Globalization and the Polish Economy: Stylized Facts and Simulations using a Computable General Equilibrium Model

Wpływ globalizacji na gospodarkę Polski. Stylizowane fakty i symulacje na podstawie modelu równowagi ogólnej (CGE)

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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 the impact of globalization are distinguished: (i) trade openness, (ii) productivity improvement, (iii) labour migrations, (iv) liberalization of the services sector. We employ a computable general equilibrium model with multiple industries and households and imperfect competition features.

Our results show positive and quite significant effects of globalization on the performance of the Polish economy, stemming mainly from productivity improvements and liberalization of services. 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 particularly beneficial to some exporting sectors and skilled segments of the labour market.

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

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Streszczenie

Celem niniejszej pracy jest ilościowa ocena wpływu globalizacji na gospodarkę polską w średnim okresie. Analizujemy cztery kanały oddziaływania: 1) otwartość gospodarki, (2) zwiększenie produktywności, (3) migracje zarobkowe oraz (4) liberalizację sektora usług. Używamy policzalnego modelu równowagi ogólnej (CGE), który uwzględnia interakcję wszystkich sektorów gospodarki, rynku pracy, gospodarstw domowych, a także niedoskonale konkurencyjną strukturę rynku produktów.

Wyniki wskazują na dodatni wpływ globalizacji na polską gospodarkę, a najistotniejszymi kanałami oddziaływania są zwiększenie produktywności i liberalizacja sektora usług. Migracje mają negatywny wpływ na gospodarkę ze względu na zmniejszenie potencjału wzrostowego i zwiększanie presji płacowej. Skutki globalizacji są szczególnie korzystne dla sektorów proeksportowych i dla gospodarstw świadczących usługi pracy wykwalifikowanej.

Słowa kluczowe: globalizacja, równowaga ogólnej, migracje zarobkowe, liberalizacja handlu

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1. 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, e.g. 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, i.e. 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 (e.g. Centrum Europejskie Natolin 2003; Orłowski 2004; NBP 2004; Allard 2006; Hagemejer, Michałek 2007), 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 simulation experiments and discuss their results. The last section concludes.

2. Review of literature and stylized facts on globalization for Poland

2.1 Review of literature

Given the fact that "globalization" is one of the most popular words in contemporary economic publications, the review of even 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). The 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 the EU's growing integration into the world's 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 of 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 Uruguay round is an annual increase in the world GDP growth by 1 pp (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 et al. (2005), estimates the static gains to equal 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, e.g. by 41% (processed foods), 34% (textiles and clothing) and 16% (sugar).

There are several papers estimating the effects of Poland's accession to the European Union and the Single Market. A recent one, by Hagemejer and Michałek (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.

[1] A comprehensive discussion of globalization, with special emphasis on global imbalances and implications for monetary policy, may be found in Rybiński (2006).

[2] An international macro model (QUEST) has been used as the simulation tool.

2.2 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 billion USD) to over 92 billion. USD in 2005 (i.e. about 31% of GDP). Inward FDIs have been important not only as a source of investment funding (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 they increase 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 compared to 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 the accession to the European Union in 2004, have considerably affected the labour market in Poland. Due to wage differentials and large pool of unemployed[4] and inactive people, migrations accelerated after 1 May 2004 to the level significant for both the Polish labour market and the countries receiving Polish émigrés (mainly the Great Britain and Ireland). There are different estimates of the actual size and duration of outward migrations since the accession. The Centre for Migrations Research of the 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 rising shortages of skilled workers as perceived by enterprises. For instance, according to the National Bank of Poland's 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 ones 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 (e.g. 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's impact, such as electricity, gas and water supply, 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, e.g. through capital inflows changing both the market structure (the competition effect) and boosting modernization (the productivity effect). This is of particular importance for the services sector of the Polish economy, which is partially overregulated and protected. In particular, this refers to telecommunications (excessive fixed-line telephony and internet access charges), financial services (relatively expensive and underdeveloped, e.g., with respect to the financing of small and medium enterprises), 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, postal services 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 Office of Electronic Communications – 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.

