerably higher and is mainly driven by the services liberalization and the productivity improvements. This industry is also experiencing an increase in the demand for labour. A moderate production and labour demand increase occurs in manufacturing and agriculture. The growth of mining and non-market services is rather limited.

**Table 7**
**Overall sectoral changes**

| | Production | Costs | Export | Import | Employment |
|---|---|---|---|---|---|
| Agriculture | 3.8 | 0.4 | -0.9 | 9.2 | 2.2 |
| Mining | 0.7 | 4.2 | -2.5 | 6.0 | -0.8 |
| Manufacturing | 3.4 | -0.4 | 1.3 | 13.9 | 1.3 |
| Construction | 12.6 | 0.6 | 11.4 | 13.6 | 10.9 |
| Market services | 8.5 | -0.1 | 9.6 | 2.3 | 6.2 |
| Non-market services | 1.9 | 5.0 | 0.9 | 9.2 | 0.3 |

Source: Own CGE model simulations

In reaction to globalization processes, the highest growth rates of exports occur mainly in market services and construction, although there is also an increase of exports of manufacturing products (which have the highest contribution to overall export increase). The economy experiences a contraction of exports in agriculture and mining industry. The highest growth of imports occurs in manufacturing and construction (over 13%). The imports of agriculture goods and non-market services grow considerably. Dynamics of imports of market services is, however, very limited.

**Table 8**
**Overall labour market changes**

| | Education | | | Total |
|---|---|---|---|---|
| | High | Medium | Basic | |
| Employment | 1.5 | 2.0 | 2.8 | 1.9 |
| Wages | 11.1 | 11.2 | 7.4 | 10.9 |
| Participation | -2.0 | -0.3 | -9.2 | -1.4 |

Source: Own CGE model simulations

Globalization processes increase wage differentials among labour with different skills (ie., education level). The wages of skilled workers increase by about 50% faster than the wages of unskilled workers (Table 8). Slower growth of wages of workers with basic education occurs despite higher demand for their services. Also the participation rates differ among work force with different skills. Although the overall participation rate declines, a decrease experienced by low-skilled workers is relatively large.

The distribution of income among different household types also changes in response to globalization processes. Almost all channels of globalization considered (except for migrations) induce a stronger increase of disposable income of non-poor households (overall effect is 8.9%) than of poorer ones (where incomes are higher by 7.4%). Increasing income inequalities in favour of non-poor households result from changing wage differentials on labour sub-markets and increased income from renting capital to productive activities, which have a stronger impact on incomes of richer households.

## Conclusions

Our simulations show some substantial growth effects of globalization for Poland in the long-run. These effects amount to 6.8% of additional GDP compared to a scenario without globalization. The main channels of pro-growth impact of globalization on Poland's economy are: productivity growth, triggered mainly by the inflow of FDI (3.4% of GDP) and the pro-efficiency effects of liberalization of the service sector (3.3% of GDP). Globalization changes growth pattern in favour of investment (19.4% in the long – run vs. 8.9% in case of consumption) which in turn makes the long run economic growth higher. The propensity to import of domestic agents increases (19.4 % of GDP in the long – run vs. 4.0 for exports). Imports are an important channel of modernisation in Poland and they also boost the long-run growth rate. Globalization contributes positively to the evolution of the labour market by an additional growth of both

wages and employment (respectively, 10.9% and 1.9% in the long-run) and it leads to an increase in wage inequalities between high-skilled (11.1% over the base-run) and low-skilled (7.4% over the base-run). The globalization processes turn out to be favourable to welfare of households, as their disposable income is in the long-run higher by 8.8%. However, together with increasing wage inequalities, globalization slightly deteriorates the relative income position of poor households as compared with the rest (respectively, 8.9% and 7.4% over the base-run).

If the results on long-run impact of globalization for EU-15, obtained in the study of Denis et. al. 2006 are to be treated as a benchmark for our results, one might be surpirsed that our estimates are lower. If pro-growth effects of globalization function mainly through FDIs and import channel creating productivity acceleration, one might expect that it should have stronger impact for relatively poorer (comparing to EU-15) countries like Poland. We find this hypothesis plausible and treat our results as a lower bound for the long-run impact of globalization on Poland's economy. Our assessment of the effects of globalization is rather conservative since we have not taken into account the following channels: First, we underestimate the trade creation effects of globalization for Poland since exports are modelled in a simplified way: they are only supply-determined and are explained by relative prices changes only. Second, since our model does not explain the general price level, we could not take into account the significant impact (downward pressure) of globalization on inflation[20]. Third, one of other prospective channels of the impact of globalization on Poland's economy is further economic integration with Europe in the form of accession to the euro area expected by NBP (2004) to cause 0.4% additional GDP growth in the long-run. Taking all these factors into account, we hypothesize that the prospective effects of globalization may be larger that reported in this paper.

[20] Allard (2006) estimates downward impact of globalization on inflation in Poland on ½ to 1 percentage point per year since the middle of the 1990s.

## Appendix: model description

The model describes the allocations and flows of funds in the economy populated by optimising economic agents, subject to their budget constraints. The model assures that the equilibrium conditions on all markets are met and thus all the quantities and prices result from a competitive allocation that supports the general equilibrium in the economy.

The sectoral structure of the model is relatively disaggregated – there are 39 production sectors that use a bundle of intermediate products and primary inputs in production of goods using the CES technology. Primary inputs include capital good and 3 types of labour (with basic, medium and higher education). The goods are supplied either to domestic or to foreign markets (EU or non-EU).

Imperfect competition is embedded in the process of gross output formation. It is assumed that a part of gross output is used to pay the fixed cost of production. The total amount of gross output forgone is a function of the number of firms operating in a given sector. Firms produce individual product varieties and each firm has a limited monopoly power stemming from product differentiation. Demand for an individual variety comes from a standard Dixit-Stiglitz (1977) aggregator. Firms are assumed to compete in the Bertrand fashion taking into account the effect of their actions on the perceived demand.

There are 10 types of households in the model, differentiated by socio-economic groups and income level. Households pool their income from renting labour and capital to producers and net transfers with other agents in the economy. They split their income on consumption, leisure and savings (according to fixed propensity to save) in the process of utility maximization. Labour supply is endogenously determined. Investment is determined by the pool of available savings and the price of investment good.

The households' demand for goods, combined with the government demand (public consumption), investments and intermediate demand are satisfied either by domestic or by foreign producers. Imports are differentiated by origin (Armington assumption).

The government revenue comes from taxes on goods (VAT, excise, import tariffs), corporate income taxes, personal income taxes and social security contributions. The government expenses include government consumption, subsidies and transfers to other sectors of the economy (including social transfers to the households that are treated as a disincentive to work in the model).

## References


Allard, C. (2006). *Inflation in Poland: How Much Can Globalization Explain?*, Paper presented at The CEPR/ESI 10th Annual Conference on 'Globalization and Monetary Policy' 1-2 September 2006, Warsaw (Hosted by the National Bank of Poland).

Centrum Europejskie Natolin (2003). *Korzyści i koszty członkostwa Polski w Unii Europejskiej* (*Benefits and costs of Poland's membership in the European Union*), Warsaw.

Clarke, G.R.G. (2003). The Effect of Entreprise Ownership and Foreign Competition on Internet Diffusion in the Transition Economies. Presented at International conference on "The 'New Economy' and Postsocialist Transition', TIGER, April 10-11, Warsaw, Poland. Conference materials.

Denis, C., Mc Morrow, K. & Röger, W. (2006). *Globalization: Trends, Issues and Macro Implications for the EU, European Commission*, Directorate-General For Economic And Financial Affairs, Economic Papers No 254, Brussels, Belgium.

Dixit, A. K. & Stiglitz, J.E. (1977). Monopolistic competition and optimum product diversity, *American Economic Review*, vol. 67, no. 3, 297-308.