3. Simulations of effects of globalization on Poland's economy

3.1 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

[3] Expenditure on R&D amounted to 0.57% of GDP in 2005, which is one of the lowest records in EU25. However, it is even lower than in 1995 (0.63% of GDP).
[4] The unemployment rate is still relatively high in Poland (at about 13% at the end of 2006) even though it has been decreasing fast over the last quarters (it was almost 17% the end of 2005).
[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.
[7] All data come from the UKE (2006).

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 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, Hagemejer 2007b), the authors assumed that in case of most industries, companies are operating in an oligopolistic setting (Bertrand) with economies of scale 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 the results of Gradzewicz and Hagemejer (2007a).

3.2 Assumptions of the globalization simulations

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 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 Uruguay Round and the future commitments in the Doha Round of the WTO, is higher. Following Hoffman (2001) and Harrison et al. (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's 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 raise 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]

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 allows 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 2006 Q1 alone). It is assumed that these transfers affect only those 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

[8] Full model description is given in Gradzewicz et al. (2006).

[9] The latest input-output table published by the 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.

[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 reviewed literature.

[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.

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 services sectors (where entry was previously barred) which 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]

4. Simulation results

4.1 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 rise of 1.4% and investment rise of 1.6% – see Table 6) trade liberalization results in an rise of GDP of 0.6% and a rise in employment of 0.2%.

Imports of manufactures increase by 4.3% and exports by 3.1%. (Table 1). The latter is due to a cost reduction resulting from the drop in prices of imported intermediate goods (of 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.

4.2 Productivity increase

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 the EU), GDP is 3.4% higher 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 1% higher. 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 a 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

[15] We based our estimate of markups over marginal costs on Gradzewicz and Hagemejer (2007b). However, a reliable estimate of scale elasticity for the services 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 firms (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, Hagemejer 2007a).

[16] We also assume that due to the import competition, the prices of manufactures go down in the EU, 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.

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

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. All changes in percent (%).

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. All changes in percent (%).

employment in agriculture[19], mining and non-market activities is moderate.

4.3 Labour migrations

The outflow of workers combined with an increase of foreign remittances causes a 0.5% decrease of GDP. 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 of 3.4%. The increase in labour income and increased transfers from abroad, induce the increase of disposable income 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 of 5.9%. That is, to a large extent, an explanation for almost no change in imports.

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.

4.4 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 the 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

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

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. All changes in percent (%).

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. All changes in percent (%).

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 price drop, the total output of market services goes up by 4.6%, the increase being the 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.

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 4.3 and 2.8%, respectively), which leads to the worsening of current account (ca. -0,52% GDP).

4.4.1. Overall globalization simulation outcomes

The overall effect of the shocks imposed on the model is a 6.7% increase of GDP 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 almost 9% higher. Increased investment results in a considerable build-up in capital – it is 7.8% higher in the long run. The increase of employment is much more moderate – it is less than 2% higher 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 almost 11% higher in the long run. Although capital supply increases substantially, its price is almost unchanged, and the differential between price of labour and capital increases.

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) positively affect 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 7). Construction also generates a considerable growth of new jobs. Supply of market services is also considerably higher and is mainly driven by the services liberalization and productivity improvements. This industry is also experiencing an increase in the demand for labour. A moderate production and labour demand

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. All changes in percent (%).

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. All changes in percent (%).

increase occurs in manufacturing and agriculture. The growth of mining and non-market services is rather limited.

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 the 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.

Globalization processes increase wage differentials among labour with different skills (i.e., education level). The wages of skilled workers increase 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 7.4% higher). 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.

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. All changes in percent (%).

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. All changes in percent (%).

5. 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. Domestic agents' propensity to import 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 positively contributes to the evolution of the labour market by an additional growth of both wages and employment (10.9% and 1.9%, respectively, 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 8.8% higher in the long-run. However, together with increasing wage inequalities, globalization slightly deteriorates the relative income position of poor households as compared with the rest (8.9% and 7.4%, respectively, 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 surprised that our estimates are lower. If pro-growth effects of globalization function mainly through FDIs and the import channel creating productivity acceleration, one might expect that it should have stronger impact in 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 the 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.

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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 goods 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 ones).

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 goods.

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).