Francois, J., van Meijl, H. & van Tongeren, F. (2005). 'Trade liberalization in the Doha Development Round, *Economic Policy* 20 (42), 349–391.

Gradzewicz, M. & Hagemejer, J. (2007a). The impact of competition and business cycle on the behaviour of monopolistic markups in the Polish economy, *Bank i Kredyt .National Bank of Poland's Journal on Economics and Finance,* vol. 3, 11-27.

Gradzewicz, M. & Hagemejer, J. (2007b). „Monopolistic markups and returns to scale in the Polish economy. Firm-level analysis", *Ekonomista*, vol. 3 (in print).

Gradzewicz, M., Griffin, P. & Żółkiewski, Z. (2006). *An empirical Recursive-Dynamic General Equilibrium Model of Poland's Economy*, joint publication of the National Bank of Poland and the World Bank, Warsaw.

Hagemejer, J. & Michalek, J. (2007). *Normy techniczne i sanitarne w handlu międzynarodowym. Ich znaczenie w integracji Polski z Unią Europejską*, Warsaw University Publishing, Warsaw.

Harrison, G., Rutherford, T. & Tarr, D.G. (1996). Increased Competition and Completion of the Market in the European union, *Journal of Economic Integration*, 11(3), 332-365.

Hoffmann A.N. (2000). The Gains from Partial Completion of the Single Market, *Weltwirtschaftliches Archiv*, vol. 4, 601-630.

IKCHZ (2006). *Inwestycje zagraniczne w Polsce. Raport roczny 2006*, Instytut Koniunktur i Cen Handlu Zagranicznego, Warszawa.

Kaczmarczyk, P. (2006). *Highly skilled migration from Poland and other CEE countries – myths and reality*, Center for International Relations, Reports&Analyses 17/06, Warsaw.

Kolasa, M. (2005). *What Drives Productivity Growth in The New EU Member States? The Case of Poland*, Working Paper Series No. 486, The European Central Bank, Frankfurt.

Kolasa, M. & Żółkiewski, Z. (2004). *Total Factor Productivity and its determinants in Poland – evidence from manufacturing industries. The role of ICT*, TIGER Working Paper Series No. 64, Warsaw.

Krugman, P. & Obstfeld, M. (2007). *Ekonomia międzynarodowa*, PWN, Warszawa.

NBP (2004), *Report on the Costs and Benefits of Poland's Adoption of the Euro*, National Bank of Poland, Warsaw.

NBP (2007), *Informacja o kondycji sektora przedsiębiorstw ze szczególnym uwzględnieniem stanu koniunktury w I kw. 2007*, Departament Analiz Makroekonomicznych i Strukturalnych NBP, National Bank of Poland, Warszawa.

Okólski, M. (2006), *Costs and benefits of migration for Central European countries*, CMR Working Papers, 7/65.

Orłowski, W. (2004), *Optymalna ścieżka do euro* (*Optimal Path to Euro*), Scholar, Warszawa.

Orłowski W. & Zienkowski L. (1998). Skala potencjalnej emigracji do Unii Europejskiej: próba prognozy, in: Korcelli P. (eds.): *Przemiany ludności jako konsekwencja przystąpienia Polski do Unii Europejskiej*, Komitet Przestrzennego Zagospodarowania Kraju, Warsaw, p. 55-66.

Piatkowski, M. & van Ark, B. (2005). *ICT and Productivity Growth in Transition Economies: Two-Phase Convergence and Structural Reforms*, TIGER Working Paper Series No. 72, Warsaw.

Rybinski, K. (2006). *Globalizacja w trzech odsłonach*, www.rybinski.eu.

UKE (2006). *Raport o stanie rynku telekomunikacyjnego w 2005 roku*, http://www.uke.gov.pl.

Yusuf, S. (2001). *Globalization and the Challenge for Developing Countries*, World Bank Policy Research Working Paper Series number 2618.